# York Oil Operable Unit 1 & 2 Superfund Site

## Moira, NY

## Operation, Maintenance, and Monitoring Plan

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# 1 Introduction

## 1.1 Purpose and Scope

This Operations, Maintenance and Monitoring (OM&M) Plan has been prepared on behalf of the Settling Defendants for the Operable Unit No. 1 (OU1) and Operable Unit No. 2 (OU2) Consent Decrees (CD) and Statements of Work (SOW) for Remedial Design/Remedial Action (RD/RA) at the York Oil Superfund Site in Moira, NY (Site) (Figures 1-1 and 1-2).

The OU1 CD (Civil Action Nos. 83-CV-1623, 92-CV-562) was entered by the Court on August 10, 1996. The Aluminum Company of America (Alcoa) was named as the Performing Party in the OU1 RD/RA CD. On November 1, 2016, Alcoa split into two new entities, Alcoa Corporation and Arconic, Inc. (Arconic). Management responsibility for the York Oil Site was assigned to Arconic. The OU2 RD/RA CD (Civil Action No. 83-CV-1623) was entered by the Court on November 30, 2000. Alcoa (now Arconic) was named as the party to manage and perform the Work under the OU2 RD/RA CD. Arconic retained ***de maximis, inc.*** *(de maximis)* as its' Project Coordinator for the RD/RA. In March 2020, Arconic retained *de maximis* as its' General Contractor to manage and perform all necessary OM&M work.

The primary goal of this OM&M Plan is to provide a consolidated summary of the various anticipated operation, maintenance, inspection, and monitoring components (collectively, the "OM&M activities") associated with the "operations and maintenance" phase of the remedy. This OM&M Plan is intended to provide a comprehensive summary of the various OM&M activities required for the Site to facilitate their ongoing implementation.

In addition to the operation and maintenance activities prescribed by SOW Section VI.I, this OM&M Plan also summarizes planned inspection and monitoring components for the Site. These include implementation of the groundwater monitoring program and periodic inspections to document the continued performance, functionality, and/or effectiveness of other completed remedial components (e.g., the RCRA cap).

## 1.2 Document Content and Format

The OU1 and OU2 CDs / SOWs provide for several OM&M related work plans.

- The OU1 SOW requires submission and approval of an "O&M Plan" to include a sampling program, maintenance program, monitoring program, and reporting requirements. Supporting plans are to include QAPP, Sampling and Analysis Plan (SAP), and "Contingency Plan".
- The OU2 SOW requires a "Contamination Pathways Monitoring Plan" to describe groundwater monitoring, and references a FSP, QAPP, and HASP.

The various OU1 and OU2 SOW requirements have been combined into this OM&M Plan to provide for one compendium that addresses all site-required OM&M work.

The reminder of this document is outlined as below:

- **Section 2 – Background Information:** Section 2 summarizes pertinent background information, including location, operational history, regulatory status, remedial actions to date, site conceptual model and a summary of the applicable cleanup standards.
- **Section 3 – Site Maintenance and Monitoring:** Section 3 describes the on-going site maintenance and monitoring activities.
- **Section 4 – Reporting:** Section 4 describes the requirements and schedule for reporting.

Other plans that are necessary to implement the scope are attached, and include:

- **Attachment A** – Health and Safety Plan (HASP): provides an updated Site-specific Health and Safety Plan addressing the O&M Phase of the project.
- **Attachment B –** Quality Assurance Project Plan (QAPP): summarizes the various procedures, sampling methods, analytical methods, and related protocols associated with sampling and analysis activities that will be done during the O&M Phase of the project.
- **Attachment C –** Field Sampling Plan (FSP): summarizes the standard operating procedures (SOPs) associated with activities performed during the O&M Phase of the project.

# 2 Background Information

This section presents a summary of background information for the York Oil Superfund Site. Historical information related to past site usage and a summary of remediation activities conducted to date are discussed.

## 2.1 Site Location and Description

The York Oil Site is located about one-mile northwest of the hamlet of Moira, in the Town of Moira, Franklin County, New York. The site is approximately 20 miles southeast of Massena, New York and 10 miles west of Malone, New York. Figure 1-1 presents a site location map, and Figure 1-2 presents a site area plan with all existing monitoring well locations shown.

The fenced portion of OU-1 slopes to the southwest and has generally sparse to moderate vegetative cover. Within the fenced portion of OU-1 was the location of three former lagoons, which is now an area of covered, treated soil resulting from the remediation of OU-1 during 1999 and the remediation of the Western Wetland located west of OU-1 in 2001. Adjacent to the fenced portion of OU-1 is the Town of Moira garage to the north, North Lawrence Road (County Route 6) to the northeast, an abandoned milk house to the east, an abandoned

railroad bed along the southern boundary of OU-1, and the Southern Wetland south of the abandoned railroad bed. Surface water from OU-1 drains to the southwest via a drainage ditch before entering a beaver pond within the Western Wetland portion of OU-2.

The geographical boundary of OU-2 is defined to be the potential extent of migration of compounds via surface water and groundwater from OU-1 into areas outside of the OU-1 boundary.

OU-1 and OU-2 do not presently contain any inhabitable buildings; additionally, institutional controls are in-place to prevent unacceptable uses of soil and groundwater. Current owners of the property located downgradient of the site use the parcels for hunting and recreational purposes only. Review of the Franklin County Tax Assessor's and the Town of Moira Building Inspector files indicates no current plans for development of the York Oil property or any downgradient properties.

### 2.1.1 Site History

The York Oil Site was first used in 1954 by the York Oil Company, which recycled used oils collected from service stations, car dealers, certain federal facilities, and a variety of industrial facilities. The oil was processed with heat and a silica-based substance to remove impurities and dirt, and then resold to several businesses. This operation was discontinued around 1962.

From 1962 to 1977, Pierce Brothers Oil Services Inc. stored and processed used oils within the fenced portion of the York Oil Site. Processing of used oils at the site was discontinued in the mid-1960s; thereafter until 1977 the site was an oil storage facility. Some oil accepted by the facility contained polychlorinated biphenyls (PCBs) and other contaminants. Oil was stored in eight metal storage tanks, at least one underground tank at the north end of the site, and in three unlined lagoons in the southern portion of the site. Residuals that settled in the lagoons were separated from light oils that were decanted and then sold as fuel oil.

### 2.1.2 Summary of Remedial Activities to Date

The primary source of impacted groundwater at the site was waste oil deposited in the unlined lagoons and aboveground storage tanks prior to 1977. The aboveground tanks and their contents were removed for offsite disposal as part of the removal action activities performed at the site during the 1980s, many years prior to OU-1 being remediated. The initial remedial investigation that was completed in 1987 on behalf of the New York State Department of Environmental Conservation (NYSDEC) outlined the potential contaminants of concern in the groundwater as PCBs, and Volatile Organic Compounds (VOCs) including benzene, toluene, ethylbenzene and xylenes ("BTEX"), 1,1-dichloroethane (DCA) and *cis*-1,2-dichloroethene (cDCE). Since then, cDCE has been the constituent found most widely in groundwater in OU-2 above New York State Water Quality Standards (NYSWQS) (5 µg/l).

OU-1 was remediated during 1999 in accordance with OU-1 Statement of Work requirements. Remediation at OU-1 consisted of excavating soil/source material, using a PCB concentration greater than 10 mg/kg as the definition of source material. The stockpiled, excavated material was placed in a pugmill, cement was added to solidify/stabilize the material, and the treated material was placed above the high-water table onsite. Additionally, sediment material exceeding 1 mg/kg PCB concentration from the Western Wetland portion of OU-2 was removed, solidified/stabilized, and the treated material was placed in the landfill, covered, and capped in 2001. The covered and capped area is designated "Landfill" on Figure 1-2.

Groundwater within OU-1 and a limited area within OU-2, south of OU-1 are impacted with VOCs associated with the oil sludge. The groundwater cleanup levels in the OU-1 Record of Decision (ROD) for VOCs are 50 µg/l, with 5 µg/l for benzene and 2 µg/l for vinyl chloride. OU-1 groundwater now meets the OU-1 ROD cleanup levels. The cleanup levels for OU-2 are lower, at 5 µg/l for VOCs and 2 µg/l for vinyl chloride. The remedy for OU-2 groundwater is natural attenuation. The difference in cleanup levels between the two Operable Units, necessitated controlling migration of OU-1 impacted groundwater into OU-2. Migration was controlled by a pump and treat system from 2000 until September 19, 2009, by *in situ* chemical reduction from 2009 to 2015, by *in situ* bioremediation via enhanced reductive dechlorination in 2016, and by liquid activated carbon in 2018.

Natural attenuation remains the remedial alternative for OU-2. Following the November 2002 sampling round, certain wells within OU-2 needed to be replaced due to a variety of factors, including: physical damage, physical limitations of wells with less than 1-inch inner diameter, screened intervals that penetrated two different geological strata, and concern about reproducibility of sampling results from round to round. Additional wells were required to monitor natural attenuation accurately, to determine the leading edge of the contaminant plume, and to satisfy landfill monitoring requirements.

Between January 28, 2003 and May 5, 2003, 14 existing groundwater monitoring wells were abandoned, and 14 new 2-inch groundwater monitoring wells were installed at the York Oil Site. The abandoned wells were WQ-2, YO-02, YO-02R, YO-12, YO-12U, YO-12A, YO-12R, YO-14, YO-14AU, YO-14AL, YO-29S, YO-29D, YO-30S, and YO-30D. The following replacement wells were installed at a minimum of 10 ft. away from the wells that they replaced: YO-14ALX, YO-14X, YO-02X, YO-02RX, YO-12AX, YO-12RX, YO-29SX, YO-29DX, YO-30SX, and YO-30DX. The following new monitoring wells were also installed: YO-110S, YO-110D, YO-113D, and YO-56D. A description of the well abandonment and installation is presented in Section 2 of the *Monitored Natural Attenuation Documentation Report No. 3*, prepared by CDM Smith and submitted to NYSDEC on October 24, 2003.

In August 2004, two additional new bedrock wells, YO-111D and YO-112D were installed in the downgradient portion of OU-2. The new wells were intended to further delineate the downgradient limits of the volatile organic compound (VOC) plume.

Source control measures at OU-1 were completed during the fall of 2001 and sampling for monitored natural attenuation (MNA) was performed until April 2005. In correspondence dated April 11, 2005 from the OU-1 and OU-2 Project Coordinator at *de maximis* to Mr. George Jacob of the U.S. Environmental Protection Agency (USEPA), Alcoa requested changes to the groundwater analytical program and method of sample collection. With USEPA concurrence, the groundwater analytical program was reduced to VOCs only for all groundwater monitoring wells in the fall of 2005. This change was supported by eight rounds of MNA sampling data from April 2001 through April 2005, each of which demonstrated the same redox/biodegradation conditions across the study area. In addition, the method of collection was changed from low flow sampling to passive diffusion bags (PDBs) after a side-by-side comparison indicated comparable results. The landfill monitoring program (OU-1) is included in the groundwater monitoring program that was submitted to the USEPA and will be discussed with the other OU-2 wells.

In June 2006, five wells were installed in OU-2. The new wells included three bedrock wells (YO-114R, YO-115R and YO-116R) and two overburden wells (YO-116D and YO-116S). These new wells were installed to allow for additional site characterization and groundwater monitoring.

#### 2.1.2.1 *In situ* Chemical Reduction Pilot Study

Groundwater extraction and treatment was selected in the OU-1 ROD to treat a plume of groundwater contamination, originally thought to consist of total phenolic compounds. The ROD anticipated reaching clean up targets within three years of operation of the groundwater extraction and treatment system. Consistent with the OU-1 ROD, a pump and treat system was designed and constructed, which achieved full operation in March 2002. Phenolics were not found to be an issue; however, a chlorinated volatile organic compound (cVOC), cDCE, was found in the system influent.

An investigation was conducted in the spring of 2009 of the former lagoon area immediately upgradient from the groundwater treatment system (GWTS), which revealed ~2,000 yards$^3$ of subsurface soil containing total petroleum hydrocarbons (TPH). In addition to the TPH, some soil samples contained cDCE and tetrachloroethene (also called perchloroethene, or "PCE"). PCE degrades to cDCE through an intermediate product, trichloroethene (TCE). PCE and TCE have partitioned into the TPH, and continue to dissolve into the groundwater. TPH could potentially serve as an electron donor that facilitates biological degradation to cDCE.

Previous analysis of MNA data identified the lack of electron donor as a limiting factor for successful biological degradation of cDCE. Full-scale biostimulation using soluble electron donors has been successfully applied at a number of sites, suggesting that installing a line of injection wells and injecting a soluble electron donor could successfully stimulate biodegradation of residual cDCE emanating from the OU-1 Site, and complete the degradation process within the OU-2 plume.

An evaluation of feasible alternatives was performed, and EHC® was identified as a preferred *in situ* remedial option for OU-1 groundwater. EHC® is a patented combination of controlled-release carbon and zero valent iron (ZVI) particles used for stimulating *in situ* chemical reduction (ISCR) of otherwise persistent organic compounds in groundwater. The evaluation considered not only the implementability, effectiveness and cost, but the sustainability and effect on greenhouse gas emissions of the various options.

The EHC® process was proposed to the USEPA at a meeting in February 2009, and a full-scale pilot study was proposed in July 2009 and approved by the USEPA in August 2009. In September 2009, the groundwater extraction and treatment system was shut down on September 21, 2009 and the system was drained for long-term inactivation.

Phase I of the *in situ* chemical reduction pilot study was completed in October 2009 with the installation of a 200-foot long EHC®-amended permeable reactive barrier (PRB) at a targeted depth of 6 to 35 ft. below ground surface (bgs). Quarterly groundwater sampling was initiated following the EHC® injection. Post-injection groundwater level measurements in the vicinity of the PRB did not indicate any changes to the direction of groundwater flow. Groundwater sampling was reduced to semiannual during 2012.

As part of the *In Situ* Chemical Reduction Pilot Study, five new monitoring wells (YO-117S, YO-117D, YO-118, YO-119, and YO-120) were installed in October 2009.

#### 2.1.2.2 *In situ* Chemical Reduction Pilot Study – Phase II

In October 2011, in a letter to USEPA on behalf of Alcoa, *de maximis* proposed a Phase II to the *in situ* chemical reduction pilot study, with the goal of enhancing the performance of the PRB through application of additional EHC®. The EHC® was to be injected using direct push technology (DPT), with locations spaced closer together as compared to Phase I to ensure creation of a continuous treatment zone. In addition, the barrier would extend further to the west to create a greater influence on the YO-12 well cluster area. The total length of the PRB would be approximately 240 ft. and extend to a depth of 6 to 43 ft. bgs. To address the recent detections of BTEX compounds, *de maximis* recommended that an EHC® product containing a sulfate salt be used to further stimulate the degradation of BTEX by anaerobic oxidation via sulfate reduction.

From October 31 to November 1, 2011, Paragon Environmental Construction, Adventus, *de maximis* and CDM Smith were onsite to perform the Phase II EHC® injection via DPT. Numerous attempts were made to direct push to 43 ft. bgs that were ultimately unsuccessful due to subsurface conditions (cobble layer). One injection point was drilled to depth, but the EHC® could not be injected because the injection tip would not open. Once the injection tip was retrieved it was evident the cobble layer had damaged the injection tip, rendering the rod unusable.

After two field days of unsuccessful attempts, the Phase II EHC® injection was abandoned. Adventus, *de maximis*, Alcoa and CDM Smith decided to explore new avenues for possible EHC® injection in spring 2012. Meanwhile, the December 2011 groundwater sampling round indicated only one well where the OU-1 cleanup standards were exceeded. Based on the difficulties encountered during the October 2011 injection attempt and the subsequent improvements in groundwater quality, semi-annual groundwater monitoring was extended through 2014.

#### 2.1.2.3 *In situ* Bioremediation via Enhanced Reductive Dechlorination Pilot Study

On November 6th, 2015, on behalf of Alcoa, *de maximis* proposed a Work Plan to the USEPA to inject LactOil® at the York Oil Superfund Site. The lack of an electron donor was targeted as a limiting factor for successful biodegradation of cDCE. From November through December 2015, five new wells were installed in OU-1. YO-121, YO-122, YO-123, and YO-124 are overburden wells used for injection of LactOil®. YO-125R, a bedrock well, is used for monitoring.

An environmental fracturing process was used to emplace enhanced permeability sand lenses out to a radius of approximately 15 to 20 ft. from the injection boreholes. The permeability enhancement injection process (environmental fracturing) caused a “tensile parting” of the soil to emplace a sand and guar mixture in a planar lens extending out from the injection borehole. Once the guar breaks down or is extracted during well development, the sand-filled lens remains to provide a high permeability injection pathway that can be used multiple times to inject electron donor to sustain a biological treatment zone between OU1 and OU2.

A 5% solution of LactOil® was pumped into the four injection wells, with a total of 5,000 pounds, approximately 1,400 gallons of LactOil® injected into the subsurface in the fall of 2015. Groundwater monitoring occurred during 2016 to evaluate effectiveness of this treatment.

#### 2.1.2.4 *In situ* Sorption/Bioremediation via PlumeStop® Liquid Activated Carbon (LAC) Pilot Study

On October 29th, 2018, on behalf of Arconic, *de maximis* proposed a Work Plan to the USEPA to inject PlumeStop®, a liquid activated carbon (LAC) at the York Oil Superfund Site. PlumeStop® was selected to address increasing BTEX compounds in the upgradient portion

of the OU2 Southern Wetlands. The LAC would also act as binding sites for both BTEX compounds and cVOCs; cDCE in particular.

From November 6, 2018 through November 9, 2018, representatives of Regenesis® were on-site to conduct the injection of the PlumeStop® product into the designated injection wells YO-121, YO-122, YO-123, and YO-124. The pressure exerted on each well was maintained at 10 psi while the concentration of the LAC/water slurry was varied throughout the injection. The initial application of 60% of the total LAC mass was followed by "chasing" that with the remaining 40% of the LAC mass dissolved in significantly more water. This served to move the LAC out of the sand zones emplaced during the hydro-fracturing when the injection wells were installed. Approximately 4,800 gallons of LAC/water slurry was injected into each well. The wells are planned to be sampled as part of the routine 2019 sampling program in April. The results of the 2019 sampling rounds will be used to assess the effectiveness of ongoing bioremediation and the PlumeStop® injection.

## 2.2 Site Hydrogeology

The Southern Wetland overburden and shallow bedrock can be classified as two groundwater zones, consistent with the *OU-2 Contamination Pathways Investigations Report* (Blasland, Bouck and Lee, Inc. (BBL), 1998). The shallow zone consists of unconsolidated glaciated material, located from the surface to approximately 15 to 35 ft. bgs. It is less dense and coarser than the dense till directly beneath.

The deep zone begins approximately 15 to 35 ft. bgs and consists of the dense till and 10 to 15 ft. of weathered bedrock. The bedrock underlying the overburden in OU-2 comprises the Theresa Formation (sedimentary layers of sandy dolomite and calcareous sandstone) and Potsdam Sandstone.

Previous site groundwater quality data indicate that the primary migration pathway for constituents of concern appears to be the deep zone within the Southern Wetland. This is due to shallow groundwater from OU-1 migrating vertically to the deep zone within OU-1 and then horizontally downgradient to the south to the Southern Wetland in OU-2. The monitoring wells sampled during the 2018 monitoring rounds are shown on Figure 1-2. The *Contamination Pathways Investigations Report* (BBL, 1998) uses historical data to calculate the average hydraulic conductivities for the shallow and deep aquifers, calculations show the conductivities are $3.25 \times 10^{-4}$ cm/sec and $3.05 \times 10^{-5}$ cm/sec, respectively.

## 2.3 Groundwater Migration to Potential Receptors

There are no existing potable drinking water wells downgradient (i.e., south) of OU-1 that could be impacted by groundwater migrating from OU-1. The Southern Wetland borders OU-1 and extends approximately 2,500 ft. to the south as undeveloped land. A detailed discussion of migration pathways and receptors was presented in the *Contamination Pathways*

*Remedial Investigation Report* (BBL, 1998). The results of the study concluded that groundwater flow is generally to the south from the OU-1 site, and the likely point of groundwater discharge to surface water is Lawrence Brook. As there are currently no potable water wells in the area between the OU-1 site and Lawrence Brook, "human exposure to groundwater is not considered a viable exposure pathway under current conditions. Moreover, future exposure via potable groundwater use is considered extremely unlikely due to the physical characteristics of the southern wetland; i.e., the fact that it is a wetland area would preclude residential or other development due to the physical and regulatory constraints" (BBL, 1998).

Based on an estimated approximate groundwater travel velocity in the deep OU-2 zone of 1.2 ft. to 7.1 ft. per year determined from 2018 groundwater elevation data, groundwater may have traveled 277 ft. to 632 ft. over the 64 years since startup of the York Oil recycling operation. This estimate does not account for the effect of the OU-1 pump and treat system "pulling" groundwater back toward OU-1 between 2000 and 2009, when the pump and treat system was operational. Recent monitoring data contradicts the travel distances calculated from the groundwater elevation data and suggests that preferential flow paths might exist in the deep aquifer, possibly due to fracture flow. This fracture flow could facilitate a small amount of higher velocity transport than is expected for the bulk groundwater flow. The ultimate discharge point for groundwater still appears to be Lawrence Brook. The nearest potential current human receptors are homes located approximately one-half mile (2,840 ft.) south of OU-1 along US Route 11 on the far side of Lawrence Brook. Based on the estimated average groundwater advective travel velocities in the deep zone, it would take approximately 575 years for site groundwater to reach these homes if the groundwater flow were to pass below Lawrence Brook. Institutional Controls that prohibit the installation of supply wells and the use of groundwater have been implemented according to the York Oil OU-2 Record of Decision (ROD) requirements and as further requested by the USEPA to minimize the possibility that impacted groundwater could affect human health. An Environmental Protection Easement and Declaration of Restrictive Covenants have been placed on the three properties where the plume is located. These include tracts identified on the Franklin County tax maps as 120-1-9, 120-5-3 and 120-5-6 (section-block-lot numbers). These deed restrictions preclude the installation of groundwater wells and prohibit any use of the property that would interfere with investigative or remedial work. The locations of the parcels with Institutional Controls are shown on Figure 2-1.

## 2.4 Performance Standards

Groundwater cleanup levels were established in the OU1 and OU2 Record of Decisions (RODs). The Performance Standards for OU2 are typically lower than those for OU1 due to a change in the applicable standards between issuance of the two RODs.

Specifically, the OU2 ROD identified certain VOCs, soluble volatile organic compounds (SVOCs), and inorganics as Constituents of Concern (COCs) based on their frequency of detection and other metrics. As such, the ROD Remedial Action Objective (RAO) is to meet federal and state maximum contaminant levels (MCLs).

A summary of the applicable Performance Standards for OU1 and OU2 groundwater is included below:

| | OU1 (COC in ROD Table 1) | OU1 Performance Standard (µg/L)[1] | OU2 (COC in ROD Table 14) | OU2 Performance Standard (µg/L)[2] |
|---|---|---|---|---|
| **VOCs** | | | | |
| Benzene | X | 5 | X | 5 |
| 1,1-dichloroethane | - | - | X | 5 |
| 1,2-dichloroethane | - | - | - | 5 |
| Cis-1,2-dichloroethene | - | - | X | 5 |
| Trans-1,2-dichloroethene | X | 50 | - | 5 |
| Ethylbenzene | - | - | X | 5 |
| Toluene | - | - | - | 5 |
| Vinyl Chloride | - | - | - | 2 |
| Xylene | X | 50 | X | 5 |
| **SVOCs** | | | | |
| 2,4-dimethylphenol | X | 50 | X | 50 |
| **Inorganics** | | | | |
| Antimony | - | - | X | 6 |
| Arsenic | X | 25 | X | 50 |
| Cadmium | X | 10 | X | 5 |
| Zinc | X | 5000 | X | 5000 |

# 3 Site Maintenance and Monitoring

## 3.1 OU1 Maintenance

The implemented Site Proper remedy requires various maintenance activities of the disposal area. Specifically, the following OU1 Maintenance annual activities will be performed:

- Mowing of the grassed area in September;
- Inspection and maintenance of the permanent erosion control structures;

[1] OU1 Performance Standards are derived from the OU1 ROD
[2] OU2 Performance Standards are derived from NYSDEC MCLs

- Inspection and maintenance of gravel access road and wells onsite;
- Inspection and maintenance of security fencing around the upland area; and
- Inspection and maintenance of final cap.

It is anticipated that the annual inspection will be conducted in September each year. Each area will be visually inspected, and any problem areas will be photographed and documented in the OU1 Maintenance Inspection Form included as Attachment D.

## 3.2 OU1 and OU2 Groundwater Monitoring

The groundwater monitoring program was developed to provide long-term monitoring of COCs in groundwater throughout OU1 and OU2. The initial groundwater monitoring program, first implemented in 2001, was subsequently expanded to include additional monitoring well locations and additional analysis for various emerging contaminants (1,4-dioxane and PFAS).

Although PFAS was not detected above applicable EPA and NYSDEC guidance levels, 1,4-dioxane was detected at several wells at concentrations exceeding NYSDEC and EPA risk-based criteria. Based on results of the groundwater monitoring program and the additional analysis of emerging contaminants to date, EPA and NYSDEC approved requested changes to monitoring program in April 2020. The approved monitoring well network, laboratory analysis and sampling frequency is provided in Table 3-1.

Note that once OU2 groundwater VOC data meets or is very close to meeting MCLs, further sampling and evaluation of 2,4-dimethylphenol and inorganics concentrations will be performed to confirm those constituents also meet MCLs.

### 3.2.1 Monitored Parameters and Sampling Approach

Groundwater samples collected under this monitoring program will be analyzed for the COCs listed in Table 3-1. Water chemistry parameters including temperature, pH, Oxidation Reduction Potential (ORP), Dissolved Oxygen (DO), specific conductance, conductivity, and turbidity will be measured and recorded during sample collection. Prior to sample collection, the depth to water in each well will be measured from the top of the well casing reference marking. The groundwater elevation at each well will then be calculated in feet above mean sea level (ft AMSL or ft NGVD) by subtracting the measured water depth from the previously surveyed elevation of the well casing reference marking.

Samples will be collected using the EPA Low-Flow/Minimal Drawdown Sampling Procedure (Low-Flow Procedure), as described in the FSP (Attachment C). All samples will be preserved as required and shipped under chain-of-custody to an approved laboratory for analysis. The

Standard Operating Procedures (SOPs) for field sample collection and laboratory analysis are provided in the FSP and QAPP.

As stated above, the Low-Flow Procedure has been selected for groundwater sampling under this monitoring program. Other sampling procedures, including no-purge procedures (e.g., Hydrasleeve™ or passive diffusion bags), may be considered for future sampling. Consideration for these alternate sampling procedures would involve collecting samples using both methods, then comparing results from the alternate method to coincident results from the Low-Flow Procedure relative to the data quality objectives described in the QAPP. If appropriate, an alternate sampling approach may be selected in place of the Low-Flow Procedure for future monitoring; changes to sample collection procedures will be discussed with EPA and NYSDEC.

### 3.3 Institutional Controls Monitoring

There are three institutional controls (ICs) in place for the Site. Once per year, the status of these controls is reviewed at the Franklin County Courthouse to confirm that no changes have occurred. A summary of ICs is included below:

| Parcel | Tax ID / Owner | IC Provisions | Title of IC Instrument Implemented and Date |
|---|---|---|---|
| Site Proper | Section 120, Block 1, Lot 9<br>Franklin County | Access Rights, restrict installation of ground water wells and ground water use, not interfere with Remedy, no residential use | Declaration of Restrictive Covenants<br>7/15/2002 |
| Southern Wetlands | Section 120, Block 5, Lot 6<br>Curtis Raymond | Access Rights, Restrict installation of ground water wells and ground water use | Declaration of Restrictive Covenants<br>7/15/2002 |
| RR ROW | Section 120, Block 3, Lot 5<br>Harry Dow | Access Rights, Restrict installation of ground water wells and ground water use | Declaration of Restrictive Covenants<br>12/1/2003 |

## 4 Reporting

### 4.1 Quarterly Reports

***de maximis*** will continue to submit quarterly progress reports to EPA and NYSDEC that document all work performed in the prior quarter.

## 4.2 Annual State of Compliance Report

***de maximis*** will submit an Annual State of Compliance Report to EPA and NYSDEC annually. The Annual State of Compliance Report will include a comprehensive evaluation of data, including, but not limited to, status of institutional controls, summary of operation and maintenance activities, and groundwater monitoring program results.

This report will also include an assessment of the progress being made towards achieving the Performance Standards, as well as recommendations for changes to any monitoring program to address deficiencies identified during the evaluation.

## 4.3 Five-Year Reviews

***de maximis*** will attend site inspections conducted by EPA and NYSDEC as part of each Five-Year Review and will support EPA's review process as requested.

## 4.4 Contamination Pathways Groundwater Natural Attenuation Completion

Section X.G of the OU2 SOW requires Alcoa (now Arconic) to notify EPA within seven days of receiving data showing that the Performance Standards relating to groundwater, as specified in the ROD, have been met for the third consecutive year (or a shorter period if approved by EPA in its sole discretion). Within 30 days of notifying EPA, Arconic will submit a draft Remedial Action Completion Report for the Groundwater Natural Attenuation Remedy that will include the following sections:

1. Introduction
2. Chronology of Events
3. Performance Standards and Quality Control
4. Notice of Completion
5. Monitoring
6. Certification

# Tables

| OU1 Wells | Purpose | Analytes | Frequency |
|---|---|---|---|
| YO-30SX | Background | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| YO-30DX | Background | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| YO-119 | Downgradient of Landfill | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| **OU2 Wells** | **Purpose** | **Analytes** | **Frequency** |
| YO-58 | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-14X | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-111D | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-117S | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-117D | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-12RX | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO- 12D | Plume Monitoring (downgradient sentinel) | VOCs, 1,4-dioxane | Annual |
| YO-14ALX | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-56D | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-101R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-102R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-113D | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-115R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-125R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |

**Table 3-1**
**Groundwater Sampling Schedule**

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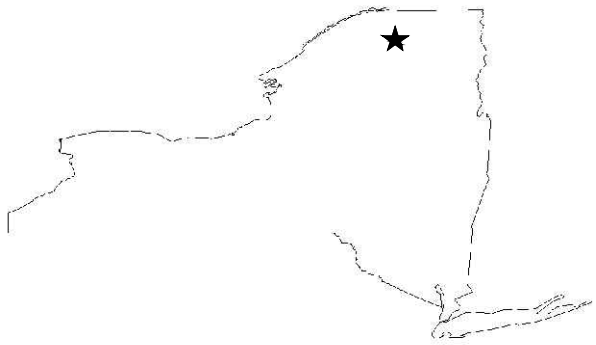
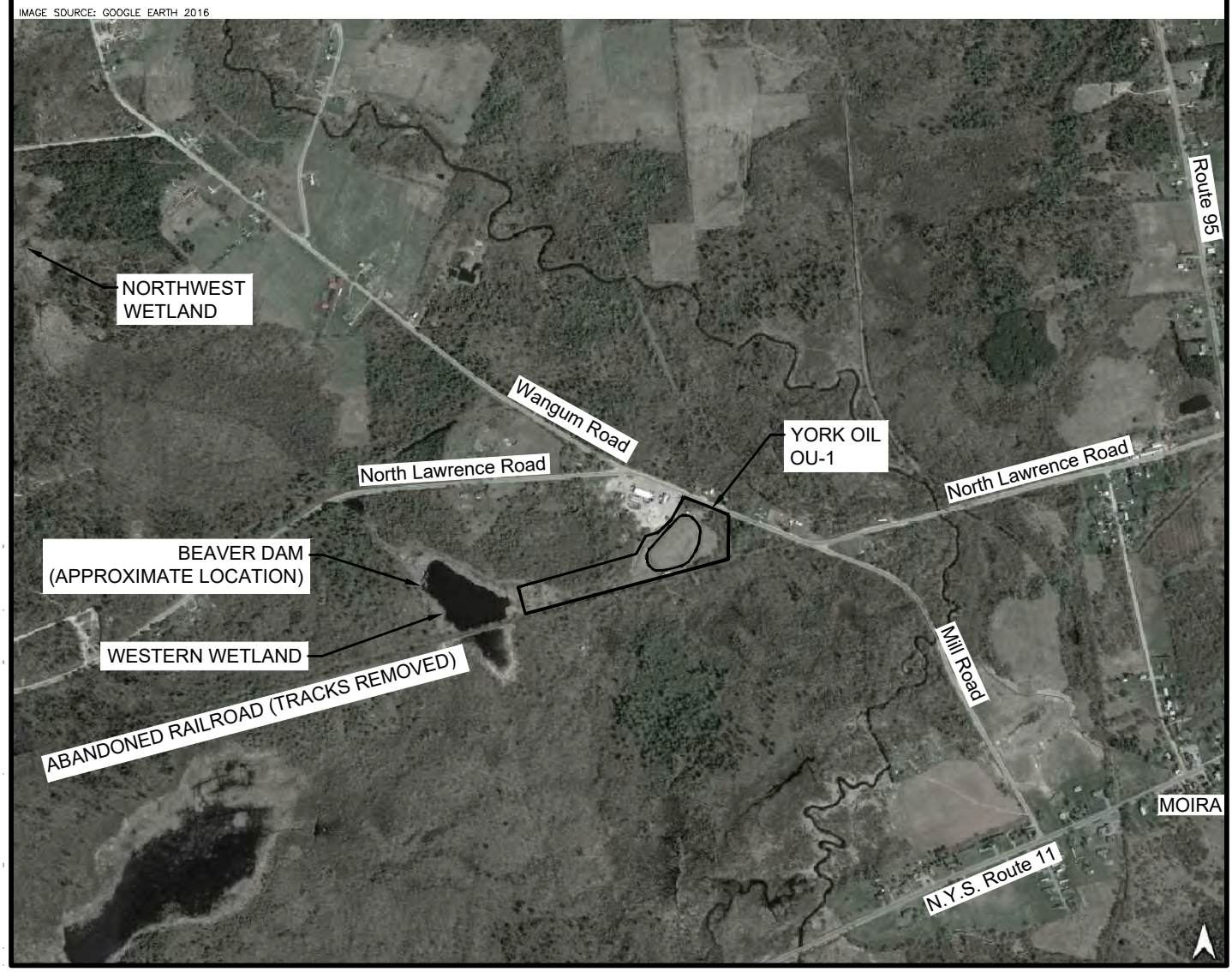


SITE LOCATION MAP

IMAGE SOURCE: GOOGLE EARTH 2016



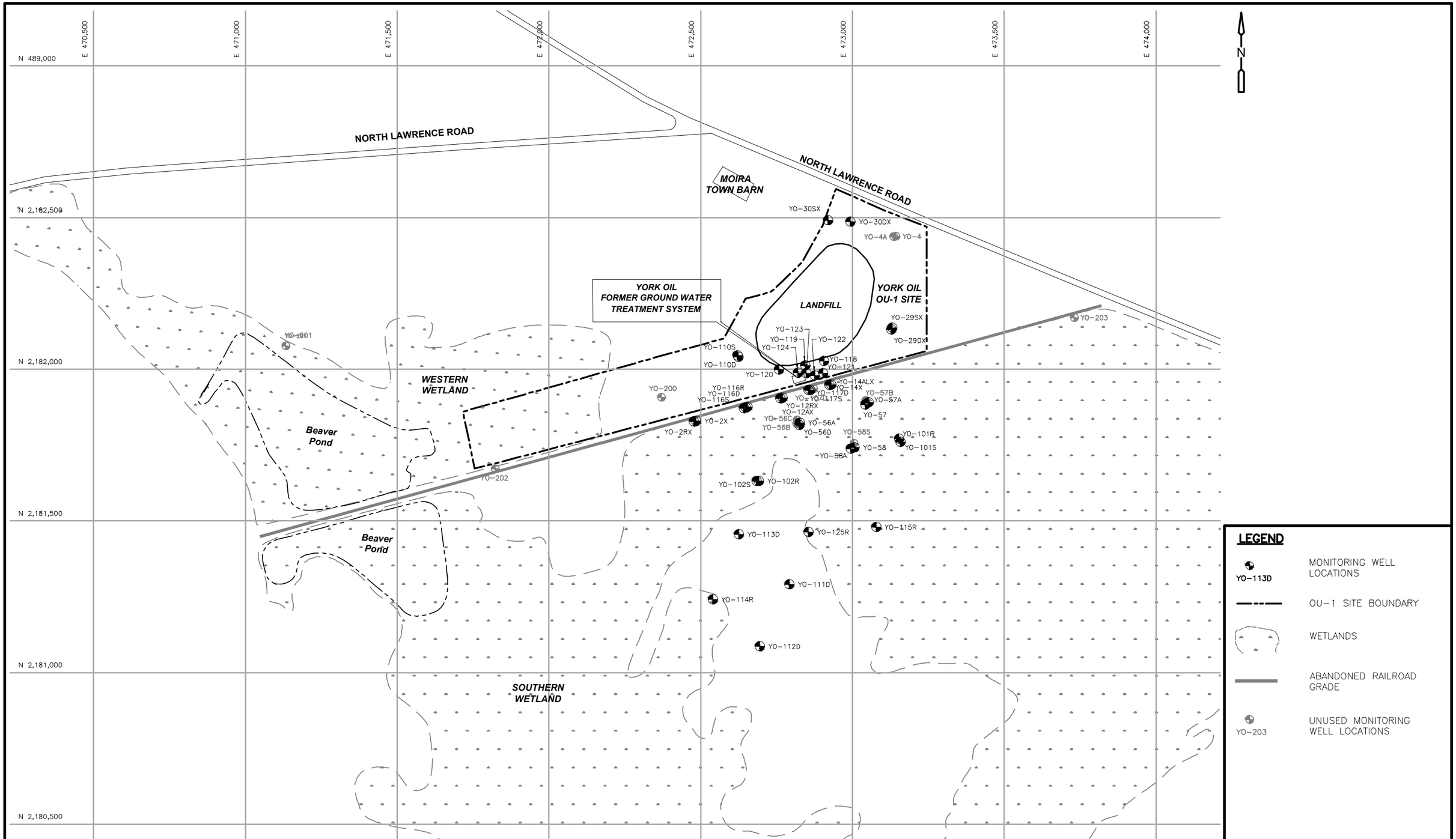

York Oil Superfund Site - Moira, New York

de maximis, inc.

1" = 1200'

600 0 1200

FIGURE 1-1
YORK OIL SITE LOCATION MAP



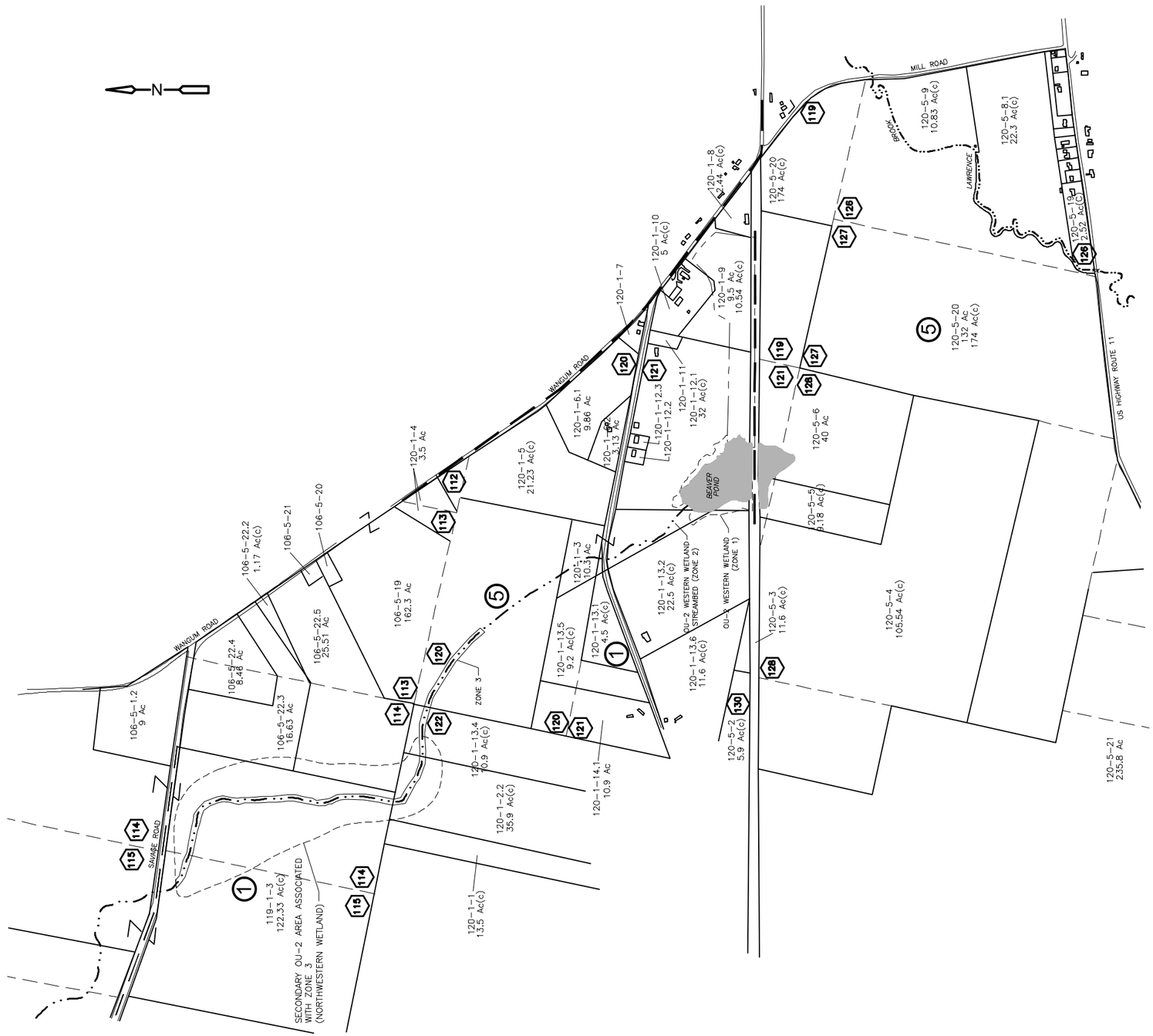

de maximis, inc.

1" = 300'

150 0 300

York Oil Superfund Site - Moira, New York

FIGURE 1-2
MONITORING WELL LOCATION PLAN




## NOTE

PROPERTY LINES ON THIS MAP ARE APPROXIMATED FROM TOWN OF MOIRA PROPERTY TAX MAPS (106, 119 AND 120). ZONES, NORTHWEST WETLANDS AND WATERLINES DERIVED FROM BLASLAND, BOUCK & LEE, INC., "CONTAINMENT PATHWAYS FEASIBILITY STUDY"; YORK OIL SUPERFUND SITE, MOIRA, NEW YORK REVISED DECEMBER 1997, AUTOCAD FIGURES 11 AND 12. THIS MAP SHALL BE USED FOR INFORMATION PURPOSES ONLY. FIELD SURVEY CHECKS ARE RECOMMENDED WHEREVER RESULTS APPEAR QUESTIONABLE.

## LEGEND

| | |
|---|---|
| 120-1-5 | SECTION-BLOCK-LOT NO. |
| 21.23 Ac(c) | AREA (CALCULATED) |
| 21.23 Ac | AREA (FROM DEED) |
| 120 | PATENT OR REALTY LOT NO. |
| 1 | BLOCK AREA NO. |
| | YORK OIL SITE BOUNDARY |
| | PROPERTY LINE |
| | PATENT OR REALTY LOT LINE |
| | BLOCK LIMIT LINE |
| | LAND HOOK |
| | WATER |
| | ROADS |
| | NORTHWESTERN WETLAND |

de maximis, inc.

NOT TO SCALE

York Oil Superfund Site - Moira, New York

FIGURE 2-1
TAX MAP BOUNDARIES WITHIN OU-1 AND OU-2

## Attachments

**Attachment A**

**Health and Safety Plan**

**Attachment B**

**Quality Assurance Project Plan**

**Attachment C**

**Field Sampling Plan**

**Attachment D**

**OU1 Maintenance Inspection Form**

# HEALTH AND SAFETY PLAN

# YORK OIL OPERABLE UNIT 1 & 2 SUPERFUND SITE
# OPERATIONS, MAINTENANCE & MONITORING
# MOIRA, NEW YORK

*Prepared by:*


***de maximis, inc.***

200 Day Hill Road, Suite 200
Windsor, CT 06095


August 2020

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| G | COVID-19 Protection Program |
| H | Respiratory Protection Program |

## 1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared on behalf of the Settling Defendants for the Operable Unit No. 1 (OU1) and No. 2 (OU2) Consent Decrees (CD) and Statements of Work (SOW) for Remedial Design/Remedial Action (RD/RA) at the York Oil Superfund Site in Moira, NY (Site) (Figures 1-1).

The OU1 CD (Civil Action Nos. 83-CV-1623, 92-CV-562) was entered by the Court on August 10, 1996. The Aluminum Company of America (Alcoa) was named as the Performing Party in the OU1 RD/RA CD. On November 1, 2016, Alcoa split into two new entities, Alcoa Corporation and Arconic, Inc. (Arconic). Management responsibility for the York Oil Superfund Site was assigned to Arconic.

The OU2 RD/RA CD (Civil Action No. 83-CV-1623) was entered by the Court on November 30, 2000. Alcoa (now Arconic) was named as the party to manage and perform the Work under the OU2 RD/RA CD. Arconic retained ***de maximis, inc. (de maximis)*** as its' Project Coordinator for the RD/RA. In March 2020, Arconic retained ***de maximis*** as its' General Contractor to manage or perform all necessary Operations, Maintenance & Monitoring (OM&M) work.

In addition to the operation and maintenance activities prescribed by SOW Section VI.I, the OM&M work includes implementation of a groundwater monitoring program and the periodic inspections to document the continued performance, functionality, and/or effectiveness of other completed remedial components (e.g., the RCRA cap).

### 1.1 Site Background

The site is located approximately one-mile northwest of the Hamlet of Moira in Franklin County, New York, is situated to the southwest of North Lawrence Road (Figure 1-1).

**Figure 1-1 Site Plan**

The York Oil facility was constructed in the 1950s by the York Oil Company, which recycled used oils collected from service stations, car dealers, and industrial facilities. The oils, some of which contained polychlorinated biphenyls (PCBs), were processed to remove impurities and resold to other businesses. The oil recycling operation was discontinued around 1962; the property was then used by Pierce Brothers Oil Services, Inc. from 1962 to 1967 for used oil storage. Some of the oil accepted by the facility contained PCBs and other contaminants. The collected oils were stored or processed in eight aboveground metal storage tanks, three earthen-dammed settling lagoons, and at least one underground storage tank. The recycled oil either was sold as No. 2 fuel oil or was used in dust control for the unpaved roads in the vicinity of the site. During heavy rains and spring thaws, the oil-water mixture from the lagoons would often overflow onto surrounding lands and into adjacent wetlands, land that Pierce Brothers Oil Services, Inc., purchased in 1964. Contamination at the Site was first reported by a state road crew in 1979.

The 17-acre Site Proper (OU1) includes a 7.2-acre fenced area previously owned and used by the York Oil Company and a 1,000-foot by 200-foot strip of land west of the fenced area and north of an abandoned railroad grade, known as the "Western Drainage Area."

The Contamination Pathways area (OU2) is divided into several areas — the 17 acre "Western Wetland" and the 82 acre "Southern Wetland," located immediately to the west and south of the Site Proper, respectively, and the 50 acre "Northwestern Wetland," located to the northwest of the Western Wetland, along the drainage paths from the Site Proper.

Relevant regulatory background information and a summary of pertinent Site remediation activities are provided in the OM&M Plan to which this HASP is appended.

### 1.2 Purpose

The objective of the site-specific HASP is to provide the basic requirements that are designed to protect personnel health, safety and the environment during implementation of the OM&M work. All contractors and their subcontractors assigned to this project are required to perform work in accordance with this HASP and applicable Federal and State Occupational Health and Safety Regulations. The site-specific health and safety requirements and procedures in this HASP will be updated as necessary based on an ongoing assessment of site conditions.

Contractors and their subcontractors are required to review the following steps, as part of the planning process, prior to initiating work on-site to minimize the potential for disruption of work due to non-compliance or other safety related issues:

i. possible problems and hazards and their solutions;
ii. environmental surveillance measures;
iii. specifications for protective clothing;
iv. the appropriate level of respiratory protection;
v. the rationale for selecting that level; and
vi. criteria, procedures, and mechanisms for upgrading the level of protection and for suspending activity, if necessary.

The work approach, administrative and engineering controls, required Personal Protective Equipment (PPE), and safety related issues shall be reviewed with the Site Project Manager (SPM) and subcontractors Field Supervisors/Site Health & Safety Officer (FS/HSO) prior to initiating activities on-Site. The SPM and FS/HSO shall be notified of any change in work procedures or change in condition throughout the implementation of activities on-Site as they relate to worker safety.

The following documents and resources were consulted during preparation of this HASP:

- Occupational Safety and Health Administration (OSHA) General Industry 29 CFR 1910 and Construction 29 Code of Federal Regulations (CFR) 1926 Standards;
- Hazardous Waste Operations and Emergency Response (Department of Labor, OSHA 29 CFR Part 1910.120 and Part 1926.65); and.
- EPA's Standards Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992).

The measures in this HASP were developed and will be implemented to comply with applicable state and federal occupational health and safety regulations. The HASP is consistent with the objectives and contents of the OM&M Plan will be updated during work whenever changes are made to organizational structure or responsibilities, changes in types or levels of hazards, changes to training and medical surveillance requirements and if new work tasks are scoped.

The York Oil Superfund Site is a multi-employer work site. ***de maximis*** is the Project Coordinator, or Controlling Employer, responsible for the implementation of the OM&M work. ***de maximis,*** as the Project Coordinator, has general supervisory authority over the worksite, including the power to directly identify and correct any health and safety violations, or require others (such as contractors and their subcontractors) to correct them. If safety concerns are noted, hazards shall be promptly remediated; failure to do so shall result in a stoppage of work until effective measures are employed to correct any potential hazards. Contractors are responsible for implementing health and safety requirements for their personnel and their subcontractors.

### 1.3 Hospital Location, Route and Map

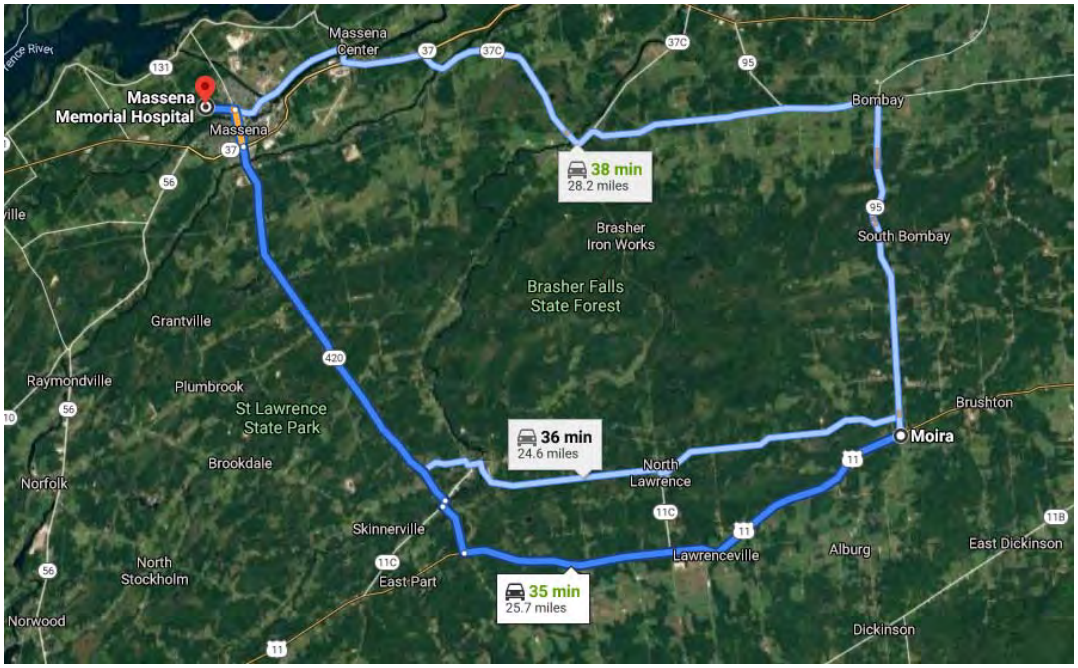
Emergency medical services at the York Oil Superfund Site are provided by the Moira Volunteer Fire and Rescue Department.

The closest hospital is:

**Messena Memorial Hospital** (approximately 25 miles away)
1 Hospital Drive
Massena, New York 13662
(315) 764-1711

Messena Memorial Hospital provides 24-hour emergency medical care along with the services of a critical care center. A map of directions to Messena Memorial Hospital is presented in Figure 1-3 below:

**Figure 1-3 Hospital Location**




35 min (25.7 miles)

via US-11 S and NY-420 N

Fastest route, the usual traffic

**Moira**

New York 12957

Head north on Church St toward US-11 S

5 s (167 ft)

Follow US-11 S and NY-420 N to Maple St in Massena

33 min (24.8 mi)

Continue on Maple St to your destination

3 min (0.9 mi)

**Massena Memorial Hospital**

1 Hospital Dr, Massena, NY 13662

At least one person qualified to perform first aid will always be present on the Site during work activity. Persons trained in first aid will have earned a certificate (or equivalent) in first-aid training from the American Red Cross. Additional training for re-certification will be performed as needed to ensure trained worker's certifications do not expire. First aid will be rendered to any person injured while on the Site, as appropriate.

## 2.0 ORGANIZATION AND RESPONSIBILITIES

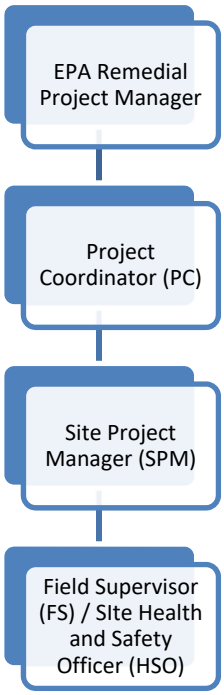
### 2.1 Site Communication Lines of Command

In accordance with the procedures set forth in this HASP, all members of each contractor will report to their company's Field Supervisor (FS). The Field Supervisors will also act as the Health and Safety Officer (HSO) for all work being performed under their firm's scope. FS/HSOs will be responsible to report to the Site Project Manager (SPM) for any manners involving health and safety.

The SPM will communicate with the Project Coordinator (PC). The SPM will coordinate emergency activities and contact local emergency response authorities if needed. In case of evacuation, see Section 8 and Section 12 for information on evacuation procedures and communication requirements.

The reporting responsibilities of specific project personnel are defined in the organizational chart below. Due to the importance of health and safety to the project, these roles and reporting structure is an operational guideline. If health and safety concerns are neglected, it is imperative that all site employees have the authority to stop work and report along the project management organizational structure until their concerns are addressed.

**Figure 2-1 Organizational Chart**



The SPM will coordinate with local authorities (e.g. police, fire, etc.) should an event rise to that level of concern.

### 2.2 Project Coordinator (PC)

The PC is responsible for administration of all actions by Settling Defendants required by the Settlement Agreement. The PC is responsible for supervising and directing the implementation of the OM&M work. The PC coordinates activities with EPA's remedial project manager (RPM) and is the interface between the community and the Settling Defendants on matters related to the OM&M Plan.

### 2.3 Site Project Manager (SPM)

The SPM reports to the PC and is responsible for overseeing all activities at the Site, including interacting with the regulatory agencies (e.g. Agencies, local municipalities, etc.), preparing reports and work plans, and processing and evaluating data. The SPM will establish project needs and monitor work in progress to ensure final deliverables adhere to requirements. The SPM's responsibilities include ensuring that all work incorporates the HASP requirements into work plans and ensures support is provided for personnel engaged in safety related tasks. The SPM will coordinate any addenda or modifications of this HASP.

The SPM or designee will always be present at the Site during the performance of intrusive site activities and is responsible for directing the daily physical work. The SPM is the on-Site individual responsible to implement emergency procedures and will determine appropriate response actions with the PC. Specific responsibilities for the SPM include:

- evaluating and assessing emergency incidents or situations;
- assigning personnel and coordinating emergency response activities;
- communicating the specific hazards to field personnel;
- notifying the FS/HSO, RSO, and PC of an emergency;
- notifying appropriate emergency response agencies (and coordinating with the PC); and
- evaluating the safety of personnel in the event of an emergency and coordinating any necessary evacuation.

## 2.4 Field Supervisors/Site Health and Safety Officer (FS/HSO)

Due to the nature of the work, subcontractor field supervisors will also be responsible for the role of Health and Safety Officers for their employees and firms working under them. FS/HSOs have the principal work area safety responsibility for their personnel. FS/HSOs ensure this responsibility is effectively carried out by integrating safety procedures into work plans and communicating safety requirements to workers each day. FS/HSOs monitor work to ensure work is being conducted as planned and in a safe manner.

The FS/HSO is responsible for assessing work area safety procedures. The FS/HSO shall perform field observations to ensure workers are implementing work in accordance with this HASP and State and Federal Safety regulations, assist with the development and presentation of safety briefings, review Job Safety Analysis (JSAs) and work plans, and complete Loss and Near-Loss investigations as needed. The FS/HSO will confirm worker training requirements are satisfied prior to personnel to entering the site.

The FS/HSO has direct responsibility for adherence to the designated safety procedures in an emergency response situation. The FS/HSO shall account for on-Site personnel during an evacuation or serious emergency and report to the SPM that all personnel are accounted for or if personnel are missing. In case of evacuation, see Section 8 and Section 12 for further information on evacuation procedures and communication requirements.

Emergency communication by the FS/HSO may require the following actions:

- Coordination with outside emergency services and emergency response personnel (communicating with the SPM and PC as soon as practical following an emergency event).
- Establish and demonstrate viability of two-way radio communications and site alarms or other procedures capable of warning site personnel and summoning assistance, e.g., air horn, site radio notification, etc.
- If an accident occurs, the FS/HSO shall immediately investigate what occurred and provide a copy of the Incident Report to the SPM. The Incident Report shall include, at a minimum, a solution that shall be implemented to prevent or minimize similar incidents from re-occurring on-site. The FS/HSO may use all site incidents as “lessons learned” that may be reviewed during the morning tailgate safety briefings.

## 2.5 All Workers

All personnel working at the Site are responsible for following safe work practices and requirements specified in this HASP, project work plans and company specific JSAs. Workers are expected to monitor the workplace for unsafe conditions and unsafe acts and respond immediately to assist with the correction of these hazards by notifying their FS/HSO or the SPM. All site workers have Stop Work Authority (SWA) which may be implemented at any time without fear of retribution or punishment. Anyone invoking their SWA must immediately notify their supervisor after the work environment is placed in a safe condition. The supervisor shall immediately notify the site FS/HSO and/or SPM.

## 2.6 Visitors

A visitor is anyone not contracted to work on this project or an employee of a contractor who has not completed the training and medical surveillance requirements of this HASP. Visitors may include representatives of Federal, State or local agencies. Visitors must be briefed on the requirements of the HASP, their responsibilities while on-site, the need to have an escort at all times while in the work area, and the opportunity to ask questions. Visitors must sign a Visitor Safety Orientation Form as an acknowledgement that they have received the aforementioned information regarding site hazards and requirements. All visitors must be escorted by a fully trained and qualified Site worker. The exception to this escort requirement is access to the administrative areas which include the office trailers and parking lot outside of the active work areas.

## 3.0 ACTIVITY HAZARD ANALYSIS

The major components that shall be implemented as part of the OM&M work are:

- Maintenance of the disposal areas including:
  - Perform periodic inspections (and maintenance, if needed) of the permanent erosion control structures, gravel access road and wells, security fencing around the upland area and the final cap; and
  - Mowing of the grassed areas throughout May and September.
- Operation and performance monitoring of the groundwater extraction and treatment system.
- Periodic groundwater elevation and groundwater water quality monitoring events.
- Sub-surface injection of PlumeStop®, as needed.

### 3.1 Site Hazards

This section provides a general hazard assessment for hazards which may be encountered during the OM&M work. The following potential hazards have been identified:

- Inhalation of dust (ex. silica) and/or VOCs;
- Dermal (skin and eye) contact with contaminants;
- Ingestion of contaminants;
- Physical hazards associated with the use of heavy equipment;
- Noise exposure;
- Trip/fall hazards;
- Physical restrictions and burdens imposed by use of PPE;
- Heat stress (depending on season);
- Ice hazards (depending on season);
- Cold exposure (depending on season);
- Flammable hazards;
- Energized sources;
- Excavations;
- Biological hazards (ticks, mosquitos, wasps, etc.); and
- COVID-19 hazards.

## 3.2 Chemical Hazards

This section describes the highest potential chemical hazards that may be encountered at the Site. Table 3-1 is a summary of possible chemical contaminants of concern (COCs) and exposure limits. If any new hazards are identified, they will be communicated to site personnel in tailgate safety meetings and in modifications to this HASP.

**Table 3-1 – Chemical Contaminants of Concern**

| Contaminant Name (Synonyms) | Appearance & Physical Form (Pure substance) | OSHA PEL/ NIOSH REL/ ACGIH TLV | STEL | IDLH | Routes of Entry | Potential Health Effects (Acute & Chronic) | PID Ionization Potential |
|---|---|---|---|---|---|---|---|
| Polycyclic Aromatic Hydrocarbons (PAHs)/Coal tar Pitch Volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene) | Black or dark brown amorphous residue | 0.2 mg/m$^3$<br>0.1 mg/m$^3$ (cyclohexane extractable fraction) (REL)<br>0.2 mg/m3 (benzene soluble aerosol) (TLV) | N/E | 80 mg/m$^3$ | Inhalation<br>Skin and/or eye contact | Dermatitis, bronchitis (potential occupational carcinogen) | NA |
| Polychlorinated Biphenyls (PCB, chlorodiphenyl 42% chlorine) | to pale yellow, viscous liquid with mild hydrocarbon odor | 1 mg/m3 (PEL)<br>0.001 mg/m$^3$ (REL)<br>1 mg/m$^3$ (TLV) | N/E | 5 mg/m3 | Inhalation<br>Absorption<br>Ingestion skin and/or eye<br>Contact | Irritation eyes; chloracne; liver damage; reproductive effects (potential occupational carcinogen) | NA |

| Contaminant Name (Synonyms) | Appearance & Physical Form (Pure substance) | OSHA PEL/ NIOSH REL/ ACGIH TLV | STEL | IDLH | Routes of Entry | Potential Health Effects (Acute & Chronic) | PID Ionization Potential |
|---|---|---|---|---|---|---|---|
| Polychlorinated Biphenyls (PCB, chlorodiphenyl 54% chlorine) | Colorless to pale yellow, viscous liquid or solid with mild hydrocarbon odor | 0.5 mg/m$^3$ (PEL)<br>0.001 mg/m$^3$ (REL)<br>0.5 mg/m$^3$ (TLV) | N/E | 5 mg/m3 | Inhalation<br>Absorption<br>Ingestion skin and/or eye<br>Contact | Irritation eyes; chloracne; liver damage; reproductive effects (potential occupational carcinogen) | NA |
| SVOCs - Dioxane | Colorless liquid or solid (below 53$^o$F) | 100 PPM (360 mg/m$^3$)<br>20 PPM (TLV) | N/E | 500 PPM | Inhalation<br>Absorption<br>Ingestion skin and/or eye<br>Contact | irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen] | NA |
| VOCs - Tetrachloroethylene | Colorless liquid with a mild chloroform-like odor | 100 PPM<br>25 PPM (TLV)<br>Ceiling 200 PPM<br>Max Peak 300 PPM 5 min in any 3 hr | 100 PPM | 150 PPM | Inhalation<br>Skin absorption<br>Ingestion<br>Skin and/or eye contact | Irritation eyes, skin, nose, throat, respiratory system; nausea, flush face, neck, dizziness, incoordination, headache, drowsiness, | 9.32 eV |

| Contaminant Name (Synonyms) | Appearance & Physical Form (Pure substance) | OSHA PEL/ NIOSH REL/ ACGIH TLV | STEL | IDLH | Routes of Entry | Potential Health Effects (Acute & Chronic) | PID Ionization Potential |
|---|---|---|---|---|---|---|---|
| VOCs - Trichloroethylene | Colorless liquid (unless dyed blue) with a chloroform-like odor | 100 PPM<br>Ceiling 200 PPM<br>Max Peak 300 PPM 5 min in any 2 hr<br>10 PPM (TLV) | 25 PPM | 1000 PPM | Inhalation<br>Skin absorption<br>Ingestion<br>Skin and/or eye contact | Irritation skin, eyes, headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremors, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, paresthesia, liver injury (potential occupational carcinogen) | 9.45 eV |

**Notes:**

| | |
|---|---|
| < | Less than |
| > | Greater than |
| °C | Degrees Celsius |
| °F | Degrees Fahrenheit |
| $\mu/m^3$ | Micrograms per cubic meter |
| g | Gram |
| g/ml | Grams per milliliter |
| C | Ceiling is the employee's exposure, which shall not be exceeded during any part of the work day |
| IDLH | Immediate danger to life and health |
| lbs | Pounds |
| LEL | Lower explosive limit |
| $m^3$ | Cubic meters |
| mg/l | Milligrams per liter |
| $mg/m^3$ | Milligrams per cubic meter |
| mg/kg | Milligrams per kilogram |
| mm | Millimeter |
| N/A | Not applicable |
| N/E | None established |

| a. | Hazard properties |
|---|---|
| Carc | carcinogen |
| Cocarc | cocarcinogen |
| Cor | corrosive |
| Expl | explosive |
| Flam | flammable |
| Inf | infectious |
| Mut | mutagenic |
| Narc | narcoti |
| Rad | radioactive |
| React | reactive |
| Scarc | suspected carcinogen |
| Tera | teratogen |
| Tox | toxic |
| Vol | volatile |

| b. | Acute exposure symptoms: |
|---|---|
| Abd | abdominal pain |
| CNS | central nervous system depression |
| Coma | comatose |
| Conf | confusion |
| Conv | convulsions |
| Decr | decreased |
| Diar | diarrhea |
| Diz | dizziness |
| Drow | drowsiness |
| Eye | eye irritation |
| Fevr | fever |
| Head | headache |
| Naus | nausea |
| Nerv | nervousness |
| Resp irritation | respiratory system |
| Skin | skin irritation |
| Sweat | sweating |
| Trem | tremors |

**Notes:**

| | |
|---|---|
| N/F | Nonflammable |
| N/I | No information is available |
| ppb | Parts per billion |
| ppm | Parts per million |
| UEL | Upper explosive limit |

| a. | Hazard properties |
|---|---|

| b. | Acute exposure symptoms: |
|---|---|
| Uncon | unconsciousness |
| Vom | vomiting |

## 3.3 Physical Hazards

This section describes the physical hazards that may be encountered at the Site. As new hazards are identified, they will be communicated to site personnel in the tailgate safety meetings and in modifications to this HASP.

Potential physical hazards include:

- Ergonomic
- Burns and fire hazards (Hot Work Procedures)
- Cut/puncture (Bloodborne Pathogen Protection Program)
- Electrical hazards (Energy Control Program)
- Excessive noise (Hearing Conservation Program)
- Slips, trips, and falls
- Heat stress (Heat Stress Protection Program)
- Cold stress (Cold Stress Protection Program)
- Struck by/Equipment pinches
- Explosive (Over-pressurization) Hazards

These potential Hazards are addressed in the Appendices of the HASP.

### 3.3.1 Ergonomics

Ergonomics is an applied science of arranging things that people use to promote a safe and efficient interaction between those items and workers. Ergonomics can help to reduce or prevent musculoskeletal disorders (MSDs), which affect an individual's muscles, nerves, blood vessels, ligaments and tendons. Risk factors that may develop MSDs include lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures and performing the same or similar tasks repetitively. Exposure to these known risk factors for MSDs increases a worker's risk of injury.

Risk factors that may develop into MSDs include - exerting excessive force (lifting heavy objects, pushing or pulling heavy loads, etc.), performing the same or similar tasks repetitively, working in awkward postures or being in the same posture for long periods of time (kneeling, squatting, etc.). Localized pressure into the body part (using the hand as a hammer), cold temperatures, and vibration (hammer drills, portable grinders, chainsaws) may develop MSDs.

In order to prevent MSDs for any site-worker, workers are encouraged to be vocal of workspaces that cause discomfort. The FS/HSO will work to remedy the situation and minimize exposure to uneasy conditions to the best of their ability. Due to the nature of the work, some work days may be less comfortable than others, however the FS/HSO will do their best to provide proper remedies (e.g. heavy lifting equipment, team lifts for items over 50 lbs., space for movement and proper breaks to relieve workers from awkward positions).

### 3.3.2 Burns and Fire Hazards (Hot Work Procedures)

Work activities such as cutting, grinding and welding are potential fire and burn hazards on-site. Contractor and subcontractor personnel are required to perform such activities under a Burn or Hot Work Permit. The FS/HSO and SPM require notification prior to the beginning and following the completion of any hot work on-site. Copies of all Hot Work Permits must be submitted to the FS/HSO upon completion.

Burn and fire hazards can also result from improper electrical wiring in equipment, improper storage of flammable material (such as gasoline), improper disposal of oil-soaked rags or improper disposal of smoking material. Contractor and subcontractor Field Supervisors are responsible for ensuring all equipment is inspected prior to, and throughout its use for damage. All damaged equipment must be tagged out and immediately taken out of service. Flammable materials must be stored in the flammable storage area. Smoking is only permitted in designated locations.

The Hot Work Procedures are in Appendix A.

### 3.3.3 Cut/Puncture (Bloodborne Pathogen Protection Program)

Potential cut and/or puncture hazards may include, but are not limited to, the use of box-cutters, old fencing, site debris chainsaws, as well as coming in contact with discarded trash or construction debris (ex. board with nails) on-site. Field supervisors shall ensure good housekeeping is always maintained on site grounds. Additional PPE such as protective aprons, chaps, cut resistant gloves or sleeves may be required where cut/puncture hazards

are present. In addition, consideration should be given towards utilizing safer tools to minimize the potential for serious injury such as the use of "safety" auto retractable box cutters in lieu of standard utility knives.

The Bloodborne Pathogen Protection Program is in Appendix B.

### 3.3.4 Electrical Hazards (Energy Control Program)

Overhead and underground electrical utilities may be present on-Site. In addition to the direct contact hazard, there is the potential for a secondary contact from a poorly grounded generator, or the placement of extension cords, and/or tools in water.

Live electrical panels and breakers must be clearly labeled to ensure all personnel are aware of the hazard and are knowledgeable on what they power/function. Field supervisors shall check extension cords periodically for damage and dispose of/or repair in accordance with manufacturer's recommendations. Field supervisors shall ensure a ground fault circuit interrupter (GFCI) is always functional and being used when using electrical tools or equipment.

The Energy Control Program is in Appendix C.

### 3.3.5 Excessive Noise (Hearing Conservation Program)

Most activities that utilize heavy machinery and powered equipment have the potential to produce excessive noise. Movement of construction vehicles as well as use of jack hammers and high-speed saws will result in high noise levels that warrant engineering controls and personal protective equipment. Field supervisors are required to ensure personnel are not exposed to excessive noise through monitoring and are protected from dangerous sounds levels by using the proper PPE.

The Hearing Conservation Program is in Appendix D.

### 3.3.6 Slips, Trips, and Falls

Arrangements of soil, tools, equipment, and other objects will change frequently during OM&M activities which may create conditions for workers to be injured by slips, trips, and falls. Field supervisors shall always follow basic housekeeping requirements and ensure tools and equipment is stored properly at the end of each day.

Personnel accessing and monitoring site wells are also subject to potential slips, trips and falls due to vegetations, slippery slopes and uneven footing. To mitigate risks, proper footwear and caution is expected to be used during monitoring activities.

### 3.3.7 Heat Stress (Heat Stress Protection Program)

Work performed in hot weather with exposure from direct sun increase the potential for heat related injury or illness to workers. Use of additional PPE, such as a modified Level D (ex. hard hat, safety glasses, safety boots and nitrile gloves) presents an increase potential for heat related injury or illness. Heat stress monitoring, and controls (administrative and/or engineering) shall be implemented during hot weather conditions.

The Heat Stress Protection Program is in Appendix E.

### 3.3.8 Cold Stress (Cold Stress Protection Program)

Cold stress hazards occur during work at less than 4$^{o}$ C. In addition, wet and windy conditions enhance the impact of cold stress on workers. Consequently, any work conducted during cold days will require cold stress intervention techniques.

The Cold Stress Protection Program is in Appendix F.

### 3.3.9 Struck by/Equipment Pinches

All tasks where there is moving construction equipment involve the potential for “caught between” or “struck by” injuries to occur. Common equipment pinch injury situations include the use of hand tools for twisting or pounding, as these tools can slip or miss and thereby cause injury to a worker.

All heavy equipment and/or vehicles where there is an obstructed view to the rear shall be equipped with functioning back-up alarms. Trained spotters will also be used to back vehicles into position for loading or unloading of materials. The Field Supervisor is required to ensure personnel complete daily, pre-use equipment inspections. This inspection shall document the required the confirmation that the back-up alarms for each vehicle is functional.

Field staff shall inspect hand tools prior to use each day. Staff shall be required to notify their supervisor in the event a damaged tool is identified. Field supervisors are responsible for removing damaged tools out of service by discarding or “tagging out” tools that need repair, or replacement.

### 3.3.10 Explosive (Over-pressurization) Hazards

Explosions due to over-pressurization can occur as a result of increase in ambient temperature surrounding a container. Over-pressurization can occur if the container is not designed to handle this change in pressure and/or due to improper storage.

All flammable and combustible materials must be stored in the designated location on-site. Compressed gas cylinders, when improperly handled, have enough pressures to create an explosive projectile if the cylinder head is broken at the valve. Any handling of compressed gas cylinders will require adherence to cylinder safety rules and protection of cylinders from heat sources.

## 3.4 Biological Hazards

Depending upon the season and specific site conditions, various biological hazards may be present at the Site. These may include such things as poison oak, poison ivy, poison sumac, flying insects, spiders, snakes, various ticks, and vermin such as mice. The presence of these hazards and the need for control measures will be determined during work planning for the OM&M activities. Particular attention will be given to pits, hollows, or other shaded areas in which personnel work.

### 3.4.1 Animals/Rodents

Wild and domestic animals carry various diseases which can cause sickness and even death. Some common animals/rodents are field mice, rats, cats, dogs, coyotes, fox, etc. Bites from these animals can transmit rabies and a variety of other diseases, viruses, etc.

### 3.4.2 Ticks

Ticks are carriers of many different diseases with *Lyme disease* being the most likely hazard for work at the Site. Contact with ticks is most likely to come from work in areas where there is dense brush, high grass or leaf litter. Field supervisors shall encourage personnel to wear light colored clothing and utilize insect repellent containing at least 20% DEET prior to commencing work in wooded or overgrown areas of the site. Personnel shall perform an end of the day check to ensure ticks have not attached themselves to their body or clothing. In the event an attached tick is found, it shall be properly removed, placed in a plastic bag and frozen. The person bit should seek medical attention if redness or inflammation is present.

### 3.4.3 Poisonous Plants

Poison ivy and poison oak are identified by three leaves radiating from a stem. Each leaf of poison sumac has clusters of seven to 13 smooth-edged leaflets. Workers must be alert and avoid these plants. Poison ivy is in the form of a vine, while poison oak and sumac are bush-like. All produce a delayed allergic hypersensitivity. Any work activity such as brush clearing is likely to bring workers in contact with these plants will require protective clothing to prevent contact.

### 3.4.4 Poisonous Snakes

There are two types of poisonous snakes indigenous to Massachusetts: copperheads and timber rattlers. These snakes are extremely rare and contact between site workers and poisonous snakes is not considered likely. Precautions used for pre-work surveying of areas should be sufficient to reduce the risk of snake bites. However, personnel should always stay alert for their presence on the site.

### 3.4.5 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered. Walk-downs of work areas will be performed to identify potential nests of stinging insects prior to the start of activities. The use of insect repellent; the reduction in the amount exposed skin (ex. long sleeve shirts), and avoidance of perfumes and/or colognes may aid in reducing the potential for exposure to flying insects. Personnel with serious allergic responses to stings are advised to notify supervisors or co-workers of location of their prescribed EpiPen(s).

### 3.4.6 Spiders

The black widow and the brown recluse are two poisonous spiders found throughout the United States. The brown recluse is the spider that is most likely to inhabit the Site.

Workers are encouraged to wear gloves and use caution when work is performed in older, abandoned structures such as well houses, or storage areas. Use insect repellants, such as DEET or Picaridin, on clothing and footwear to further reduce potential for contact.

## 3.5 COVID-19 Hazards

On May 13, 2020, the New York State Department of Health issued the *"Interim Guidance for Construction Activities During the COVID-19 Public Health Emergency"* which was created to provide owners/operators of construction projects and their employees and contractors

with precautions to help protect against the spread of COVID-19 as construction sites reopen following the state of emergency declared by New York in March 2020.

The applicable guidance as of the creation of this document is included as Appendix G. Note that where guidance in the attached document differs from other guidance documents issued by New York State, the more recent guidance shall apply.

In addition to adherence of the applicable guidance as stated above, prior to mobilization a Site Mobilization Checklist shall be completed and submitted to NYSDEC Project Manager. All personnel must also complete the COVID-19 Declaration Form prior to entering the Site on a daily basis. The Site Mobilization Checklist and the COVID-19 Declaration Form are also provided in Appendix G.

## 4.0 HAZARD PROTECTION PRACTICES AND CONTROLS

Controlling exposures to occupational hazards is the fundamental method of protecting site personnel. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls. One representation of this hierarchy is illustrated in Figure 4-1 below and summarized as follows:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal protective equipment

The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. During the OM&M activities, elimination is not always practical or possible given the nature of the work. Substitution, particularly where chemicals or tools are brought onto the Site for use will be considered whenever purchases are made.

Engineering, administrative controls and personal protective equipment will be the primary controls used at the Site. The subsequent sections expand upon the work practices and PPE that will be used to protect workers.

**Figure 4-1 - Hierarchy of Controls**

## 4.1 Work Practices

Personnel will always adhere to established safe work practices throughout the OM&M activities. The following sections clarify specific work practices that will be used on this project to protect workers. Hazard types associated with field activities are identified, as well as protection practices that will be used.

### 4.1.1 General Work Practices

Whenever possible, contact with contaminated (or potentially contaminated) surfaces will be avoided. Puddles and discolored surfaces will be walked around, not through. Workers will not kneel or set equipment directly on potentially contaminated ground.

Entry into any controlled or exclusion zone established at the Site will be in accordance with the control document such as a task specific work plan or JSA.

Equipment and non-disposable PPE, such as respirators, gloves, boots, etc., will not be removed from controlled areas until they have been surveyed and released by a member of the radiological safety staff, when necessary. Additional decontamination procedures may be established in a task specific work plan prior to moving material or equipment from a controlled zone.

Legible and understandable precautionary labels or marking will be prominently attached to containers of debris, and contaminated protective clothing.

No food or beverages will be present or consumed in a controlled or exclusion zone. No tobacco products will be present or used, and cosmetics will not be applied in control or exclusion zones. Such products are allowed only in designated uncontrolled areas.

All personnel must observe one another for abnormalities such as:

- Changes in complexion and skin discoloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern
- Irritability or mood swing

All personnel will inform one another of non-visual abnormalities such as:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory tract

Any detected abnormalities will be immediately reported to the individual's FS/HSO and/or SPM.

An emergency eyewash unit will be located immediately adjacent to areas where employees handle hazardous or corrosive materials. Operations involving the potential for eye injury, splash, etc., will have locally available eye wash units capable of delivering at least 0.4 gallons per minute for at least 15 minutes.

If any on-site activities continue later than dusk, adequate lighting will be provided. The lighting will meet the lighting required specified by 29 CFR 1926.56.

Exterior hazardous work, such as handling hazardous materials and heavy loads, and equipment operation etc., will be avoided during high winds or severe storms.

Operations involving the potential for fire hazards will be conducted in a manner as to minimize the risk of fire by using non-sparking tools. Fire extinguishers shall also be immediately available along with a fire watch. Sources of ignition shall also be identified and removed from the area and when necessary, using explosion-proof instruments and/or bonding and grounding techniques. 29 CFR 1926.151(a)(3).

PPE which includes safety glasses, steel toe boots and hard hats that meet 29 CFR 1926.102, 29 CFR 1926.96 and ANSI Z89.1 will be worn during all field work activities.

Any personnel willfully engaged in unsafe practices or activities during working hours or while on the Site (including parking lot) will be subject to potential removal from the project team and expulsion from the site.

### 4.1.2 Buddy System

The "buddy system" is a practice which prevents a worker from being isolated from other workers by providing visual contact among workers in groups of at least two members. Worker isolation prevents observations for abnormalities and delays assistance to an injured or ill worker. The

"buddy system" will be used at all times by all field personnel in Controlled and Exclusion Zones. In the "buddy system," personnel must stay within the line of sight of at least one other person.

#### 4.1.3 Dust Control

The most effective way to control dust is to minimize its initial generation. Preventive measures shall be implemented by project personnel to maintain fugitive dust emissions at levels below action levels. The following list details methods and measures that can be applied:

- Minimize dust generation during PDI work by utilizing wet methods during invasive work (drilling, test pits, etc.)
- Using dust suppressants during excavation, loading and hauling operations such as water spraying of haul roads, stockpile(s) and loading equipment
- Scheduling hauling operations to minimize trips
- Water sprays for concrete slab demolition and local water spray application at point of cutting tool use

In accordance with 29 CFR 1926.1153, a written exposure control plan must be established in addition to the exposure control methods used and implemented. The written exposure control plan will identify tasks that involve exposure to respirable silica and methods used to protect workers, including methods to restrict access to work areas where exposures may be high.

#### 4.1.4 Tailgate Safety Meetings

The FS/HSO will conduct a tailgate safety meeting at the beginning of each shift. The topics discussed at the tailgate safety meeting will include health and safety considerations for the day's activities, necessary PPE, and potential problems with new operations. All attendees shall sign the tailgate attendance form. Attendance records and meeting notes will be maintained with the project files.

#### 4.1.5 Access/Egress

Life safety considerations for the Site include means of egress consisting of exit access, exits and exit discharge, exit signage, and emergency lighting. Field supervisors shall ensure that exits within office areas shall be maintained clear and free at all times.

In addition, FS/HSO will ensure that work areas are maintained in a manner that will not impede a worker's ability to exit the space. In the event of an emergency, workers shall not be placed at risk due to lack of egress in any work zone.

### 4.1.6 Heavy Equipment Operation

Safety hazards include working with heavy equipment such as forklifts, backhoes, drill rigs, etc. Special attention must be given by personnel working in the vicinity of this equipment to remain a safe distance from moving parts and tools. The following are general safety precautions for heavy equipment operations:

1. When working around heavy equipment, the following safe distances must be maintained:
   a) Non extendable equipment (ex. dump truck, bulldozer, etc.): 15 ft in front of the machine and 15 ft behind the machine (with the side limits established during the job briefing according to individual circumstances).
   b) Extendable equipment (excavator, telehandler, etc.): 10 ft beyond the maximum reach of any extended portion of the machine in any direction.
2. Personnel must not enter a machine's Controlled Access Zone without first communicating with the operator either through hand signals or a radio. Workers must maintain eye contact with equipment operators prior to entering a machine's work-zone.
3. Operators must not allow the machine to approach workers closer than 15 ft without first communicating with them using a horn, hand signals or a radio.
4. Blind spots: Where blind spots occur in potential travel areas a "spotter" will be used to communicate with the operator and warn personnel in the area of the presence of moving equipment.
5. All machinery used on-site where the operator's vision is obscured to the rear of the vehicle (ex. dump truck, etc.) will be equipped with functioning mirrors, back-up alarms and utilize a spotter when backing up.

### 4.1.7 Drum Handling

Due to the bulk size and weight of drummed materials, the followings precautions will be utilized during drum handling to prevent injury and minimize risk of spills.

*General Safety Precautions*

- All drums and containers of hazardous materials and hazardous wastes will be labeled in accordance with the regulations promulgated by the U.S. Department of Transportation (DOT) and MassDEP (310 CMR 30.341).
- Drums and containers of known or potentially hazardous waste must be closed at all times except when adding or removing waste.

- Field supervisors shall inspect drums and containers weekly and their integrity shall be assured prior to being moved.
- Work performed requiring movement of drums and containers shall be planned and organized to minimize the movement of the materials.
- When a container holding hazardous waste is not in good condition, e.g., severe rusting, apparent structural defects, or if it begins to leak, the waste must be transferred immediately to another container or otherwise processed to remedy the situation. Wastes transferred from damaged or leaking containers will not be mixed.
- Spill response materials and equipment shall be available in any area where spills, leaks, or ruptures may occur.
- Major spills shall be handled in accordance with the Emergency Response Plan.

*Receiving and Storage*

- Drums should not be placed on a pallet in such a way that the edge of the drum extends beyond the edge of the pallet. The drums are to be banded together at a level in the top 1/3 of their height for safety if the pallet will be placed on another pallet of drums.
- Wastes shall be placed in storage according to their compatibility. At no time will incompatible wastes be placed on the same pallet.
- Drums will be placed in drum storage in rows or racks separated by aisles at least two ft (24") wide in such a way that all drums on each pallet are visible for inspection, including the label.
- The pallets shall not be placed so that they overlap the next pallet.

### 4.1.8 Compressed Gas Cylinders

The following are general safety precautions for working with compressed gases (29 CFR 1926.350):

- All compressed gas cylinders shall be stored in well ventilated areas. The cylinders shall be secured upright at all times, and when not in use, the protective cap shall be placed over the cylinder's valve.
- Flammable substances such as oil and volatile liquids will not be stored in the same area.
- Cylinders of oxygen will not be stored within 20 ft of cylinders containing flammable gases. If storage must be closer than 20 ft, then the cylinders shall be separated by a fire-resistive wall (such as concrete partition) at least 5 ft high and have a fire rating of at least 1/2 hour.

### 4.1.9 Flammable Liquids

Flammable liquids like oil, gas, kerosene and many solvents present unique fire hazards (29 CFR 1926.152). They give off invisible vapors that can travel long distances and catch fire quickly or explode when ignited by something as small as a static discharge.

Flammable and combustible liquids will be used only when a nonflammable replacement is not reasonably available. The use of these liquids will be kept to a minimum and will be returned to an approved storage cabinet or storage area when not in use. The FS/HSO must be notified of all flammable liquids brought on-site by any personnel in accordance with the site HAZCOM Program. Flammable liquids are to be stored in approved cabinets or enclosures.

FS/HSOs shall ensure the following general safety precautions for working with flammable liquids are adhered to by their field staff:

- Keep ignition sources, such as cigarettes or hot machinery surfaces, away from flammable liquids;
- Use only in areas with good ventilation;
- Store in approved metal containers. Liquids shall be added to container using approved, metal funnel;
- Ground and bond containers when transferring materials to safely discharge static electricity;
- Take only what is needed for a job;
- Clean up spills and leaks quickly;
- Remove clothing that has absorbed liquids immediately;
- Never store near heat sources; and
- Do not cut or weld on drums or containers that once contained gasoline or other flammable liquids.

### 4.1.10 Corrosive Liquids

The following basic safe practices will be used when working with corrosive materials:

- Be aware of all the hazards (fire/explosion, health, chemical reactivity) of the materials you work with – review the SDS prior to use;
- Store corrosives in suitable labeled containers away from incompatible materials, in a cool, dry area;
- Store, handle, and use corrosives in well-ventilated areas;

- Inspect containers for damage or leaks before handling. Never use containers that appear to be swollen;
- Dispense corrosives carefully and under ventilation and keep containers closed when not in use;
- Wear face shields, safety goggles, longs sleeves, and double gloves, using latex or nitrile gloves, unless SDS states otherwise;
- Spill Control Kits with the appropriate clean up equipment will be present on site for all the different materials being used at the site (consult SDSs). Corrosive spill controls typically neutralize the hazardous nature of the spilled material. Acids and bases require different types of spill control materials;
- Know where to closest eyewash station and safety showers are located, and how to use them;
- Flush contaminated eyes or skin with water for at least 20-30 minutes, sometimes longer, in case of accidental contact. Call immediately for medical assistance; and
- Do not reuse empty containers. The residue may be hazardous.

#### 4.1.11 Electrical Safety

The existing electrical service provides power to office trailer areas, fence-line air monitoring systems, as well as site lighting, security and main gate operation.

*General Electrical Safety Guidelines*

- Electrical repairs will be made only under the direction of documented qualified, trained individual;
- Lock Out/Tag Out (Energy Control) procedures shall always be implemented to prevent the release of hazardous energy as workers perform maintenance activities;
- An employee's use of metal in jewelry and clothing will be limited in locations where an energized circuit can be contacted by the metal or the voltage is sufficient to cause arcing from the circuit to the metal;
- Electrical switches will be visually inspected before each use and will be replaced as necessary;
- Electrical fixtures used in hazardous atmospheres or confined spaces (tools, wiring, lights, radios, etc.) must be intrinsically safe (lights must be approved with a Class I Div. I rating) as indicated in the National Electric Code Part 500 -5;
- Electrical wiring apparatus safety procedures will be conducted in accordance with OSHA Standard 29 CFR 1926, Subpart K;

- Electrical equipment will be of a type listed by Underwriters Laboratories or Factory Mutual Engineering Corporation for the specific application;
- Electrical installations will comply with the National Electrical Safety Code or the National Electrical Code regulations;
- Electrical work shall be performed by personnel familiar with code requirements and have documented they are qualified for the class of work to be performed;
- Live parts of wiring or equipment will be guarded to protect all persons or objects from harm;
- Flexible electric cords will be covered or elevated to protect from damage by foot or vehicle traffic; and eliminate trip hazards;
- Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment will be marked to indicate the maximum operating voltage;
- Patched, oil-soaked, worn, or frayed electric cords or cables shall not be used;
- Extension cords or cables will not be fastened with staples, hung from nails, or suspended by wire;
- Electrical circuits will be grounded in accordance with the National Electrical Code and the National Electrical Safety Code unless otherwise noted in the reference manuals;
- Portable and semi-portable electrical tools and equipment will be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle unless it is clearly marked as “double insulated;”
- Personnel shall stay at least 10 ft away from all overhead power lines and assume they are energized;
- Semi-portable equipment, floodlight, and work lights will be grounded. The protective ground of such equipment will be maintained during moving unless supply circuits are de-energized;
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools will be distinctly marked and listed by Underwriters Laboratories or Factory Mutual Engineering Corporation;
- Flexible cord will be of a type listed by the Underwriters Laboratories. Flexible cord sets will contain the number of conductors required for the service plus equipment ground wire. The cords will be hard usage or extra hard usage as specified in the National Electrical Code. Approved cords may be identified by the word “outdoor” or letters “WA” on the jacket;
- Temporary wiring will be guarded, buried, or isolated by elevation to prevent accidental contact by personnel or equipment;
- Ground fault circuit interrupters (GFCI) are required in circuits used for portable power tools unless the tool is clearly marked as “double insulated.” Certification will be

indicated by the presence of color-coded labels. GFCIs or assured equipment grounded outlets must be used in conjunction with power hand tools and cord sets which are plugged into any 15 or 20 ampere (120 VAC) outlets;

- All power tools, cord sets, and GFCIs should be inspected at least quarterly. The inspection must ensure equipment grounding conductors are continuous, each receptacle and plug is correctly wired, insulation is free of defects and GFCIs operate properly; and
- Personnel that are using such equipment are responsible for performing a visual inspection prior to each day's use for external defects, such as deformed or missing pins or insulation damage, and for evidence of possible internal damage. Defective equipment must be removed from service immediately.

*Breaker Boxes and Junction Boxes*

- All new and existing breaker switches will be labeled to identify the circuit for which it is being used;
- All new and existing breaker boxes will be labeled when there is a single switch which could interrupt power to a series of circuits;
- The area around a circuit breaker boxes will be kept clear 30 inches in all directions; and
- Bare or exposed wiring shall never be allowed.

*Electrical Extension Cords*

Cords will be inspected before each use for deterioration, fraying, or other external damage. In addition:

- Cords will not be used if damaged or frayed (damaged cords will be tagged out "Do Not Use" and placed in a separate area for repairs or discarded);
- Splicing of cords will not be permitted;
- There must be a ground plug on the cord; and
- A GFI, ground fault interrupter, must be used with all electrical extension cords, electrical power tools, and other electrical devices.

*Electrical Lockouts*

FS/HSOs shall ensure protective measures such as Lock-Out/Tag-Out is employed prior to the performance of maintenance involving energized equipment. FS/HSOs are also responsible for notifying field personnel of location and type of equipment that is locked out and will ensure site personnel do not attempt to operate locked out equipment.

Contractors shall follow their Lockout/Tag-Out Standard Operating Procedure before and during any maintenance involving energized equipment (electrical or mechanical). Field supervisors shall notify the SPM of any work involving Lock-Out/Tag-Out prior to initiating such work. A copy of the completed Lock-out/Tag-Out form shall be provided to the HSO once work is complete.

*Electrical Panels and Boxes*

When turning the power to an electrical panel on or off, *always do this by operating the switch on the outside right hand side of the box* ***WITH YOUR LEFT HAND***. This positions your face and body right of the box instead of directly in front which would provide some protection to you in the event of a panel explosion and/or panel arcing.

**4.1.12 Fire Protection and Prevention**

The following fire protection and prevention methods shall be followed:

- Portable fire extinguishers will be located as determined by the FS/HSO. A monthly visual inspection will be made to ensure that extinguishers are fully charged and in an operable condition. Hoses, nozzles, brackets, and supports will be inspected for deficiencies and corrected. Gauge pressure will be checked monthly by the HSO on pressurized units to ensure units are fully charged. An inspection tag will be attached to each extinguisher to designate that it has received proper inspection;
- Flammable liquids must be handled only in approved, properly labeled metal safety cans equipped with flash arresters and self-closing lids. Transfer of flammable liquids from one container to another will be done only when the containers are electrically interconnected (bonded);
- Equipment motors will be shut off during fueling operations;
- Flammable liquids stored in properly grounded metal drums will be equipped with self-closing safety faucets, vent bung fittings, and drip pans;
- FS/HSOs shall perform daily inspections to ensure combustible material storage remains protected and in accordance with Site requirements.

*Fire Extinguishers*

Currently, several portable fire extinguishers are installed on-site. The FS/HSO shall inform all personnel of the location and type of extinguishers located on-site to ensure all personnel are familiar with their locations. Throughout RD/RA activities, additional fire extinguishers will be provided as necessary.

*Type & Placement*

- Construction equipment (cranes, bulldozers, drilling rigs, etc.) will be shipped with a functioning fire extinguisher of 10 ABC units or higher;
- Each vehicle dedicated to on-site activities will be equipped with a fire extinguisher of 5 ABC units or higher;
- Temporary offices will be equipped with a fire extinguisher of 10 ABC units or higher;
- At least one portable fire extinguisher of 20 ABC units will be located not less than 25 ft nor more than 75 ft from any flammable liquid storage area; and
- Only "Multi-Purpose" Class A-B-C dry chemical fire extinguishers, twenty (20) pound minimum with a pressure gauge, are to be used at the Site.

*Training*

Whenever fire extinguishers are provided employees will be trained by a Qualified Trainer in the general principles of fire extinguisher use and the hazards involved with incipient stage firefighting. The FS/HSO will document all Fire Extinguisher Training. Fire Extinguisher Training requires annual Recertification.

*Inspections*

Fire extinguishers shall be inspected by a FS/HSO monthly for the following:

- Location in designated place;
- No obstructions to access or visibility;
- Operating instructions on nameplate legible and facing outward;
- Safety seals and tamper indicators not broken or missing;
- Examinations for obvious physical damage, corrosion, leakage, or clogged nozzle;
- Pressure gauge reading or indicator in the operable range or position; and
- Label in place.

In addition, annual maintenance checks will be performed in full compliance with NFPA-10-6.

### 4.2 Work Plans, Permits & JSAs

All work conducted at the Site is governed by written work plans and/or permits. Work plans shall provide overall guidance for management of the OM&M activities. Job Safety Analysis shall also be utilized to inform workers of task specific hazards. The following describes the primary documents to be used for managing safety.

### 4.2.1 Task Specific Work Plans

Task specific work plans are procedural documents developed for complex tasks not governed by "skill of the trade" and where the project management team deems a detailed written approach to work as a more effective means for communicating and controlling the conduct of the work. Task specific work plans may address the following:

- The scope of the task being performed;
- The equipment and materials needed to perform the task;
- The prerequisite actions needed prior to start of work. Examples are training, notifications and permit completion;
- The steps in as close to sequential order as can practically be written;
- Hold points or required inspections, certifications, sampling and/or measurements to be made as required during task implementation;
- Close-out elements to determine and verify completion of the task; and
- Documentation that needs to be produced and maintained.

All necessary safety elements should be integrated into the procedural steps.

### 4.2.2 Permits

High hazard activities typically require permits that provide additional controls to govern the conduct of the work. Examples of permits required for work on this project are those permits required for Hot Work Permits (Appendix A). The instructions or minimum requirements for each of these permits can be found in the applicable Appendices to this HASP.

### 4.2.3 Job Safety Analysis (JSA)

JSAs should be prepared for tasks with the potential to cause injuries and tasks in which one simple human error can lead to an accident or injury. FS/HSOs shall ensure JSAs are available and personnel review these documents in accordance with their Health & Safety programs. All personnel involved in a task shall have the opportunity to revise an existing JSA based on site conditions and/or personal knowledge/experience.

## 4.3 Chemical Protection Practices

The chemical hazards at the Site are principally associated with potential inhalation and direct contact with residual contamination in soil, sediment and groundwater.

COCs at the Site include PCBs, VOCs and SVOCs. Exposure pathways to COCs include dermal contact, inhalation, ingestion, and direct exposure.

A list of chemicals brought to the Site for the performance of the work as well as their Safety Data Sheet (SDSs) will be kept and processed in accordance with the site HAZCOM Program.

#### 4.3.1 Safety Data Sheets (SDSs)

SDSs are maintained by the FS/HSOs in the site field office. The SDSs will be available for all workers to review at any time while on-site. The site orientation training program will provide a review of the site specific HAZCOM Program, which shall include information regarding the location and procedures regarding SDSs as well as container labeling and other requirements.

#### 4.3.2 Medical Surveillance and PPE

Medical surveillance and PPE requirements will be based upon the nature of the work, the type of contaminant and the level of contamination. Field supervisors shall review the TSWP and/or JSAs for additional detailed information for PPE and process controls to minimize worker exposure. Sections 5 and 9 provide additional information on the PPE and medical surveillance programs, respectively.

#### 4.3.3 Chemical Exposure Standards

Threshold limit values (TLV) will be the primary work exposure control parameter used for potential worker exposures. Where a substance specific standard exists within the OSHA regulations, that standard's action level and exposure limits will be used to control worker exposures. Where no TLV or OSHA Permissible Exposure Limit (PEL) exist, the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) or an industry established standard will be used.

ALARA practices will be used, regardless of exposure limits, to minimize worker exposure to chemical contaminants.

### 4.4 Lifting and Repetitive Motion Control Practices

FS/HSOs shall ensure that workers are aware of tasks that may pose an increased risk of developing MSDs and implement solutions to control these hazards such as the use of mechanical devices (forklifts, etc.) Workers are encouraged to report early signs and symptoms of MSDs to reduce the progression of symptoms and subsequent development of serious injuries. Methods of preventing MSDs include:

- Limiting load lifts for a single person to 50 pounds
- Reviewing lifting techniques at the safety brief prior to conduct of the work task
- Field observation by an independent observer to assess lifting techniques (e.g. use of NIOSH lifting equation)
- Use of mechanical advantage equipment to reduce or eliminate manual lifting by personnel
- Rest periods or periodic personnel "switching" to reduce strain from repetitive tasks
- Use of two individuals to lift heavy or unusually shaped objects
- Securing the shortest path with the least obstacles for movement of materials

Individuals with concerns about lifting up to 50 pounds may request a medical surveillance screening from their OSHA physician's review of the worker's capability to physically perform the assigned project tasks.

### 4.5 Hot Work

Any hot work (i.e., welding, burning, grinding, etc.) conducted must comply with the guidelines established in the Hot Work Procedures, Appendix A. The FS/HSO and SPM require prior notification when hot work is required on-site, and copies of all Hot Work Permits must be submitted to the FS/HSO upon completion.

### 4.6 Noise

A hearing conservation program will be implemented if exposures equal or exceed an 8-hour Time Weighted Average (TWA) of 85 decibels (dB). As part of the criteria for the medical surveillance program established for the Site, audiometric testing is conducted by a qualified OSHA physician to monitor each worker's ability to hear. Sound level measuring will be conducted initially at the Site work zones and whenever new tasks are started, or additional equipment is brought onto the Site that has not previously had its sound level quantified. Enough monitoring data exists to require the use of hearing protection when operating hand power tools such as reciprocating, saws, circular saws, hammer drills, etc.

Engineering controls, such as mufflers and baffles, should be utilized when feasible to reduce noise. Hearing protection, such as disposable ear plugs, earmuffs, etc., is required to be worn by personnel working with or around equipment that can generate noise levels in excess of 85 dBA. The Hearing Conservation Program and requirements are further detailed in Appendix D to this HASP. Personnel may request and use hearing protection even if noise levels are less than 85 dBa.

### 4.7 Slips, Trips & Falls

Prevention measures such as good housekeeping, level work surfaces, and defined walkways will be utilized. Use of ladders for elevated work may be required. Field Supervisors shall ensure good housekeeping is performed each day. In addition, a formal pre-use inspection is required document all aerial lifts used on-site, including rentals. Only Extra Heavy Duty (Type 1A) or Special Duty (Type 1AA) ladders are permitted for use on-site. Ladders must be properly stored and inspected by the HSO in accordance with manufacturer requirements.

A fall protection system (typically full body harness and lanyard) will be used to protect site workers who are exposed to unprotected sides or edges of surfaces that present a fall hazard of six (6) feet or more to a lower level and/or use aerial boom-lifts. Fall protection shall be in accordance with 29 CFR 1926 Subpart E, 1926.95, 1926.104, 1926.106, M and L, and 1926.451. Field supervisors shall notify the SPM when a fall protection system, or additional fall protection is required. Field supervisors are required to document that site personnel are trained, and all fall protection is maintained in good condition and inspected in accordance with manufacturer requirements.

### 4.8 Heat and Cold Stress

Heat and cold stress intervention programs are described in Appendices E and F, respectively. Field supervisors shall ensure their employees are knowledgeable on the signs and symptoms of heat and/or cold related injuries and monitor their personnel during periods of extreme weather conditions. All heat and cold related illnesses shall be reported to the FS/HSOs and the SPM.

### 4.9 Biological Hazards

Biological hazards that may be encountered at the Site include spores and viruses from animal dung, bacteria in soils (tetanus and hepatitis A), through ingestion of fecal contaminated materials (investigation and removal of septic field). Exposure to bacteria transmitted from ticks can result in transmission of Rocky Mountain spotted fever, Lyme disease and/or other Blood-Borne Pathogens. Less likely, is exposure to viruses through animal bites such as rabies. Employers shall ensure that workers are current with vaccinations (ex. tetanus) and receive a two-dose series hepatitis A vaccine where increased potential for exposure exists. Exposure shall also be limited though the use of PPE and good sanitary procedures (ex. frequent handwashing, etc.). Protection against insect bites include the use of insect repellent with at least 20% DEET, wearing light colored clothing, and performing tick checks throughout the day.

Although unlikely, personnel exposure to bloodborne pathogens in the event of a worker injury is also a potential. The Bloodborne Pathogen Protection Program is outlined in Appendix B of this HASP. At a minimum all workers assigned first aid duties will participate in the Bloodborne Pathogen Protection Program.

### 4.10 Sanitation

*Water*

An adequate supply of drinking water will be available on-site. Liquids will be dispensed in an approved potable water system and in a manner, which prevents contamination between the consumer and dispenser. Outlets dispensing non-potable water will be posted "Non-Potable Water." Systems furnishing non-potable water and systems furnishing potable water will remain completely independent of one another.

*Toilets*

Toilets shall be provided on-site in accordance with 29 CFR 1926.51 at a minimum. Arrangements will be made for the routine servicing and cleaning of these units.

*Trash Collection*

Adequate trash receptacles will be appropriately placed for trash collection. Receptacles constructed of smooth, corrosion resistant, easily cleanable, or disposable materials, shall be provided and used for the disposal of waste food. The number, size, and location of such receptacles shall encourage their use and not result in overfilling. They shall be emptied not less frequently than once each working day, unless unused, and shall be maintained in a clean and sanitary condition. Receptacles shall be provided with a solid tight-fitting cover unless sanitary conditions can be maintained without use of a cover. Trash containers will be surveyed for unconditional release prior to being removed from the Restricted Area.

### 4.11 Decontamination

All personnel, equipment and materials shall be subject to decontamination as identified by the FS/HSO and/or SPM. Invasive activities on-site shall be performed within an exclusion zone. Equipment entering into an exclusion zone should be protected by wrapping the instrument or tool with plastic. A complete decontamination of equipment shall be performed where this is not possible or when contamination is already present.

Decontamination of tools and sampling equipment is performed as follows:

- Wipe off excess soils and rinse with water;

- Scrub using an Alconox® or Liquinox® solution;
- Rinse with de-ionized water or equivalent; and
- Allow equipment to air dry before use.

## 5.0 PERSONAL PROTECTIVE EQUIPMENT

### 5.1 Levels of Protection

The following is a brief description of the PPE reviewed and found appropriate for both physical and chemical hazards expected at the Site. The PPE described may be potentially required during various phases of the project. The EPA terminology for protective equipment will be used: Levels A, B, C, D and D-modified. Contractors and their Field Supervisors shall identify the need and type of PPE to be used during the implementation for each phase of work in which they are involved and in accordance with their HASP. FS/HSOs are required to review the PPE requirements for their personnel with the SPM and RSO prior to the start of work.

#### 5.1.1 Level A Protection

Level A protection is not anticipated during this project.

#### 5.1.2 Level B Protection

Level B is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. Level B protection is not anticipated but may be required if identified as a necessary part of a hazard assessment. A reduction in the level of respiratory protection to Level C can be completed based on the results of the personal monitoring data. Contractors and or their subcontractors required to perform work where there is a potential for an upgrade to Level B shall have the equipment and training necessary to support this work.

Examples of Level B protection include positive-pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.

#### 5.1.3 Level C Protection

Level C protection is not anticipated but may be required if identified as a necessary part of a hazard assessment. Level C protection will be used when all the following conditions are met:

- The types of air contaminants have been identified, concentrations have been measured, and an air-purifying respirator is available that can remove contaminants.

- The substance has adequate warning properties and all criteria for the use of an air-purifying respirator have been met.
- The area is not immediately dangerous to life and health (IDLH).

Level C protective equipment at a minimum will consist of:

- Steel-toed, heavy duty, PVC boots – or boot covers over steel-toed boots;
- Tyvek coveralls with hoods and elastic wrists and ankles (poly-coated when there is a potential for contaminated liquid contact);
- Nitrile inner gloves;
- Nitrile or work gloves (outer);
- Hearing protection (if necessary, as determined by the Field Supervisor, HSO, and/or RSO);
- ½ Face mask air-purifying respirator (APR) with safety glasses or full-face APR/powered air-purifying respirator (PAPR) or supplied air respirator (SAR);
- Hard hat; and
- Duct tape to cover openings (ankles, wrists, and respirator).

### 5.1.4 Level D Protection

Level D PPE will only be used in areas where the following conditions are met:

- Work functions preclude significant splashes, immersions, and the potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful contaminants.
- Atmospheric concentrations of contaminants are less than one-tenth the TLV/PEL.
- The potential for inhalation of radionuclides is minimal.

Level D PPE at a minimum will consist of:

- Steel-toed (and/or Safety Toe), heavy duty, PVC boots
- Safety glasses
- Hearing protection (if needed for hearing protection as specified in the JSA or work plan);
- Splash shield (if needed for face protection as specified in the JSA or work plan);
- Hard hat; and
- Leather palm gloves (if needed for hand protection as specified during the hazard assessment or work plan).

### 5.1.5 Level D Modified Protection

Level D Modified PPE will only be used in areas when the following conditions are met:

- There is a potential for minor splashes, immersions, or contact with harmful contaminants.
- Modeled or measured airborne concentrations of the contaminants are less than one-fourth the TLV/PEL or 1/10 the Derived Air Concentration (DAC) for uranium.
- The potential for the inhalation of radionuclides is minimal.

Level D Modified PPE at a minimum will consist of:

- Steel-toed (and/or safety toe), heavy duty, PVC boots;
- Tyvek coveralls with hoods and elastic wrists and ankles (polycoated when there is a potential for contaminated liquid contact);
- Nitrile inner gloves;
- Nitrile outer gloves;
- Hearing protection (if necessary, as determined by the HSO/RSO);
- Splash shield (if necessary, as determined by the HSO/RSO);
- Hard hat;
- Safety glasses; and
- Duct tape to cover openings (ankles, wrists).

## 5.2 Respiratory Protection

Respiratory protection measures may be used to protect workers from a variety of airborne hazards including oxygen deficient atmospheres, particulates, and vapors. Respiratory protection in this HASP is based on requirements in 29 CFR 1910.134.

Respiratory protection equipment will be selected using allowed respiratory protection factors to ensure that individual limits on intake or exposure are not exceeded. Engineering controls and work practices that eliminate the need for respiratory protection will be assessed by the FS/HSOs and SPM for work feasibility before any respiratory protection (except in emergencies) is assigned.

Appendix H contains the minimum requirements of a respiratory protection program that will be followed as part of this project.

## 6.0 SITE CONTROL

All workers will maintain a "buddy" or line of sight system of communication when working on the site. Cell phones or radios will be left "on" and used for communications with Field Supervisors or individuals assigned by the FS/HSO to monitor the safety and location of personnel performing the work.

### 6.1 Zones

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas and associated PPE requirements will be clearly identified. Designated work areas or zones are required as stated in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/United States Coast Guard/USEPA, November 1985.

Areas of the Site where work activities will be conducted will be subdivided into three zones: an Exclusion Zone; a Contamination Reduction Zone (CRZ); and a Support Zone.

#### 6.1.1 Exclusion Zone

The Exclusion Zone isolates the area of activity and serves to restrict the spread of potential contamination from work areas of the Site to support areas and off-site locations. The Exclusion Zone is demarcated by a tape line or physical barrier. Personnel entering the Exclusion Zone must: (1) enter through the CRZ; (2) wear the prescribed level of protection; and (3) otherwise be authorized to enter the Exclusion Zone. Any personnel, equipment or materials exiting the Exclusion Zone will require radiological screening in the CRZ before entering in the Support Zone. (See Section 8 for decontamination requirements). Equipment and materials will either be subject to decontamination or containerized in uncontaminated devices for decontamination at the designated off-site location.

The EPA HAZWOPER terminology uses the term "Exclusion Zone" to define where the highest level of hazardous work is occurring and where the strictest level of worker protection must take place. Because several areas contain specific contaminants or combinations of contaminants, areas that are delineated as Chemically Restricted Areas (ex. PCBs, etc.) will be considered synonymous with the term Exclusion Zone. In support of the extensive excavation work planned for the site, a restricted area will be established by the SPM and/or FS/HSO that includes an appropriate area for the heavy equipment operation. Other restricted areas will be designated

as necessary. Specific access for emergency services to areas of site operations will be established by the FS/HSO and SPM.

### 6.1.2 Contamination Reduction Zone

The CRZ is a transition zone between the Exclusion Zone or Restricted Area and support areas central to the demolition activities. It is designated by a tape line between the Exclusion Zone and the beginning of the CRZ, and by a control line between the CRZ and the support areas. Field personnel, equipment or materials which leave the Restricted Area require decontamination. After undergoing the decontamination process or containerization, personnel, equipment or materials will be permitted to exit the CRZ.

Within the CRZ is the Contamination Reduction Corridor (CRC). In the CRC, materials necessary for field personnel and portable equipment decontamination and certain safety equipment associated with normal work-related incidents are staged. Separate areas at the Site may be designated by the FS/HSO and/or SPM for the decontamination of heavy equipment.

### 6.1.3 Support Zone

A Support Zone will be established in an appropriate area at the Site and will contain the necessary support facilities for site operations and general administrative and logistic purposes. It also will serve as the communications center, storage of sampling equipment and PPE, and source of emergency assistance for operations in the Exclusion Zone and CRZ. The Support Zone shall be set up by the FS/HSO and/or SPM in an area of the Site that is known to be or is likely to be free of contamination.

The Field Supervisors are required to monitor and ensure their workers entering the Restricted Areas have met all training and medical surveillance requirements. The FS/HSO and/or SPM or his designee shall maintain a log of all persons entering and exiting any of the Restricted Areas on the site.

## 6.2 Site Evacuation and Emergency Communications

Although extremely unlikely, a potential does exist to encounter previously unknown chemical contamination or unidentified underground utility (e.g., natural gas pipeline).

The FS/HSOs and/or SPM may declare an Emergency and order a Site Wide Evacuation. Unless directed differently by the HSO and/or SPM, all site personnel will gather at the designated rally

point identified during the Tailgate each morning. The FS/HSOs will perform a “head count” and will verify all personnel are accounted for to the SPM. In the event a site worker cannot to accounted for, the Field Supervisor will immediately inform the SPM. The SPM will determine the last know location of the missing worker, hazards present at that location and the best and safest method(s) to search for this missing worker.

Emergency communications with outside agencies (police, fire, etc.) will be performed by the SPM or PC (if present on site). The SPM or PC will be the point of contact for information from the FS/HSO to any responding Agencies.

## 7.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Chemical and dust exposure monitoring will be conducted during field work operations to determine employee exposure to airborne contaminants and to ensure that the PPE and engineering controls utilized at the Site are sufficient to ensure worker safety. The monitoring results will dictate work procedures and the selection of PPE. At a minimum, this monitoring will include evaluations for hazardous concentrations of airborne particulates contaminated with VOCs. Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities.

Air monitoring to be conducted on-site includes:

- Use of an $O_2$/Lower Explosive Limit (LEL) meter to measure oxygen content and lower explosive limit of the work environment when work in confined spaces is occuring. Air monitoring will be conducted continuously with the $O_2$/LEL meter if flammable/explosive vapors are suspected exceeding 10% LEL.
- Photoionization detector (PID) 11.7 or 11.8 electron volt (eV) lamp for measuring total VOCs in the breathing zone (BZ). Real-time monitoring for VOCs will be performed during the conduct of all activities having the potential for personnel exposure to VOCs. Default action levels for VOC monitoring will be a continuous reading of 2 ppm or higher. A more stringent action level may be used based upon the known chemical contaminant and its associated PEL or TLV.

*Monitoring Equipment Maintenance and Calibration*

- Direct reading instrumentation calibrations will be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated in accordance with manufactured requirements before and after use, noting the reading(s) and any adjustments that are necessary. Chemical exposure monitoring equipment calibrations, including the standard used for calibration must be documented on the Field Activity Daily Log or the calibration log. Completed health and safety documentation/forms will be maintained by the FS/HSO.
- Chemical exposure monitoring equipment will be maintained and calibrated in accordance with the specific manufacturers' procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

- If an instrument is found to be inoperative or suspected of giving erroneous readings, the HSO will immediately remove the instrument from service and obtain a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The FS/HSO is responsible for obtaining a replacement unit and/or initiating repairs on the defective equipment.

## 8.0 TRAINING REQUIREMENTS

To ensure that training and medical surveillance requirements are appropriately applied based on the potential exposures at the Site, all individuals present on site during the OM&M activities are categorized as follows:

**Visitors:** Are personnel who are not assigned to the Site, only perform observations and do not perform any physical work at the Site or supervise those who are performing physical work.

**Service Workers:** Personnel who perform one specific function while on-site and only occasionally visit the Site to perform that function. Examples of service workers are Telephone Company, electrical utility company or trucking company employees.

**OM&M Workers:** Personnel assigned full time to the project and their supervisors and are likely to enter the Exclusion Zone or CRZ at the Site.

### 8.1 Visitor Training

Visitors must receive the Site Visitor Briefing as developed by the HSO. Visitors must be escorted all times when on-site apart from entries to the parking lot and administrative areas.

### 8.2 Service Workers

Service Workers will receive specific hazard training for the areas in which they will be working. The training will ensure the following enabling objectives are achieved:

- Staff can identify areas where they require an escort or additional training before entry;
- Staff can explain the various warning signs and labels likely to be used on the Site;
- Staff can list the various hazards associated with site operations; and
- Staff can describe actions to be taken in the event of an emergency.

If a Service Worker's exposure to contaminants is expected to be detectable for chemical contaminants (i.e., a positive analysis on an air sample) then the worker requires the following additional training:

- 24-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1926.65(e)(3)(ii).

- Substance specific training as required by that substance's specific control program contained in 29CFR1926 Subpart Z.

Service Workers who are likely to have exposures that exceed the TLV/PEL or the Derived Air Concentration (DAC) will be classified as Site Workers and their training must then rise to meet those requirements.

### 8.3 OM&M Workers

The Training and Medical Surveillance described in Section 9 lists the training requirements for OM&M Workers. In addition, some training requirements in the matrix are optional to some as they involve workers who may be exposed to chemicals or other potential hazards specific to their job requirements.

### 8.4 Training Documents

#### 8.4.1 Acknowledgement Forms

All training will require a signature of the individual trained and that of the trainer or person providing the briefing. The form will be an acknowledgement the person has received the training and has had the opportunity to ask questions.

#### 8.4.2 Training Certificates and Training Equivalency

Certificates of training for workers who have obtained training off-site must contain the date of the training, the location, a specific notation as to the regulatory standard which the training was directed toward, and the signature of the trainer. A copy of all required training certificates for OM&M Workers to perform their essential job functions on-site shall be provided to the HSO.

Certificates will be reviewed by the FS/HSO or designee and maintained as part of the worker's training file.

Equivalent training to that being presented on-site is acceptable provided the FS/HSO review the request for declaration of equivalency and provide a note to file as to the rationale for accepting equivalency.

## 9.0 MEDICAL SURVEILLANCE

### 9.1 Medical Examination

All personnel classified as OM&M Workers will require participation in a medical surveillance program. Non-OM&M classified workers will require medical surveillance participation if the task being performed is a task where medical surveillance is required as part of 29CFR1926 Subpart Z.

#### 9.1.1 Initial Examination

An initial examination by a physician or other licensed health care professional (PLHCP) must be completed prior to personnel working within an Exclusion Zone or CRZ at the Site.

The following information will be provided to the examining PLHCP:

- Copy of 29 CFR 1910.134 (29CFR1926.103 considered equivalent) and Appendices A through D in 1910.134;
- Regulatory Guide 8.15;
- Description of employee's duties;
- Contaminants potentially exposed to;
- Description of the PPE to be used;
- Substance Specific OSHA standard;[1] and
- Information from previous medical exams if made available by the employee or already in possession of PLHCP.

The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to perform the assigned tasks in their job description and wear the PPE likely to be assigned for performing the task. Each subcontractor will ensure their workers are medically qualified to perform work associated with the OM&M activities. The subcontractor will provide the FS/HSO with a copy of the physician's statement for each employee that states they are medically qualified prior to their arrival on-site.

#### 9.1.2 Periodic Examinations

All personnel working at the Site will receive annual physical examinations. The results of these physical examinations are to be compared to previous results and the baseline physical by the

[1] Where one exists for the contaminant the employee will be exposed to in the work environment.

PLHCP to determine if any effects due to exposure have occurred or if the employee has suffered an impairment impacting the employee's ability to perform the essential functions of their work.

Additional exams may be warranted if an employee suffers a work or on-work related exposure/injury that the FS/HSO believes may have a health impact on the employee.

Each subcontractor is responsible for following the recommendations made by their PLHCP for each of their employees.

### 9.2 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and will be kept for a minimum of 30 years. Confidentiality of employee medical records will be maintained in accordance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

The medical exam data needed for the site records consists of a medical clearance letter signed by the PLHCP stating the employee can perform their assigned tasks and wear the task-required PPE.

An additional declaration by the PLCHP is required for personnel expected to wear respiratory protection. Employees voluntarily using tight-fitting respirators must follow the medical surveillance requirements for respirator users as specified in this section and Appendix H of this HASP.

Work restrictions identified by the PLHCP must be clearly noted on the PLHCP's medical clearance letter.

### 9.3 Medical Restrictions

Each subcontractor is required to follow any employee work restrictions identified by their PLHCP and communicate same to their employees and their FS/HSO who in turn will communicate with the SPM.

## 10.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY

The HSO performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with onsite parties, and local emergency service providers (as appropriate).

- Review the facility emergency assembly locations for each major operational area.
- Determine what onsite communication equipment is available (e.g., two-way radio, cell phones).
- Determine what offsite communication equipment is needed and its location (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital (where accessible). Communicate the information to on-site personnel.
- Establish a clear and simple protocol to communicate if or when, there is an emergency.
- Establish a clear procedure of when 911 should be called and when an ambulance is required to transport injured personnel to the Hospital (ex. Falls over six feet, unconscious worker).
- Inform emergency room supervisors and the chief of the local emergency response team(s) that site work has resumed and of ambulance access points and the potential types of site emergencies.
- Check site emergency equipment, supplies, and potable water are present and/or functional.
- Communicate emergency procedures to the workers for personnel injury, exposures, fires, explosions, and releases.
- Supervisors are to rehearse the emergency response plan before site activities begin, including a “practice run” by driving the route to the hospital.
- Brief new workers on the emergency response plan.
- The HSO will evaluate emergency response actions and initiate appropriate follow-up actions.
- Throughout the project, review changes in site conditions, onsite operations, and personnel in relation to emergency response procedures.

## 11.0 RECORD KEEPING

Proper record keeping and data management are an essential component of this HASP. The forms associated with the record keeping and data management requirements must be completed in legible writing in an accurate, timely fashion and filed with the appropriate entities. It is the responsibility of the FS/HSO to ensure that the forms are properly completed and filed. Completed forms will be kept and maintained at the Site. These records will be maintained in accordance with project requirements. Subcontractors will also be responsible for maintaining a copy of the forms pertaining to their personnel.

### 11.1 Changes to the Health and Safety Plan

The HASP is considered a "living document" and may be updated to reflect the needs of the project.

Any individual or subcontractor directly involved in the project or EPA may request a change to the requirements of the HASP. Requests must made in writing to the SPM requesting the change and the request should state the specific change to be made and the basis for the change

The FS/HSO and the SPM will make an initial determination whether a proposed change is administrative or substantive in nature. In general, administrative changes involve organization names, position titles, other non-technical issues, but may also involve program changes where the degree of protection provided employees is not lessened.

The PC will make the final decision regarding whether a change is administrative or substantive. The PC will have final approval for all administrative changes. All administrative changes will be distributed to EPA and NYSDEC.

Change requests will be evaluated and acted upon expeditiously. Administrative changes should be completed within 30 days. Substantive changes require approval of the EPA prior to implementation.

### 11.2 Temporary Changes to the Health and Safety Plan

To provide a means to respond quickly to changing situations, temporary changes or exceptions to the requirements of the HASP may be approved by the FS/HSO and SPM provided the PC review and approve the change.

### 11.3 Logs

The FS/HSO will maintain logs to track inspections, audits and incidents. Additional field information will be recorded on separate log forms for air monitoring, sampling, equipment calibration inspections, and incident reporting.

### 11.4 Inspections and Audits

All inspection and audit reports including the follow-up corrective actions will be maintained on site. FS/HSOs are required to provide follow-up information regarding the implementation of corrective actions to the SPM when requested.

## 12.0 ACRONYMS

| | |
|---|---|
| ACA | Airborne Contamination Areas |
| AIHA | American Industrial Hygiene Association |
| ALARA | As Low As Reasonably Achievable |
| AOC | Administrative Order of Consent |
| AOI | Area of Investigation |
| APR | Air-Purifying Respirator |
| ARAR | Applicable or Relevant and Appropriate Requirement |
| BBS | Behavioral Based Safety |
| BZ | Breathing Zone |
| CD | Consent Decree |
| C&D | Construction and Demolition Debris |
| CCA | Contamination Controlled Area |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| $cm^2$ | Square Centimeter |
| CNC | Computer Numerical Code |
| COC | Contaminant Of Concern |
| COMP | Cognizant Occupational Medicine Physician |
| CPR | Cardiopulmonary Resuscitation |
| CRC | Contaminant Reduction Corridor |
| CRZ | Contaminant Reduction Zone |
| CSEP | Confined Space Entry Permit |
| DAC | Derived Air Concentration |
| dB | Decibel |
| DOT | Department Of Transportation |
| DPM | Disintegrations Per Minute |
| DU | Depleted Uranium |
| ERP | Emergency Response Plan |
| eV | Electron Volt |
| FS | Field Supervisor |
| FSP | Field Sampling Plan |

| | |
|---|---|
| GC | General Contractor |
| GFCI | Ground Fault Circuit Interrupter |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HB | Holding Basin |
| HEPA | High Efficiency Particle Arresting |
| HIPAA | Health Insurance Portability and Accountability Act of 1996 |
| HSM | Health and Safety Manager |
| HSO | Health and Safety Officer |
| HWP | Hot Work Permit |
| IDLH | Immediately Dangerous to Life or Health |
| IDW | Investigation Derived Waste |
| ISS | In-Situ Sequestration |
| JSA | Job Safety Analysis (aka: Activity Hazard Analysis or AHA) |
| LEL | Lower Explosive Limit |
| MDT | Memorial Drive Trust |
| mg/m3 | Milligrams per Cubic Meter |
| MSD | Musculoskeletal Disorder |
| NFPA | National Fire Protection Association |
| NIOSH | National Institute for Occupational Safety and Health |
| NRR | Noise Reduction Rating |
| OSHA | Occupational Safety and Health Administration |
| PAHs | Poly Aromatic Hydrocarbons |
| PAPR | Powered Air Purifying Respirator |
| PC | Project Coordinator |
| PCB | Polychlorinated Biphenyl |
| PDI | Pre-Design Investigation |
| PDWP | Pre-Design Work Plan |
| PEL | Permissible Exposure Limits |
| PID | Photoionization Detector |

| | |
|---|---|
| PLHCP | Physician or other Licensed Health Care Professional |
| PPE | Personal Protective Equipment |
| PPM | Parts Per Million |
| PVC | Polyvinyl Chloride |
| QAPP | Quality Assurance Project Plan |
| RAWP | Removal Action Work Plan |
| RCRA | Resource Conservation and Recovery Act |
| RD/RA | Remedial Design/Remedial Action |
| RDWP | Remedial Design Work Plan |
| R&D | Research & Development |
| REL | Recommended Exposure Limit |
| RI | Remedial Investigation |
| RIFS | Remedial Investigation Feasibility Study |
| SAP | Sampling and Analysis Plan |
| SCBA | Self-Contained Breathing Apparatus |
| SD | Settling Defendants |
| SDS | Safety Data Sheet |
| SFA | Settling Federal Agency |
| SMIP | Site Monitoring and Inspection Plan |
| SOM | Site Operations Manager |
| SOW | Statement of Work |
| SPM | Site Project Managers |
| SRP | Separate Emergency Response Plan |
| SVOC | Semi-Volatile Organic Compound |
| SWA | Stop Work Authority |
| TLV | Threshold Limit Values |
| TS | Treatability Studies |
| TSWP | Treatability Studies Work Plan |
| TWA | Time Weighted Average |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compound(s) |

## 13.0 REFERENCES

Code of Federal Regulations, 29 CFR PART 1910 Occupational Safety and Health Standards

Code of Federal Regulations, 29 CFR PART 1926 Safety and Health Regulations for Construction

Code of Federal Regulations, 10 CFR Part 20 Standards for Protection Against Radiation

Code of Massachusetts Regulations, 105 CMR Chapter 120 Control of Radiation

NRC, 1992, Regulatory Guide 8.25, "Air Sampling in the Workplace", NRC, 1992.

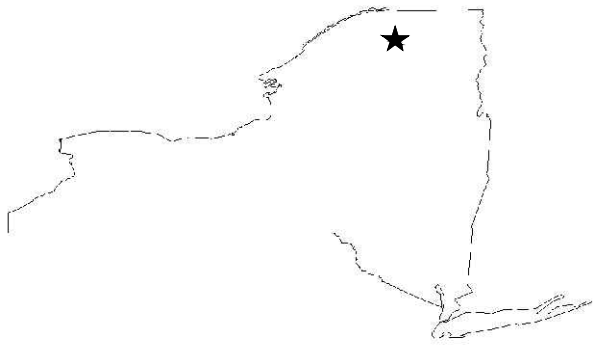
NRC, 1992, Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus", NRC, 1992.

NRC, 1996, Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure", NRC, 1996.

NRC, 1999, Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure", NRC, 1999.

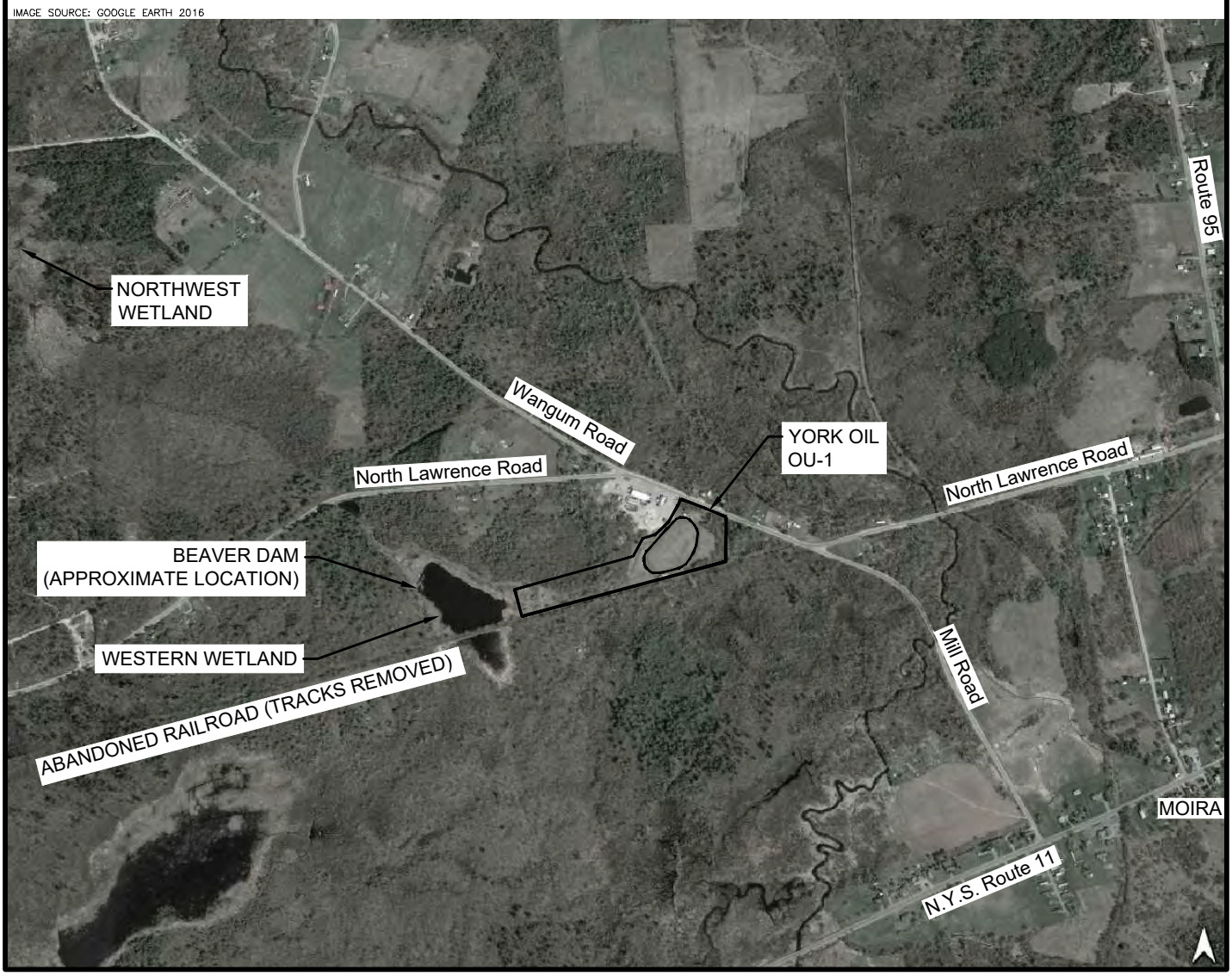
NRC, 1999, Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection", NRC, 1999.

U.S. Environmental Protection Agency (USEPA), 1990. "National Oil and Hazardous Substances Pollution Contingency Plan"; 40 CFR Part 300; March 1990.



SITE LOCATION MAP

IMAGE SOURCE: GOOGLE EARTH 2016




York Oil Superfund Site - Moira, New York

de maximis, inc.

1" = 1200'

600 0 1200

FIGURE 1-1
YORK OIL SITE LOCATION MAP

# APPENDIX A

# HOT WORK PROCEDURES

# HOT WORK PROCEDURES

## 1 PURPOSE

This procedure establishes the occupational safety requirements for employees and subcontractors who are required to perform hot work at the York Oil Site. Hot work includes any temporary operation involving open flames or producing heat and/or sparks including welding, cutting, brazing, grinding, soldering, work on metal that would conduct heat through a wall or in contact with a wall, or torch applied roofing.

## 2 SCOPE

This procedure applies to employees and subcontractors working at the York Oil Site. Cutting and grinding that does not generate sufficient heat or sparks to be considered a significant source of ignition to surrounding combustibles does not require a Hot Work Permit and those activities are exempt from the requirements of this procedure.

## 3 DEFINITIONS/ABBREVIATIONS

**ANSI** - American National Standards Institute

**CFR** - -Code of Federal Regulations

**Fire Watch** – A designated individual trained in specific fire-watch duties and dedicated to both worker safety and property loss prevention for a specified duration (usually one-half hour after completion of hot work).

**FR** – Flame Resistant

**Hot Work** - hot work is any temporary operation involving open flames or producing heat and/or sparks including brazing, cutting, grinding, soldering, arc welding or torch applied welding.

**Hot Work Permit** – Provides an authorization from the issuing authority to perform Hot Work.

**Issuing Authority** – An individual authorized by management with operating or designated jurisdiction over the facility or area where WBH is to be performed. The issuing authority should have a working knowledge of the facility and a good understanding of the potential hazards that could be involved with WBH operations.

**NFPA** - National Fire Protection Association

**PPE** - Personal Protective Equipment

**Welding, Burning and Hot Work (WBH**) – All methods of welding, arc and torch cutting, and open-flame brazing, open-flame burning, open-flame soldering, and other portable torch open-

flame operations for construction or maintenance activities. Electric soldering and drilling are NOT considered hot-work. If in question, contact Health and Safety.

# 4 REFERENCE/APPLICABLE DOCUMENTS

- ANSI Z49.1, Safety in Welding and Cutting and Allied Processes
- 29 CFR 1910, Occupational Safety and Health Standards
- 29 CFR 1926, Safety and Health Regulations for Construction
- NFPA Standard 51B, Fire Prevention in Use of Cutting and Welding Processes

# 5 RESPONSIBILITIES

## 5.1 Supervisors

Field Supervisors/Health and Safety Officers (FS/HSO) are responsible for compliance with this procedure within their respective areas of responsibility.

## 5.2 Employees

It is the responsibility of all personnel performing welding, cutting & brazing operations, designing construction or decommissioning/decontamination work, or planning packages, to comply with the requirements of this procedure and any other project specific requirements.

# 6 REQUIREMENTS

## 6.1 General Requirements

Hot Work shall be performed only after obtaining and completing a Hot Work Permit. The permit must be approved and signed by the issuing authority for the project. In addition, all hot work must be reviewed and approved by a representative from Health and Safety.

Because the hot work permit does not address all of the potential hazards with the activity, an Activity Hazard Assessment (AHA) or a Job Hazard Analysis (JHA) must be conducted.

Take all precautions necessary to determine changing conditions that may indicate a deviation from the original scope of activity. IF such a condition occurs, THEN the AHA or JHA must be re-evaluated.

Hot work controls shall include review and approval of adequate fire prevention measures and adequacy of personal protective equipment to ensure worker safety. Prior to performance of Hot Work, personnel approving the activity shall ensure workers understand the fire prevention controls and roles of the fire watch.

### 6.1.1 Fire Prevention Precautions

- Hot Work shall be permitted only in areas that are or have been made fire safe.

- Hot Work shall only be performed in an area approved as a Permissible Welding Area or in an area specifically authorized by a Hot Work Permit.

- The floor around the area where the Hot Work is to be performed should be swept clean for a radius of 35 feet.

- Combustibles shall be relocated at least 35 feet away from the work area. If relocation is not possible, combustibles shall be protected with flame-proof covers or otherwise shielded with metal or flame-resistant guards or curtains. The edges of covers at the floor shall be tight to prevent sparks from going under the covers.

- Hot Work on pipes and other metal in contact with combustible walls, partitions, ceilings, or roofs shall not be undertaken, if the work is close enough to cause ignition by conduction.

- Fully charged and operational fire extinguishers, appropriate for the type of possible fire shall be available in the work area for Hot Work performed in other than designated permissible welding areas.

- Work in an outside environment requires additional precautions to prevent sparks from migrating to adjacent combustible foliage and trees

Nearby personnel shall be relocated or suitably protected from heat, sparks, slag, arc flashing, or infrared or ultraviolet radiation.

### 6.1.2 Permissible Welding Areas

Permissible welding areas are designated areas for long term or permanent performance of Hot Work, such as a maintenance shop or detached outside location. Hot Work may be performed within a permissible welding area without a Hot Work Permit.

## 6.2 Personal Protective Equipment

- Helmets or hand shields will be used during all arc welding or arc cutting operations.

- Helpers or firewatchers will be equipped with proper eye protection.

- Goggles or other suitable eye protection will be used during all gas welding or gas cutting operations.

- All operations and helpers of resistance welding or brazing will use goggles or face shields.

- When required, flame resistant clothing (coveralls, gloves, etc.) shall be worn.

## 6.3 Individuals Performing Hot Work

Individuals performing the hot work are responsible for the following:

- Obtaining written approval from issuing authority for the hot work permit.

- Ensuring the conditions are safe and hazard free before beginning the hot work.

- Being prepared to contact supervision should conditions change or warrant reassessment while performing the hot work.
- Using appropriate personal protective equipment (PPE) while performing hot work (welding helmets, gloves, jackets, etc.)
- Completing the appropriate section(s) of the hot work permit.
- Returning the completed hot work permit to the issuing authority.

### 6.4 Firewatch

Individuals performing the Firewatch are responsible for the following:

- Being aware of the inherent hazards involved in the hot work.
- Ensuring safe conditions are maintained during the hot work.
- Ensuring appropriate fire extinguishers are readily available.
- Knowing how and when to report a fire or other emergency situation.
- Maintaining the watch for at least 30 minutes after the work is completed.
- Using the appropriate PPE.
- Completion of the appropriate section of the hot work permit.

### 6.5 Supervisors

Supervisors are responsible for the following:

- Maintaining cutting or welding equipment in safe operating condition.
- Ensuring the precautions listed on the Hot Work Permit are understood by the person(s) performing the permitted cutting, welding or brazing operations.

## 7 HOT WORK PROCESS

Hot Work Permit Forms (see attached) should be used for all work at the York Oil Site. Contractors may substitute their own form provided the Site Project Manager (SPM) has approved their Hot Work Program.

### 7.1 Prior to Hot Work

- Obtain hot work permit and post at the location in a highly visible area.
- Inspect the hot work area to identify any fire hazards.
- Remove all flammable or combustible materials within a thirty-five (35)-foot radius of the hot work.

- Properly shield combustibles that cannot be removed from the area with noncombustible blankets or other noncombustible materials.
- Seal all cracks and openings through which hot sparks or slag may enter. As an alternate means, a fire resistant shield may be used to block the openings.
- Sweep floor of all loose combustible debris.
- Place noncombustible or flame resistant screens to protect personnel in adjacent work areas from heat, flames, radiant energy, and welding splatter.
- Protect conveyer systems that may carry sparks of slag to other parts of the building.
- Post the area to warn nearby personnel of the danger.
- Cover sprinkler heads directly above the hot work area with wet rags or other noncombustible materials to not be triggered during the work.
- Cover smoke detectors located in close proximity to the hot work area.

## 7.2 During Hot Work

- Appropriate fire extinguishing equipment shall be maintained in close proximity to the hot work for its entire duration, plus thirty (30) minutes after completion of work.
- Combustible floors shall be kept wet during the hot work.
- Store acetylene and other fuel cylinders in a secure and upright position.
- Place hoses to prevent becoming crushed or damaged.

## 7.3 After Hot Work

- Firewatch will remain at the site for at least thirty (30) minutes following the completion of the hot work.
- Fire extinguishing equipment must remain accessible in the area until the Firewatch is secured.
- Remove any covers from sprinkler heads immediately when hot work is completed.
- Remove covers from any smoke detectors immediately when hot work is completed.
- Completion of the appropriate section(s) of the hot work permit and the return of the complete form to the issuing authority.

## 7.4 Hot Work Restrictions

- Areas, including those with confined spaces, where atmospheres of explosive gases, vapors, or dusts exist or could accumulate.

- On metal walls, ceilings, or roofs built of composite, combustible, and sandwich-type panel construction or having combustible coverings.
- On containers where flammable liquids, solids, or vapors may be present.
- On pipes in contact with combustible walls, ceilings, roofs, or partitions where heat by conduction can cause ignition.
- Removal of paint with known or suspect lead, cadmium or PCB contaminants.

### 7.5 Storage of Cylinders

- Cylinders will be stored at least twenty (20) feet from highly combustible materials and where the cylinders will not be exposed to excessive rise in temperature, physical damage or tampering by unauthorized persons.
- Cylinders must be chained at all times or otherwise secured to prevent from falling over.
- Oxygen cylinders will be separated from fuel gas cylinders or combustible materials at a minimum distance of twenty (20) feet or by a noncombustible barrier at least five (5) feet high, having a fire resistance rating of a least thirty (30) minutes.

## 8 TRAINING

### 8.1 Individuals Performing Hot Work and Firewatchers

All employees performing hot work or acting as the firewatcher must be trained to conduct hot work activities. The training contains at a minimum:

- How hot work fires and explosions start
- How fires can be prevented and what makes hot work fires more severe.
- What are the Hot Work Policy, procedures, and responsibilities.

### 8.2 Contractors

Contractors are required to provide training to their employees involved in performing hot work. Any job where the contractor fails to follow hot work procedures will be shut down until the infraction has been corrected. All contractors must notify the hot work permit issuing authority of any hot work to be performed.

## 9 RECORDKEEPING

### 9.1 Hot Work Permits

All original hot work permits shall be returned to the issuing authority for record retention. Keep a copy for your file. Records of hot work permits should be maintained for

one (1) calendar year. Hot work permits on file should be reviewed for program improvement or modification purposes prior to disposal.

## 9.2 Training

Copies of training records shall be maintained in accordance with project records management requirements.

# Hot Work Permit - Example Permit

HOT WORK BEING PERFOMED BY:

☐ EMPLOYEE

☐ CONTRACTOR _____

DATE ISSUED:

LOCATION / BUILDING & FLOOR:

NATURE OF JOB:

NAME OF PERSON(S) PERFORMING HOT WORK:

**The above location has been examined. The precautions checked on the Required Precaution Checklist have been taken to prevent fire. Permission is granted for this work.**

SIGNED: (Safety Supervisor)

| TIME STARTED: | AM PM | TIME FINISHED: | AM PM |
|---|---|---|---|
| **PERMIT EXPIRES** | | DATE: | TIME: AM PM |

**FIRE WATCH SIGNOFF**

Work area and all adjacent areas to which sparks and heat might have spread were inspected for at least 30 minutes after work was completed and found safe.

Signed: _____

**After completion of work, return permit to:**

_____

**REQUIRED PRECAUTIONS CHECKLIST**

☐ Fire sprinklers, hose streams and extinguishers in service.

☐ Cutting and welding equipment in good repair (same for brazing, etc.)

**Requirements within 35 ft. of work**

☐ Flammable liquids, dust, lint, and oily deposits removed.

☐ Floors swept clean.

☐ Combustible floors wet down or covered with damp drop cloths, or metal shields.

☐ Remove other combustibles where possible. Otherwise protect with fire-resistant tarpaulins or metal shields.

☐ All wall floor openings covered.

☐ Fire-resistant tarpaulins suspended beneath work.

**Work on walls or ceilings**

☐ Construction is noncombustible and without combustible covering or insulation.

☐ Combustibles on other side of wall moved away.

**Work on enclosed equipment**

☐ Enclosed equipment cleaned of all combustibles.

☐ Containers purged of flammable liquids.

**Fire Watch/Hot Work area monitoring**

☐ Fire watch will be provided during and for 30 minutes after completion of work.

☐ Fire watch is supplied with extinguishers and/or hose.

☐ Fire watch is trained in use of this equipment and in sounding the alarm.

# APPENDIX B

# BLOODBORNE PATHOGENS PROTECTION PROGRAM

# Bloodborne Pathogens Protection Program

## 1. PURPOSE

The purpose of this Program is to provide guidance on the implementation of applicable regulatory requirements associated with work activities that have the potential to expose employees to blood or other potentially infectious materials. Specifically, employees may be assigned, as part of their job duties, responsibilities to provide Cardiopulmonary Resuscitation (CPR) and first aid.

## 2. SCOPE

- This procedure applies to de maximis activities. Contractors should have their own Bloodborne Pathogens program that is equivalent to or more restrictive than this one. Equivalency is determined by the Site Project Manager (SPM) in agreement with the Field Supervisor/Health and Safety Officer (FS/HSO).
- This program does not address such contact related to Good Samaritans.

## 3. REFERENCES

29 CFR 1910.1030 – Bloodborne pathogens

29 CFR 1910.1020 – Access to employee exposure and medical records

29 CFR 1926.50 – Medical services and first aid

## 4. ACRONYMS AND DEFINITIONS

Biological Agents/Organic Materials – Agents (pathogens or allergens) that are derived from or are living organisms (viruses, bacteria and fungi) and can cause negative health effects including allergic reactions, respiratory disorders and hypersensitivity and infectious diseases. Biological agents are infectious through one or more of the following mechanisms of exposure, depending upon the particular type of agent: inhalation, ingestion, contact with the mucous membranes of the eyes, or nasal tissues or penetration of the skin through open cuts (even very small cuts and abrasions of which employees might be unaware). Common examples: Human Immunodeficiency Virus (HIV), Tuberculosis (TB), Hepatitis B and C, etc.

Biohazard – Biological material that can cause harm to other living organisms.

Blood – Human blood, human blood components, and products made from human blood.

Bloodborne Pathogens – Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Contaminated – The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

## 5. PERIODIC PROGRAM REVIEWS

The HASP and any JHAs associated with prevention of contact with Bloodborne Pathogens shall be reviewed and updated at least annually and whenever necessary to reflect new or modified tasks and procedures which affect occupational exposure and to reflect new or revised employee positions with occupational exposure.

The review and update of such plans shall also:

- Reflect changes in technology that eliminate or reduce exposure to bloodborne pathogens; and
- Document annually consideration and implementation of appropriate commercially available and effective safer medical devices designed to eliminate or minimize occupational exposure.

## 6. PERSONNEL PROTECTION

- The employer shall provide hand washing facilities which are readily accessible to employees.
- When provision of hand washing facilities is not feasible, the employer shall provide either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes.
- When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.
- Employees must wash their hands with soap and water immediately or as soon as feasible after removal of gloves or other PPE used to perform first aid.
- Flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.
- All first aid procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets and aerosols of these substances.
- Equipment which may become contaminated with blood or other potentially infectious materials shall be examined prior to servicing or shipping and shall be decontaminated as necessary, unless the employer can demonstrate that decontamination of such equipment or portions of such equipment is not feasible. Equipment should also be appropriately labeled.
- Contaminated laundry shall be handled as little as possible with a minimum of agitation and shall be bagged or containerized at the location where it was used. Bags and containers will be labeled appropriately.
- When there is occupational exposure to bloodborne pathogens, appropriate PPE will be provided, at no cost to the employee. Appropriate PPE is considered gloves, gowns, laboratory coats, face shields or masks and eye protection, and mouthpieces, resuscitation bags, pocket masks, or other ventilation devices. PPE will be considered "appropriate" only if it does not permit blood or other potentially infectious materials to pass through to or reach the

employee's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used.

• FS/HSOs shall ensure that the employee uses appropriate PPE unless it can be shown that the employee temporarily declined to use PPE when, under rare and extraordinary circumstances, it was the employee's professional judgment that in the specific instance its use would have prevented the delivery of first aid or public safety services or would have posed an increased hazard to the safety of the worker or coworker. When the employee makes this judgment, the circumstances shall be investigated and documented in order to determine whether changes can be instituted to prevent such occurrences in the future.

• The project contractor companies will ensure that appropriate PPE in the appropriate sizes is readily accessible to employees covered by this program.

• Each company shall provide a means to clean, launder, and dispose of PPE at no cost to the employee. As well, repairs or replacements of PPE will also be provided at no cost, and as needed.

• If a garment(s) is penetrated by blood or other potentially infectious materials, the garment(s) shall be removed immediately or as soon as feasible.

• All PPE shall be removed prior to leaving the work area.

• When PPE is removed it shall be placed in an appropriately designated area or container for storage, washing, decontamination or disposal.

• Gloves shall be worn when:

- It can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, and nonintact skin;
- The employee performing first aid has cuts, scratches, or other breaks in his or her own skin;
- The employee is receiving training in first aid techniques; and
- Handling or touching any potentially contaminated items or surfaces.

• All equipment and environmental and working surfaces shall be cleaned and decontaminated with an appropriate disinfectant immediately after contact with blood or other potentially infectious materials or as soon as feasibly possible.

• Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means, such as a brush and dust pan, tongs, or forceps.

## 7. VACCINATIONS, EVALUATION AND FOLLOW-UP

The hepatitis B vaccine and vaccination series will be made available by employers to all employees who may have occupational exposure, and post-exposure evaluation and follow-up to all employees

who have had an exposure incident. See Attachment 1 for an example of a declaration form to be used.

The vaccination will take place after the employee has received the training and within 10 working days of initial assignment to all employees who have occupational exposure unless the employee has previously received the complete hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons.

Each employer shall ensure that all medical evaluations and procedures including the hepatitis B vaccine and vaccination series and post-exposure evaluation and follow-up, including prophylaxis, are:

- Made available at no cost to the employee;
- Made available to the employee at a reasonable time and place;
- Performed by or under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional; and
- Provided according to recommendations of the U.S. Public Health Service current at the time these evaluations and procedures take place and by an accredited laboratory.

Following a report of an exposure incident, the employer shall make immediately available to the exposed employee a confidential medical evaluation and follow-up, including at least the following:

- Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred;
- Identification and documentation of the source individual, unless the employer can establish that identification is infeasible or prohibited by state or local law;
- The source individual's blood shall be tested as soon as feasible and after consent is obtained in order to determine TB, HBV and HIV infectivity.

If consent is not obtained, the employer shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, shall be tested and the results documented.

Each employee covered by this plan will be provided with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of any medical evaluations and test results.

## 8. TRAINING

Training shall be provided at the time of initial assignment to tasks where occupational exposure may take place and at least annually thereafter.

The training program shall contain at a minimum the following elements:

- An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of the employer's exposure control plan (i.e., HASP and JHA) and the means by which the employee can obtain a copy of the written plan;
- An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE;
- Information on the types, proper use, location, removal, handling, decontamination and disposal of PPE;
- An explanation of the basis for selection of PPE;
- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;
- Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;
- Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;
- An explanation of the signs and labels and/or color coding required; and
- An opportunity for interactive questions and answers with the person conducting the training session.

## 9. EVALUATION OF EXPOSURE INCIDENTS

An exposure determination shall be made, without regard to personal protective equipment (PPE), and will contain the following:

- A list of all job classifications in which all employees in those job classifications have occupational exposure;
- A list of job classifications in which some employees have occupational exposure, and
- A list of all tasks and procedures or groups of closely related task and procedures in which occupational exposure occurs and that are performed by employees in job classifications listed.

## 10. RECORDKEEPING

Each operation location shall establish and maintain an accurate medical record for each employee with occupational exposure, in accordance with 29 CFR 1910.1020.

## 11. ATTACHMENTS

Attachment 1 - Hepatitis B Vaccine Declination (Mandatory)

# ATTACHMENT 1

## HEPATITIS B VACCINE DECLINATION (Mandatory)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Signature:_____Date:_____

Supervisor Signature:_____Date:_____

# APPENDIX C

# ENERGY CONTROL PROGRAM

# ENERGY CONTROL PROCEDURE- LOCK-OUT/TAG-OUT PROGRAM

## 1 PURPOSE

This appendix establishes the policies and provides administrative requirements for the hazardous energy control program for work conducted at the site.

## 2 SCOPE

This procedure applies to de maximis activities. Contractors should have their own Lock-out Tag-out program that is at a minimum equivalent to this one. Equivalency is determined by the Site Project Manager (SPM)

This Appendix is applicable for the control of energy during servicing and maintenance of machines and equipment in which the unexpected energization or startup of the machines or equipment, or release of stored energy could cause injury to employees.

This Appendix is not applicable to normal production operations, unless the servicing or maintenance requires:

- An employee to remove or bypass a guard or other safety device; or
- An employee to place any part of his or her body into an area or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

This Appendix is not applicable under the following circumstances.

- Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, provided:
- The activities are routine, repetitive, and integral to equipment use for production, and
- The work is performed using alternative measures which provide effective protection
- Work on cord-and-plug connected electric equipment and unplugging the equipment controls hazardous energy sources, and the plug is under the exclusive control of the employee performing the servicing or maintenance.

This Appendix establishes **minimum** locking, tagging, and trying requirements to isolate a component or system for servicing and maintenance. This procedure is applicable for systems recognized as having potential sources of hazardous energy including:

- Pneumatic
- Electrical
- Mechanical

- Chemical
- Compression
- Thermal
- Hydraulic

# 3 DEFINITIONS

## 3.1 Affected Employee

An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lock-out or tag-out, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

## 3.2 Authorized Employee

A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this procedure.

## 3.3 Capable of Being Locked Out

An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

## 3.4 Energized

Connected to an energy source or containing residual or stored energy.

## 3.5 Energy Isolating Device

A mechanical device that physically prevents the transmission or release or energy, including but not limited to the following:

- Manually operated electrical circuit breaker;
- Disconnect switch;
- Manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently;
- Line valve;
- Block; and
- Similar device used to block or isolate energy.

Note: Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

### 3.6 Energy Source

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

### 3.7 Lockout

The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

### 3.8 Lockout Device

A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

### 3.9 Normal Production Operations

The utilization of a machine or equipment to perform its intended production function.

### 3.10 Servicing and/or Maintenance

Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

### 3.11 Tagout

The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

### 3.12 Tagout Device

A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

## 4 ENERGY CONTROL PROGRAM PROCEDURAL REQUIREMENTS AND POLICIES

The following actions will result in disciplinary action up to and including termination or prohibiting site access for employees or contractors;

- Failure to follow instructions on an approved and hung tag.
- Operating or attempting to operate a component with a lock and tag attached.
- Otherwise operating or performing maintenance work in a manner, which could reasonably cause injury to personnel or equipment damage.

Energy isolating devices, when used, will be locked out and tagged.

Only Authorized Employees may lock and tag isolation devices. Sub-contractors will identify authorized employees specifically by name or title. The subcontractor is responsible for maintaining an Authorized Employees List and annually reviewing the list to ensure personnel continue to meet the requirements to qualify as an Authorized Employee.

Locks, tags, and other materials and hardware will comply with 29 CFR 1910.147 (c)(5), Protective materials and hardware.

A Safety Operating Procedure will be developed, documented, and used for lock out tag out of potentially hazardous energy during servicing and maintenance. The procedure will address:

1. Shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy;

2. Placement, removal, and transfer of lockout devices and responsibility for devices;

3. Testing a machine or equipment to determine and verify effectiveness of lockout devices, tagout devices, and other energy control measures;

4. Requirements of this procedure and the following sections of 29 CFR 1910.147:

- 1910.147(c)(8) Energy isolation,
- 1910.147(c)(9) Notification of employees
- 1910.147(d) Application of control,
- 1910.147(e) Release from lockout or tagout, and
- 1910.147(f) Additional requirements.

5. NFPA 70E: Standard for Electrical Safety in the Workplace Training will be provided in accordance with Section 5.0, Training. Inspections will be performed in accordance with Section 6.0, Inspections.

# 5 TRAINING

Training will be provided to ensure the purpose and functions of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training will include the following:

- Each authorized employee will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control;

- Each affected employee will be instructed in the purpose and use of the energy control procedure; and

- All other employees whose work operations are or may be in an area where energy control procedures may be utilized, will be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

• Although tagout systems are not used (in lieu of lockout), employees should be trained in the following limitations of tags.

• Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

• When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

• Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

• Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace.

• Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

• Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

Employee Retraining

• Retraining will be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

• Additional retraining will also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

• The retraining will reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

• Certification will be provided that employee training has been accomplished and is being kept up to date. The certification will contain each employee's name and dates of training. Records of training will be maintained by the each subcontractor for each employee trained under their LOTO Program.

# 6 LOCKS, TAGS, AND OTHER HARDWARE REQUIREMENTS

Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware will be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

Lockout devices and tagout devices will be singularly identified; will be the only device(s) used for controlling energy; will not be used for other purposes; and will meet the following requirements:

• Durable

• Lockout and tagout devices will be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

• Tagout devices will be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

• Tags will not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled land stored.

## 6.1 Standardized

Lockout and tagout devices will be standardized within the facility in at least one of the following criteria: Color; shape; or size, and additionally, in the case of tagout devices, print and format will be standardized.

## 6.2 Substantial

### 6.2.1 Lockout Devices

Lockout devices will be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

### 6.2.2 Tagout Devices

Tagout devices, including their means of attachment, will be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means will be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment tolerant nylon cable tie.

## 6.3 Identifiable

Lockout devices and tagout devices will indicate the identity of the employee applying the device(s).

Tagout devices will warn against hazardous conditions if the machine or equipment is energized and will include a legend such as the following: Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate. Inspections.

Periodic inspection of the energy control procedure will be performed at least annually to ensure procedures are being followed and requirements of 29 CFR 1910.147 are being met.

The periodic inspection will be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.

The periodic inspection will be conducted to correct any deviations or inadequacies identified.

Where lockout is used for energy control, the periodic inspection will include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

An Energy Control Program Periodic Inspection Record form (see attachment 3) will be used to document and certify the inspection.

The FS/HSO will ensure inspections are performed at least annually and will be responsible for filing completed Energy Control Program Periodic Inspection Record.

# 7 REFERENCES

29 CFR 1910.147, The Control of Hazardous Energy (lockout-tagout)

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 29 CFR 1910.147. The Control of Hazardous Energy. OSHA: Washington, DC.

U.S. Department of Energy, Manual 5480.19, Chapter 9. Lockouts and Tagouts. Washington, DC.

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 29 CFR 1910.333. Lock and Tag Requirements for Electrical Systems. OSHA: Washington, DC.

National Safety Council (NSC). 1992. Accident Prevention Manual for Industrial Operations: Engineering and Technology, 10th Edition, 1992. NSC: Chicago, IL.

American National Standard Institute (ANSI) 244.1. 1982. For Personnel Protection Lockout/Tagout of Energy Sources-Minimum Safety Requirements. ANSI: New York. U.S.

Department of Labor, Occupational Safety and Health Administration (OSHA). 1991. Publication 3120. Control of Hazardous Energy, (lockout/tagout). OSHA: Washington, DC.

# APPENDIX D

# HEARING CONSERVATION PROGRAM

# HEARING CONSERVATION PROGRAM

## 1. Purpose

The purpose of this Program is to protect personnel from occupational hearing loss due to excessive exposure to noise. This Program addresses the requirements of the OSHA Standard 29 CFR 1910.95. The Company will also comply with other OSHA state or local regulations for noise and hearing conservation as they relate to occupational exposure.

## 2. Scope

This Program applies to all York Oil project employees when working in areas where noise exposure exceeds the Action Level of 85 dBA for an 8-hour TWA.

## 3. Definitions

**Action Level**: An 8-hour time weighted average exposure of 85 decibel (dB) measured on the A-scale slow response. This is equivalent to a dose of 50%.

**Audiogram**: A graph chart or table produced from an audiometric or hearing test that documents an individual's hearing threshold levels at several different frequencies usually in a range from 500 to 6000 hertz (Hz).

**Audiometer**: An instrument for measuring hearing thresholds for pure tones of normally audible frequencies.

**dB(A**): The unit representing the sound level measured with the A-weighting network on a sound level meter. The A weighted scale discriminates against very low frequencies as does the human ear at lower noise levels. It is usually the preferred scale for measuring general sound levels with a sound level meter in the work place.

**Dampening**: To decrease the amplitude of a sound-generating wave caused by vibration.

**Decibel**: The unit of measurement of sound level abbreviated dB. Decibels are logarithmic units of measurement. An increase of 3 dB represents an approximate doubling of the measured characteristic.

**Hz**: Abbreviation for hertz frequency measured in cycles per second (1 cycle per second = 1 hertz).

**Noise**: Sound that is loud, unpleasant, or unwanted.

**Noise dosimeter**: An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

**Sound level meter**: An instrument for the measurement of sound level.

**Sound pressure level**: The level in decibels of a sound as compared to a reference sound pressure.

**Standard threshold shift**: A change in the hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000 3000 and 4000 Hz in either ear.

# 4. Responsibilities

## a. Employees

Employees shall use only approved and provided noise reduction equipment in accordance with Site Health and Safety Procedures.

## b. Site Operations Manager

The subcontractor's Field Supervisor/Health and Safety Officers are responsible for ensuring that all aspects of Sections 5, 6, 7, and 8 are implemented in their operations including ensuring that:

i. Appropriate noise level measurements are made to determine employee exposure.

ii. Feasible engineering and administrative controls are used to reduce noise levels to acceptable levels. Hearing protection is only to be issued:

- While feasible controls are being installed or initiated;
- When feasible controls are not sufficient to reduce noise levels to acceptable levels;
- Emergencies.

iii. Appropriate hearing protection is provided as required by noise monitoring and assessment and that hearing protection is worn where required.

iv. Designated employees are provided with annual audiometric testing as required by this Program.

v. Copies of employees' noise exposure assessments are maintained by the physician or other licensed health care professional (PLHCP).

# 5. Permissible Noise Exposures

Site personnel shall not be exposed to noise levels while at work exceeding those listed in Table 5-1 below as measured on the A scale of a standard sound level meter at slow response. If noise levels exceed those listed in Table 1 below, hearing protection shall be required.

Table 5-1

Permissible Noise Exposures

| Duration per day (hours) | Sound Level db(A) |
|---|---|
| 16 | 85 |
| 12 | 87 |
| 10 | 88 |
| 8 | 90 |
| 6 | 92 |
| 4 | 95 |
| 3 | 97 |
| 2 | 100 |
| 1.5 | 102 |
| 1 | 102 |
| 0.5 | 110 |
| 0.25 or less | 115 |

# 6. Noise Monitoring

## a. General Requirement

All work areas shall be monitored for noise levels upon indication that employees' exposures may exceed 85 dB(A). Any areas where a normal level of speaking cannot be readily heard at a distance of 2 feet will be included in the monitoring. Sound level meters may be used to screen areas or activities for further noise monitoring. Any areas or activities where the maximum noise level is 80 dB(A) or less may be excluded from more comprehensive monitoring.

## b. Representative Monitoring

All monitoring being performed to determine employees' inclusion in the Hearing Conservation Program must be indicative of their personal 8-hour time weighted average (TWA) exposures.

## c. Equipment

Personal exposure monitoring must normally be carried out using personal noise dosimeters. Only trained health and safety professionals are allowed to carry out personal noise exposure monitoring using a sound level meter and then only with permission of the appropriate Safety and Health Manager (company dependent).

## d. Additional Monitoring

Noise monitoring must be repeated whenever there is a significant change in the operation. A significant change includes any change that puts additional employees at risk to noise levels above 85 dB(A) and any change that may create an increase in noise levels such that the assigned hearing protection would be rendered inadequate. For field operations monitoring must also be repeated with any significant change in equipment materials or environment. Historical noise monitoring data may be used for worksites as long as all equipment and materials are comparable and the operation has not changed significantly as described in this paragraph.

### e. Records

Noise monitoring data and employees' exposure assessments shall be kept as required.

## 7. Audiometric Examinations

### a. Baseline

Baseline audiograms shall be provided to all employees assigned to job classifications where noise levels have been shown to be above an 8-hour TWA of 85 dB(A) without regard to the attenuation afforded by hearing protection. The baseline audiogram shall be provided within the first 6 months of active employment or change in job classification.

### b. Annual

Employees described in shall also undergo annual audiometric testing. Comparisons to the baseline audiogram interpretation of results and ensuring that employees are provided written notification of test results shall be the responsibility of the Physician or other Licensed Health Care Professional (PLHCP) 1 .

### c. Low Noise Before Audiogram

Prior to undergoing audiograms employees shall not be exposed to workplace noise for a period of at least 14 hours. Employees shall also be notified to avoid excessive nonoccupational noise exposure during that time period.

### d. Standard Threshold Shift

If the audiogram indicates a standard threshold shift has occurred the PLHCP shall determine appropriate follow-up actions.

### e. Responsibility for Testing

PLHCP is responsible for ensuring that all audiometric testing facilities and equipment comply with applicable requirements.

## 8. Hearing Protection

### a. Control Priorities

Wherever feasible engineering or administrative controls shall be implemented to reduce noise levels below the action level. Engineering and administrative controls may include such measures as:

- Increasing distance from the noise source - noise levels may be reduced by about 6 dB by doubling the distance between employees and the noise source;
- Isolating the noise source - either with an enclosure or in a separate room;
- Controlling noise producing vibrations – by reducing vibrating surface or by dampening; and
- Use of mufflers – on electric motors, intakes of air compressors, on exhaust of pneumatic hand tools, etc.

## b. PPE Assessment

a. Where feasible controls fail to reduce noise levels below the Action Level of 85 dB(A) 8-hour TWA, a hearing protection PPE assessment shall be completed and documented by the FS/HSO certifying the following:

- the name(s) of the person(s) performing the assessment;
- the signature of the person certifying that the assessment and evaluation were performed;
- the workplace job site or task being certified; and
- the date(s) of the hazard assessment.
- Documentation shall be maintained in the project file.

b. Placards containing notice that hearing protection is required in the area shall be posted in every area requiring hearing protection.

## c. When PPE Must be Available

Personal hearing protection shall be provided when engineering and administrative controls cannot achieve noise levels below the Action Level or as otherwise required.

## d. When PPE Must be Used

Employees shall be required to use provided hearing protection:

- When noise exposures exceed the OSHA permissible noise exposure (see Table 1)
- By employees whose noise exposure meets or exceeds an 8-hour Time Weighted Average (TWA) of 85 dB(A) and
- Who have not had their baseline audiogram, or
- Have experienced a standard threshold shift.

## e. Acceptable Protection

The following formula shall be used to determine required hearing protector attenuation unless the HSO approves a different method.

SL = measured sound level in dB(A)

NRR = Noise Reduction Rating as indicated on hearing protection

SL - (NRR-7)/2 = dB

if dB < 85 for peak sustained or 8-hour TWA or < 140 for impulse or impact then the hearing protection is adequate for the task.

Note: If it becomes necessary to combine types of hearing protection to achieve adequate attenuation, contact the HSO for guidance. NRRs of two devices in combination are not simply added.

### f. Selection

At least two styles of adequate protection shall be provided at no cost to employees. Employees shall be permitted to select their hearing protectors from the styles provided.

### g. Fitting

Employees shall receive assistance in fitting hearing protectors during the training described in 9 of this Program. Additional assistance and fitting instructions shall be provided whenever there is a significant change in hearing protectors or when it is observed that employees are not properly using the hearing protection.

## 9. Employee Information and Training

### a. Who to Train

The following employees shall be provided training:

- All who are exposed to noise levels of 85 dB(A) or greater
- All who receive audiograms and
- All who are required to wear hearing protection.

### b. Training Contents

Employee training shall include as a minimum:

- The effects of noise on hearing;
- The purpose of hearing protectors;
- The advantages and disadvantages of different types of hearing protectors including attenuation;
- Instructions on selection, fitting, use, and care of hearing protectors;
- The purpose of audiometric testing and an explanation of test procedures; and
- Information concerning any engineering or administrative controls implemented to reduce their noise exposures.

In addition, posters identifying the correct placement of hearing protection shall be placed in areas requiring hearing protection.

### c. When to Train

Affected employees shall receive training prior to being assigned to work in areas where noise levels may exceed an 8-hour TWA of 85 dB(A) and on an annual basis thereafter. The initial and annual training may be incorporated into other annual training programs such as HAZWOPER refresher course or may be offered as standalone sessions.

### d. Incorporation of Training with Other Health and Safety Training

Hearing Conservation training may be included as a part of any other health and safety training such as Chemical Hygiene training HAZWOPER training etc. on the condition that all relevant

topics are addressed. Documentation of any such training must clearly show that hearing conservation was addressed during the training session.

### e. Exposure Monitoring Results

Employees exposed to an 8-hour TWA of 85 dB(A) or more shall be notified in writing of the results of any personal noise exposure monitoring characteristic of their exposures.

### f. OSHA Standard

A copy of the OSHA Occupational Noise Exposure standard 29 CFR 1910.95 shall be made available to employees exposed to an 8-hour TWA of 85 dB(A) or more.

## 10. Regulatory References

- 29 CFR 1910.1910.95 (OSHA – Hearing Conservation)

# APPENDIX E

# HEAT STRESS PROTECTION PROGRAM

# Heat Stress Measurement & Control

## I. Purpose

Provide instructions for methods for control and monitoring heat stress during periods of work in elevated temperature environments.

## II. Scope

Elevated temperatures and the use of impermeable PPE are indicators for when monitoring and controls should be considered:

- Work involving the wearing of impermeable PPE in environments with temperatures greater than 70 °F
- Work involving high metabolic activity for durations greater than one hour and in environments with temperatures greater than 80 °F

Note: work of shorter duration and of low metabolic activity does not preclude use of heat stress control strategies, only implementation of all the methods of this procedure is not required.

This procedure applies to all York Oil employees and their contractors. Contractors may use their own equivalent program provided that program has been reviewed and determined equivalent by the de maximis Site Project Manager.

## III. Responsibilities

### Field Supervisors / Health & Safety Officers

Field Supervisors/Health and Safety Officers (FS/HSOs) are responsible for determining which heat stress monitoring and control methods outlined by this procedure will be used for the tasks performed by their company.

### Workers

Recognizing heat stress symptoms, they are experiencing or noticing symptoms in fellow workers and reporting same to supervisors.

## IV. Precautions

Individuals, who smoke, drink excessive quantities of alcohol, are overweight and otherwise in poor physical health or fitness are at high risk of heat stress regardless of the measures implemented using this procedure.

Humidity and airflow play a limited role in heat stress when the worker is wearing impermeable clothing; these factors will be significant for the area a worker is assigned to rest in after performing work in an elevated temperature environment.

## V. Prerequisites

Personnel affected by this procedure require the following prior to their participation in the monitoring and control measures recommended by this procedure:

a) Medical examination by a licensed physician

b) Training in the symptoms of heat stress and emergency response measures to be taken for worker's experiencing extreme heat stress reactions

c) Personnel performing the monitoring requirements recommended in this procedure should be knowledgeable of the operation of monitoring equipment and interpretation of the readings.

Personnel performing the monitoring requirements recommended in this procedure should be knowledgeable of the operation of monitoring equipment and interpretation of the readings.

## VI. Initial Hazard Assessment

Moderate or heavy work in elevated temperature environments are candidates for heat stress impact work. FS/HSOs need to determine the following when assessing the risk of heat stress hazards to workers under their cognizance.

1.1.1. Determine the type of work to be performed and the relative level of metabolic activity.

1.1.2. Estimate the work area temperatures likely to be experienced and the sources of those temperatures.

1.1.3. The duration of the work to be performed.

1.1.4. Identify any factors that can affect the work environment such as use of protective clothing, flow air or presence of cooling/heat sources, humidity of environment, radiant heat from sun absence (night work) or presence (day work), and use of labor saving devices/tooling.

## VII. Monitoring and Control for Heat Stress

Note: There are three personal monitoring methods provided in this section. Each method has advantages and limitations. Ideally, individual worker objective monitoring such as pulse rate or body temperature is more likely to identify a potential heat stress effect than surrogate criteria such as WBGT or dry bulb measurements. Further these surrogate criteria and recommended controls were not designed to be used with elevated levels of personal protective equipment. The company or project Health & Safety Officer is designated as responsible for determining the best method for monitoring personnel for the task conditions.

A majority of invasive site activities will require the use of elevated levels of PPE (Tyvek Coveralls, respiratory protection, etc.) based on the levels of contaminants. The project team will rely on physiological monitoring combined with engineering and administrative controls to protect site works from heat stress. Personal monitoring can be done by checking the heart rate, body temperature, or extent of body water loss.

Note that no single method is perfect for changing site conditions and for a group of employees with varying health, weight, age, and background. The Site FS/HSO shall consider all available factors when determining work and rest cycles for each task.

### 1. Heart Rate Monitoring

Pulse rate monitoring is perhaps the simplest method but requires a rapid assessment once the worker leaves the elevated temperature environment.

#### i. Measurement

The recovery heart rate can be checked by comparing the pulse rate taken at 30 seconds (P1) with the pulse rate taken at 2.5 minutes (P3) after the rest break starts. The two pulse rates can be interpreted using the Heart Rate Recovery Criteria as listed below.

#### ii. Control

Use the heart rate recover tool on the table below, to determine follow-up actions

| ***Heart Rate Recovery Pattern*** | ***P3*** | ***Difference between P1 and P3*** |
|---|---|---|
| Satisfactory Recovery | <90 | -- |
| High Recovery (Conditions may require further study) | 90 | 10 |
| No Recovery (May indicate too much Stress) | 90 | <10 |

### 2) Body Temperature

Body temperatures are taken through the ear canal.

#### i. Measurement

The worker will obtain body temperature measurements through the ear canal when required.

#### ii. Control

Body temperature above 102 °F requires that the worker be excluded from performing anymore high metabolic activities for the remainder of the day.

Body temperatures above 100.4 °F require either an increase in rest time or decrease in workload.

### 3) Body Water Loss

Body water loss can be measured by weighing the worker on a scale at the beginning, after each break and at the end of each work day. The worker's weight loss should not exceed 1.5% of total body weight in a work day. If a weight loss exceeding this amount is observed, fluid intake should increase.

## VIII. Engineering Controls

Prior to and in addition to implementation of heat stress measurement and controls consideration should be given to implementing the following engineering controls

- Ice vests, vortex cooling tubes to inhibit increases in body temperature

- Fans for increasing air speed in area to enhance evaporative cooling effect
- Shielding for any radiant heat sources
- Cooling of supply air
- Dehumidification to enhance evaporative cooling of sweat from skin surfaces
- Local exhaust ventilation to remove heat at the source
- Isolation of worker from heat environment
- Use of labor-saving tooling to decrease metabolic load

## IX. Work Practices

The following work practices should be employed

Acclimatize worker(s) to elevated temperature environment by using first six days with increased rest regimen with gradual phase in of work time until table maximums are reached.

a) Permit self-limitation of exposures and encourage co-worker observation to detect signs and symptoms of heat strain in others.

b) Counsel and monitor those who take medications that may compromise normal cardiovascular, blood pressure, body temperature regulation, renal, or sweat gland functions.

c) Provide cooled drinking water and sports drinks to employees during rest periods. Encourage employees to frequently drink small amounts (about one cup ever 15-20 minutes).

d) Perform work during early morning, or cooler evening hours when possible.

e) Place workers when resting in cool environment or one where fans/ cooling units are located.

f) Ensure workers are aware of diet effects on response to heat stress; attempt to schedule high metabolic load environment well apart from meal taking.

## X. Worker Recovery Periods

a) Workers are allowed a recovery period from physiological strain after being exposed to a Heat Stress environment.

b) Recovery areas are located outside Heat Stress work area, and where the temperature is < 80 degrees F.

c) Cool drinks are provided for worker consumption in the recovery area.

d) When the physiological state of a worker has returned to pre-exposure conditions, then their recovery period is considered completed.

## XI. Records

Records, logs and recordings are maintained on site until termination of the project.

a) Upon termination of project, the records should be forwarded to the Corporate Safety Officer.

b) Upon individual employee termination from the project, the records associated specifically with that individual should be supplied to the Corporate Safety Officer and these records will then be added to the employee's medical records and exposure file.

## XII. Definitions

**Acclimatization** - Series of physiological and psychological adjustments that occur in an employee during initial exposures to hot environmental conditions that increase the employee's tolerance to elevated work environment temperature.

**Maximum Heart Rate** - Amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Maximum heart rate (MHR) is calculated by subtracting an employee's age from 200.

## XIII. Attachments

Attachment 1, Heart Rate & Body Temperature Monitoring Form

Attachment 2, Body Water Loss Monitoring Form

# Heat Stress, Heart Rate & Body Temp Monitoring

Date: | Work Area: | Weather: | Stay Time:

| Name | Rest Start Time | Heart & Recovery Rate | | | | | Body Temp Monitoring | | | | | Rest End Time | Total Rest Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P1 Start Rest (30 Sec Into) | >110 BPM? (Yes-Shorten Work Period By 1/3) | | P3 At Rest (2.5 min into) | (P3-P1) Recovery Heart Rate | Temp (Ear) | >100.4 (Yes-Increase Rest Or Decrease Work Load) | | >102 F (Yes-Remove Worker For Day) | | | |
| | | | Yes | No | | | | Yes | No | Yes | No | | |
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# Heat Stress, Body Water Loss Monitoring

Work Area: | Date: | Stay Time:

| Name | Weight In | | Weight Out | | 1.5% Total Body Weight | Δ Weight | >1.5% Total Body Weight (If Yes Increase Fluid Intake) | |
|---|---|---|---|---|---|---|---|---|
| | Time | Lbs | End Time | Lbs | | | Yes | No |
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# APPENDIX F

# COLD STRESS PROTECTION PROGRAM

# Cold Stress Prevention

## I. Purpose

This Procedure is to provide the minimum safety requirements and practices for prevention of temperature-related illnesses associated with exposure to cold environments.

## II. Scope

This Procedure applies to all York Oil operations where employees may encounter working conditions and/or environments that can reasonably be anticipated to cause cold-related illnesses.

## III. REFERENCES

a. 29 CFR 1910.1200 – Hazard Communication

b. 29CFR 1910.120 – Hazardous Waste Operations and Emergency Response

c. HASP Medical Surveillance Program

## IV. ACRONYMS AND DEFINITIONS

**Administrative Controls** – The use of measures such as management involvement, training of employees, rotation of employees in and out of exposure areas, warning signs, controlled access to areas, air sampling, biological sampling, and medical surveillance to protect individuals.

**Cold Stress** - Body heat is lost to the environment by four different routes: Radiation is the loss of body heat to the colder air in the environment due to the temperature difference; conduction is loss of heat through direct contact between objects, heat transfer; in convection, warm molecules against the surface of the body are moved away and replaced with cold molecules. Wind chill is an example of the effects of air convection, the wind chill table (Table 3) gives a reading of the amount of heat lost to the environment relative to still air temperature; in evaporation, heat and fluid is lost to the environment from sweating and respiration, a decreased fluid level makes the body more susceptible to hypothermia and other cold injuries.

**Engineering Controls** – The methods of controlling employee exposure to contaminants by measures such as process change, substitution, isolation, ventilation, or source modification.

**Personal Protective Equipment (PPE)** - Specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, and shirts) are not considered to be personal protective equipment.

**Wind Chill** - The cooling rate felt on exposed skin resulting from the loss of body heat due to air temperature and wind velocity. While increased wind speed does not reduce the actual air temperature, it does increase how quickly heat is lost, thus effecting a person's perception of the air temperature.

# V. REQUIREMENTS

## a. General Requirements

i. Safety hazards created by extreme cold include the following:

- Decreased body temperature and physical discomfort promote irritability, anger, and other emotional states which can affect workers alertness and attitudes towards safe work practices.
- Eyeglasses can become fogged and walking surfaces slippery increasing the risk for slips and falls.

ii. Workers should refrain from drinking alcoholic beverages while off duty (alcohol consumption is never permitted on the job) because the resultant dilation of blood vessels can permit a rapid loss of body heat, increasing the risk of hypothermia.

iii. Dehydration can occur in cold environments as well as hot ones, increasing employees 'susceptibility to thermal injury. In order to maintain the body's fluid level and to provide necessary calories, warm, sweet drinks and/or soup may be provided at the work site. However, caffeinated drinks (e.g., coffee, tea, cola drinks, soft drinks etc.) should be discouraged because it increases water loss and can lead to dehydration. In addition, it increases blood flow at the skin surface which can increase the loss of body heat. Non-caffeinated versions of the above are acceptable. The following are some guidelines for maintaining hydration:

- Maintain water temperature at 50° to 60°F (10° to 15.6°C);
- Provide small disposable cups that hold about 4 ounces (0.1 liter);
- Have employees drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

## b. Training shall include at least the following:

- Recognition of predisposing factors, danger signs and symptoms of cold-related illnesses (See Attachment 1);
- Methods that can be taken to prevent cold stress;
- Methods for physiological monitoring and implementing control measures;
- Procedures for first-aid and responding to cold stress emergencies.

## c. Cold Stress Prevention Instructions

i. In order to calculate wind chill (see Table 1), both the temperature and wind speed shall be monitored or checked every 4 hours. This data shall be recorded in the project log book or log form approved by the FS/HSO.

Table 1 - Wind Chill Chart

| Wind (mph) \ Temperature (°F) | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calm | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
| 5 | 36 | 31 | 25 | 19 | 13 | 7 | 1 | -5 | -11 | -16 | -22 | -28 | -34 | -40 | -46 | -52 | -57 | -63 |
| 10 | 34 | 27 | 21 | 15 | 9 | 3 | -4 | -10 | -16 | -22 | -28 | -35 | -41 | -47 | -53 | -59 | -66 | -72 |
| 15 | 32 | 25 | 19 | 13 | 6 | 0 | -7 | -13 | -19 | -26 | -32 | -39 | -45 | -51 | -58 | -64 | -71 | -77 |
| 20 | 30 | 24 | 17 | 11 | 4 | -2 | -9 | -15 | -22 | -29 | -35 | -42 | -48 | -55 | -61 | -68 | -74 | -81 |
| 25 | 29 | 23 | 16 | 9 | 3 | -4 | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 | -64 | -71 | -78 | -84 |
| 30 | 28 | 22 | 15 | 8 | 1 | -5 | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 | -67 | -73 | -80 | -87 |
| 35 | 28 | 21 | 14 | 7 | 0 | -7 | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 | -69 | -76 | -82 | -89 |
| 40 | 27 | 20 | 13 | 6 | -1 | -8 | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 | -71 | -78 | -84 | -91 |
| 45 | 26 | 19 | 12 | 5 | -2 | -9 | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 | -72 | -79 | -86 | -93 |
| 50 | 26 | 19 | 12 | 4 | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 | -74 | -81 | -88 | -95 |
| 55 | 25 | 18 | 11 | 4 | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 | -75 | -82 | -89 | -97 |
| 60 | 25 | 17 | 10 | 3 | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 | -76 | -84 | -91 | -98 |

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill } (^\circ F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

ii. Employees who have a medical condition (e.g., cardiovascular disease, diabetes, hypertension) or are taking medication (e.g., drugs that act on the cardio-respiratory system) that interferes with normal body temperature or tolerance to the cold shall not be assigned to field work where temperatures are below 32°F.

iii. A work-warm regimen (with breaks at least 10 minutes long) shall be instituted when work is being conducted in environments where the wind chill temperature is below 20°F. Heated warming shelters shall be available or provided on or nearby the work site, as appropriate. Table 4 contains the requirements for the number of breaks per 4 hour shift for extremely low temperatures. An employee experiencing any of the following symptoms shall return immediately to the warming shelter: heavy shivering; frostnip; excessive fatigue; irritability; or euphoria. Employees should also use the buddy system and be alert for these symptoms in their co-workers as well.

Table 2 - Work/Warm Schedule[11]

| Air Temperature Sunny Sky | No Noticeable Wind | | 5 mph Wind | | 10 mph Wind | | 15 mph Wind | | 20 mph Wind | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Max. Work Period | No. of Breaks | Max. Work Period | No. of Breaks | Max. Work Period | No. of Breaks | Max. Work Period | No. of Breaks | Max. Work Period | No. of Breaks |
| -15 to -19 °F | Normal Breaks | 1 | Normal Breaks | 1 | 75 min | 2 | 55 min | 3 | 40 min | 4 |
| -20 to -24 °F | Normal Breaks | 1 | 75 min | 2 | 55 min | 3 | 40 min | 4 | 30 min | 5 |
| -25 to -29 °F | 75 min | 2 | 55 min | 3 | 40 min | 4 | 30 min | 5 | Non emergency work should cease | |
| -30 to -34 °F | 55 min | 3 | 40 min | 4 | 30 min | 5 | Non emergency work should cease | | | |
| -35 to -39 °F | 40 min | 4 | 30 min | 5 | Non emergency work should cease | | | | | |
| -40 to -44 °F | 30 min | 5 | Non emergency work should cease | | | | | | | |
| -45 °F and below | Non emergency work should cease | | | | | | | | | |

[1] From the Occupational Health & Safety Division, Saskatchewan Department of Labor. Schedule applies to any 4-hour period with moderate to heavy work activity and an extended lunch break. For light to moderate work, apply one step lower. This applies to employees in dry clothing.

iv. For work in temperatures below 40°F, insulating clothing must be used. Employees should select their clothing based on the planned activities and the predicted air temperature and winds speed. Layering of clothing and wearing a hat and insulating gloves or mittens is highly recommended. Wet clothing should be changed as soon as possible.

v. Outdoor field work shall be suspended when wind chill temperatures reach -74°F. Suspension of field work at temperatures greater than -74°F may be required due client requirements or work conditions.

## VI. RECORDS

All documents generated as a result of the implementation of this Procedure shall be kept in the project file.

## VII. Attachments

Attachment 1 - Cold Illness Description

## Attachment 1

### COLD STRESS ILLNESSES

**Chilblains**

| | |
|---|---|
| **Description** | A chronic condition due to an abnormal reaction of the body to cold affecting the skin and peripheral capillary circulation, resulting from prolonged exposure of the bare skin. |
| **Signs and Symptoms** | Small, red swelling on the skin which can be very itchy and gradually becomes very painful. |
| **Causes** | Chilblains can occur in temperatures at or below 60°F and usually occur on the smaller toes, but can occur on the finger, face and the nose or on a pressure bearing area such as a bunion<br>. |
| **First Aid** | Do not rub or scratch chilblains, avoid direct heat (ie do not expose the feet to a heater), but keep the feet warm by the use of woolen socks and footwear, use soothing lotions (eg calamine lotion), and if the skin is broken, use an antiseptic dressing to prevent the chilblains becoming infected |
| **Prevention** | Stop exposure to cold, remove any wet or constrictive clothing, gently wash and dry the injured area, elevate it, cover it with layers of loose warm clothes and allow to rewarm. Smoking also interferes with the circulation in the small blood vessels and increases the risk of getting chilblains. |

**Immersion Foot (trench foot)**

| | |
|---|---|
| **Description** | Formerly called trench foot, it is a cold injury resulting from prolonged exposure to near-freezing temperatures when standing or walking on wet or swampy ground. |
| **Signs and Symptoms** | Severe pain, tingling, itching in feet and legs, edema, blisters, and reduced touch sensation. |
| **Causes** | Caused from wet feet and exposure to cold temperatures above freezing. |
| **First Aid** | Get into a warm room as soon as possible, cover the person or area in warm blankets, avoid walking on feet or toes to avoid more serious damage, immerse the areas affected into warm (not hot) water, the area should be gently washed, dried, and wrapped in sterile bandages and kept clean to avoid infection, consult your physician regarding the use of an oral antibiotic or topical ointment. |
| **Prevention** | When possible, air-dry and elevate your feet, and exchange wet shoes and socks for dry ones to help prevent the development of trench foot.<br>Treatment for trench foot is similar to the treatment for frostbite. Take the following steps:<br>• Thoroughly clean and dry your feet.<br>• Put on clean, dry socks daily. |

| | |
|---|---|
| Immersion Foot **Prevention** **(Cont.)** | • Treat the affected part by applying warm packs or soaking in warm water (102° to 110° F) for approximately 5 minutes.<br>• When sleeping or resting, do not wear socks.<br>• Obtain medical assistance as soon as possible.<br><br>If you have a foot wound, your foot may be more prone to infection. Check your feet at least once a day for infections or worsening of symptoms |

**Frostbite**

| | |
|---|---|
| **Description** | A freezing of the hands, feet, ears, and parts of the face as a result of exposure to very low temperatures. Frostbite occurs when ice crystals form in the fluid in cells of the skin and tissue. Most often, frostbite affects the nose, ears, cheeks, chin, fingers, or toes, and can permanently damage the body, even leading to amputation in severe cases. The risk of frostbite is increased in persons with reduced blood circulation, those with constriction of blood flow because of gloves or boots that are too tight, and in persons not dressed for extremely cold temperatures. Exposed hands and feet are the most vulnerable. There are three stages of frostbite: incipient frostbite (frostnip), superficial frostbite, and deep frostbite:<br>• Frostnip – Incipient form of frostbite that affects the skin only. Typically does not require medical treatment.<br>• Superficial Frostbite – A form of frostbite that affects the skin and tissues immediately beneath the skin.<br>• Deep Frostbite – The most serious form of frostbite with damage that affects deeper tissue and even bone. |
| **Signs and Symptoms** | Redness or pain in a skin area, a white or grayish-yellow skin area, skin that feels unusually firm or waxy, and/or numbness. |
| **Causes** | Exposure to extremely low temperatures. |
| **First Aid** | Get into a warm room as soon as possible, cover the person or area in warm blankets, avoid walking on frostbitten feet or toes to avoid more serious damage, immerse the areas affected by frostbite into warm (not hot) water, warm the affected area using body heat, avoid rubbing or massaging the affected area as this can cause further damage, do not use anything hot, such as a heating pad, stove, or furnace, to warm the affected area, as these areas are numb and may burn easily due to a lack of sensation, the frostbitten area should be gently washed, dried, and wrapped in sterile bandages and kept clean to avoid infection, consult your physician regarding the use of an oral antibiotic or topical ointment. |
| **Prevention** | Keep exposed extremities with isolative clothing; avoid smoking or drinking alcohol. |

# APPENDIX G

# COVID-19 PROTECTION PROGRAM

NEW YORK STATE | Department of Health

# INTERIM GUIDANCE FOR CONSTRUCTION ACTIVITIES DURING THE COVID-19 PUBLIC HEALTH EMERGENCY

When you have read this document, you can affirm at the bottom.

As of May 13, 2020

## Purpose

This Interim Guidance for Construction Activities during the COVID-19 Public Health Emergency ("Interim COVID-19 Guidance for Construction") was created to provide owners/operators of construction projects and their employees and contractors with precautions to help protect against the spread of COVID-19 as indoor and outdoor construction sites reopen.

These guidelines are minimum requirements only and any employer is free to provide additional precautions or increased restrictions. These guidelines are based on the best-known public health practices at the time of Phase I of the State's reopening, and the documentation upon which these guidelines are based can and does change frequently. Construction sites must adhere to all local, state and federal requirements relative to construction activities. All construction-involved entities are also accountable for staying current with any updates to these requirements, as well as incorporating same into any construction activities and/or Site Safety Plan.

## Background

On March 7, 2020, Governor Andrew M. Cuomo issued Executive Order 202, declaring a state of emergency in response to COVID-19. Community transmission of COVID-19 has occurred throughout New York. To minimize further spread, social distancing of at least six feet must be maintained between individuals, where possible.

On March 20, 2020, Governor Cuomo issued Executive Order 202.6, directing all non-essential businesses to close in-office personnel functions. Essential businesses, as defined by Empire State Development Corporation (ESD) guidance, were not subject to the in-person restriction, but were, however, directed to comply with the guidance and directives for maintaining a clean and safe work environment issued by the New York State Department of Health (DOH), and were strongly urged to maintain social distancing measures to the extent possible.

On April 12, 2020, Governor Cuomo issued Executive Order 202.16, directing essential businesses to provide employees, who are present in the workplace, with a face covering, at no-cost, that must be used when in direct contact with customers or members of the public during the course of their work. On April 15, 2020, Governor Cuomo issued Executive Order 202.17, directing that any individual who is over age two and able to medically tolerate a face-covering must cover their nose and mouth with a mask or cloth face-covering when in a public place and unable to maintain, or when not maintaining, social distance. On April 16, 2020, Governor Cuomo issued Executive Order 202.18, directing that everyone using public or private transportation carriers or other for-hire vehicles, who is over age two and able to medically tolerate a face covering, must wear a mask or face covering over the nose and mouth during any such trip. It also directed any operators or drivers of public or private transport to wear a face covering or mask which covers the nose and mouth while there are any passengers in such a vehicle.

On April 26, 2020, Governor Cuomo announced a phased approach to reopen industries and businesses in New York in phases based upon a data-driven, regional analysis. On May 4, 2020, the Governor provided that the regional analysis would consider several public health factors, including new COVID-19 infections, as well as health care system, diagnostic testing, and contact tracing capacity. On May 11, 2020, Governor Cuomo announced that the first phase of reopening would begin on May 15, 2020 in several regions of New York, based upon available regional metrics and indicators.

In addition to the following standards, both essential and non-essential businesses must continue to comply with the guidance and directives for maintaining clean and safe work environments issued by DOH.

Please note that where guidance in this document differs from other guidance documents issued by New York State, the more recent guidance shall apply.

### Standards for Responsible Construction Activities in New York State

No construction activity can occur without meeting the following minimum State standards, as well as applicable federal requirements, including but not limited to such minimum standards of the Americans with Disabilities Act (ADA), Centers for Disease Control and Prevention (CDC), Environmental Protection Agency (EPA), and United States Department of Labor's Occupational Safety and Health Administration (OSHA).

The State standards contained within this guidance apply to all construction activities – both essential and non-essential – in operation during the COVID-19 public health emergency until rescinded or amended by the State.

The following guidance is organized around three distinct categories: people, places, and processes.

## I. PEOPLE

### A. Physical Distancing

- For any work occurring indoors (e.g. construction within an existing building), no more than 1 worker per 250 square feet is allowed on site, excluding supervisors, unless additional personal protective measures are implemented; or

- A distance of at least six feet must be maintained among workers at all times, unless safety of the core activity requires a shorter distance (e.g. dry walling, glazing, lifting). Any time employees must come within six feet of another person, acceptable face coverings must be worn. Employees must be prepared to don a face covering if another person unexpectedly comes within six feet.
    - Acceptable face coverings for COVID-19 include but are not limited to cloth-based face coverings and disposable masks that cover both the mouth and nose.
    - However, cloth, disposable, or other homemade face coverings are not acceptable face coverings for workplace activities that typically require a higher degree of protection for personal protective equipment due to the nature of the work. For those activities, N95 respirators or other personal protective equipment (PPE) used under existing industry standards should continue to be used, as is defined in accordance with OSHA guidelines.

- The number of work stations and employee seating areas, and their use, may be modified or restricted, so that workers are at least six feet apart in all directions (e.g. side-to-side and when

facing one another) and are not sharing workstations without cleaning and disinfection between use. When distancing is not feasible between workstations, the use of face coverings or physical barriers (e.g. plastic shielding walls, in lieu of face coverings in areas where they would not affect air flow, heating, cooling, or ventilation) must be provided and required.

  - Physical barriers should be put in place in accordance with OSHA guidelines.
  - Physical barrier options may include: strip curtains, plexiglass or similar materials, or other impermeable dividers or partitions.

- The use of tightly confined spaces (e.g. elevators, hoists, vehicles) by more than one individual at a time, unless all employees in such space at the same time are wearing acceptable face coverings, should be prohibited. However, even with face coverings in use, occupancy must never exceed 50% of the maximum capacity of the space or vehicle, unless it is designed for use by a single occupant. Ventilation with outdoor air should be increased to the greatest extent possible, while maintaining safety protocols, and additional measures to prevent congregation in elevator waiting areas and limit density in elevators, such as enabling the use of stairs, should be taken.

- Measures should be put in place to reduce bi-directional foot traffic using tape or signs with arrows in narrow aisles, hallways, or spaces, and post signage and distance markers denoting spaces of six feet in all commonly used areas and any areas in which lines are commonly formed or people may congregate (e.g. clock in/out stations, health screening stations, etc.).

- Signs must be posted throughout the site, consistent with DOH COVID-19 signage. Customized signage specific to a workplace or setting can be developed and used, provided that such signage is consistent with the Department's signage. Signage should be used to remind employees to:
  - Cover their nose and mouth with a mask or cloth face-covering when six feet of social distance cannot be maintained.
  - Properly store and, when necessary, discard personal protective equipment.
  - Adhere to physical distancing instructions.
  - Report symptoms of or exposure to COVID-19, and how they should do so.
  - Follow hand hygiene and cleaning guidelines.

## B. Gatherings in Enclosed Spaces

- In-person gatherings (e.g. shapeups, toolbox talks, safety meetings) must be limited to the greatest extent possible and other methods such as video or teleconferencing must be used whenever possible, per CDC guidance "Interim Guidance for Businesses and Employers to Plan and Respond to Coronavirus Disease 2019 (COVID-19)". When videoconferencing or teleconferencing is not possible, meetings should be held in open, well-ventilated spaces and it should be ensured that individuals maintain six feet of social distance between one another (e.g. if there are chairs, leave space between chairs, have employees sit in alternating chairs).

- Practices for adequate social distancing in confined areas, such as restrooms and breakrooms, must be put in place, and signage and systems (e.g. flagging when occupied) to restrict occupancy when social distancing cannot be maintained in such areas should be developed; and

- Schedules should be staggered for employees to observe social distancing (i.e., six feet of space) for any gathering (e.g. coffee breaks, meals, and shift starts/stops).

### C. Workplace Activity

- Measures should be taken to reduce interpersonal contact and congregation, through methods such as:
  - limiting in-person presence to only those staff who are necessary to be on site;
  - adjusting workplace hours;
  - reducing on-site workforce to accommodate social distancing guidelines;
  - shifting design (e.g. A/B teams, staggered arrival/departure times);
  - prioritizing tasks that allow for social distancing (e.g. steel erection) over those that do not (e.g. dry walling, glazing); and/or
  - avoiding multiple crews and/or teams working in one area by staggering scheduled tasks and using signs to indicate occupied areas.

### D. Movement and Commerce

- Non-essential visitors on site should be prohibited.
- Designated areas for pickups and deliveries must be established, limiting contact to the extent possible.
- On-site interactions (e.g. designate an egress for workers leaving their shifts and a separate ingress for workers starting their shifts) and movements (e.g. employees should remain near their workstations as often as possible) should be limited.

## II. PLACES

### A. Protective Equipment

- In addition to necessary personal protective equipment (PPE) as required for certain workplace activities, acceptable face coverings must be procured, fashioned, or otherwise obtained, and such coverings must be provided to employees while at work at no cost to the employee. An adequate supply of face coverings, masks and other required PPE should be on hand in the event an employee needs a replacement, or a visitor is in need. Acceptable face coverings include, but are not limited to, cloth (e.g. homemade sewn, quick cut, bandana), surgical masks, N95 respirators, and face shields.
- Face coverings must be cleaned or replaced after use and may not be shared. Please consult CDC guidance for additional information on cloth face coverings and other types of personal protective equipment (PPE), as well as instructions on use and cleaning.
  - Note that cloth face coverings or disposable masks shall not be considered acceptable face coverings for workplace activities that impose a higher degree of protection for face covering requirements. For example, if N95 respirators are traditionally required for specific construction activities, a cloth or homemade mask would not suffice. OSHA standards for such safety equipment must be adhered to.
- Employees must be allowed to use their own acceptable face coverings, but cannot be required to supply their own face coverings. Further, this guidance shall not prevent employees from wearing their personally owned additional protective coverings (e.g. surgical masks, N95 respirators, or face shields). Compliance with all applicable OSHA standards is required.

- Measures should be put in place to limit the sharing of objects, such as tools, machinery, materials, and vehicles, as well as the touching of shared surfaces, such as railings and fences; or, require workers to wear gloves (trade-appropriate or medical) when in contact with shared objects or frequently touched surfaces; or, require workers to sanitize or wash their hands before and after contact.

- Workers must be trained on how to adequately put on, take off, clean (as applicable), and discard PPE, including but not limited to, appropriate face coverings.

## B. Hygiene and Cleaning

- Adherence to hygiene and sanitation requirements as advised by the CDC and DOH, including "Guidance for Cleaning and Disinfection of Public and Private Facilities for COVID-19," and the "STOP THE SPREAD" poster, as applicable, is required. Cleaning logs that include the date, time, and scope of cleaning must be maintained.

- Hand hygiene stations must be provided and maintained on site, as follows:
  - For handwashing: soap, running warm water, and disposable paper towels.
  - For sanitizer: an alcohol-based hand sanitizer containing at least 60% alcohol for areas where handwashing facilities may not be available or practical.

- Appropriate cleaning / disinfection supplies for shared and frequently touched surfaces must be provided, and employees should be encouraged to use these supplies before and after the use of these surfaces, followed by hand hygiene.

- Regular cleaning and disinfection of the work site must be conducted, as well as more frequent cleaning and disinfection for high risk areas used by many individuals and for frequently touched surfaces. Cleaning and disinfecting must be rigorous and ongoing and should occur at least after each shift, daily, or more frequently as needed. Please refer to DOH's "Interim Guidance for Cleaning and Disinfection of Public and Private Facilities for COVID-19" for detailed instructions on how to clean facilities.
  - Regular cleaning and disinfecting of restrooms must be ensured. Restrooms should be cleaned more often depending on frequency of use.
    - Distancing rules must be adhered to by reducing restroom capacity where feasible.
  - Equipment and tools must be regularly disinfected using registered disinfectants, including at least as often as workers change workstations or move to a new set of tools. Refer to the Department of Environmental Conservation (DEC) list of products registered in New York State and identified by the EPA as effective against COVID-19.
  - If cleaning or disinfection products or the act of cleaning and disinfecting causes safety hazards or degrades the material or machinery, hand hygiene stations must be put in place for in between uses and/or disposable gloves must be supplied.

- Cleaning and disinfection of exposed areas must be provided for in the event of a positive case of COVID-19 of a worker, with such cleaning to include, at a minimum, all heavy transit areas and high-touch surfaces (e.g. shared tools, machines, vehicles, handrails, portable toilets).

- CDC guidelines on "Cleaning and Disinfecting Your Facility" if someone is suspected or confirmed to have COVID-19 infection are as follows:
  - Close off areas used by the person who is sick.

        - Operations do not necessarily need to be closed, if affected areas can be closed off.
    - Open outside doors and windows to increase air circulation in the area.
    - Wait 24 hours before you clean or disinfect. If 24 hours is not feasible, wait as long as possible.
    - Clean and disinfect all areas used by the person who is sick, such as offices, bathrooms, common areas, and shared equipment.
    - Once the area has been appropriately disinfected, it can be opened for use.
        - Workers without close contact with the person who is sick can return to the work area immediately after disinfection.
            - Per CDC's "Evaluating and Testing Persons for Coronavirus Disease 2019 (COVID-19)," considerations when assessing close contact include the duration of exposure (e.g. longer exposure time likely increases exposure risk) and the clinical symptoms of the person with COVID-19 (e.g. coughing likely increases exposure risk as does exposure to a severely ill patient).
    - If more than seven days have passed since the person who is sick visited or used the facility, additional cleaning and disinfection is not necessary, but routine cleaning and disinfection should continue.

- Shared food and beverages (e.g. buffet style meals) must be prohibited, bringing lunch from home should be encouraged, and adequate space for employees to observe social distancing while eating meals must be identified and reserved.

### C. Phased Reopening

- Reopening activities are encouraged to be phased-in so as to allow for operational issues to be resolved before production or work activities return to normal levels. A limited number of employees and hours, when first reopening should be considered so as to provide operations with the ability to adjust to the changes.

### D. Communications Plan

- Affirmation that the state-issued industry guidelines have been reviewed, are understood, and that they will be implemented, must be provided.

- A communication plan for employees, visitors, and customers should be developed that includes applicable instructions, training, signage, and a consistent means to provide employees with information. Development of webpages, text and email groups, and social media should be considered.

## III. PROCESSES

### A. Screening and Testing

- Mandatory daily health screening practices must be implemented.
    - Screening practices may be performed remotely (e.g. by telephone or electronic survey), before the employee reports to the work site, to the extent possible; or may be performed on site.

- Screening should be coordinated to prevent workers from intermingling in close contact with each other prior to completion of the screening.
- At a minimum, screening should be required of all workers and visitors and completed using a questionnaire that determines whether the worker or visitor has:
  - (a) knowingly been in close or proximate contact in the past 14 days with anyone who has tested positive for COVID-19 or who has or had symptoms of COVID-19,
  - (b) tested positive for COVID-19 in the past 14 days, or
  - (c) has experienced any symptoms of COVID-19 in the past 14 days.

- According to the CDC guidance on "Symptoms of Coronavirus," the term "symptomatic" includes employees who have the following symptoms or combinations of symptoms: fever, cough, shortness of breath, or at least two of the following symptoms: fever, chills, repeated shaking with chills, muscle pain, headache, sore throat, or new loss of taste or smell.

- Employees should be required to immediately disclose if and when their responses to any of the aforementioned questions change, such as if they begin to experience symptoms, both during work hours or outside of work hours.

- Daily temperature checks may also be conducted per Equal Employment Opportunity Commission or DOH guidelines. Keeping records of employee health data (e.g. temperature data) is prohibited.

- Any personnel performing screening activities, including temperature checks, must be appropriately protected from exposure to potentially infectious workers or visitors entering the site. Personnel performing screening activities should be trained by employer-identified individuals who are familiar with CDC, DOH, and OSHA protocols.

- Screeners should be provided and use PPE, including at a minimum, a face mask, and may include gloves, a gown, and/or a face shield.

- An employee who screens positive for COVID-19 symptoms should not be allowed to enter the worksite and should be sent home with instructions to contact their healthcare provider for assessment and testing. The local health department and DOH must be immediately notified about the suspected case. Information on healthcare and testing resources should be provided to the employee.

- An employee who has responded that they have had close contact with a person who is confirmed or suspected for COVID-19 may not be allowed to enter the worksite without abiding by the precautions outlined below and documentation of the employee's adherence to those precautions has been done.

- All employee and visitor responses collected by the screening process on a daily basis must be reviewed and a record of such review must be maintained. A contact as the party for workers to inform if they later are experiencing COVID-19-related symptoms, as noted in the questionnaire, must be identified.

- A site safety monitor must be designated whose responsibilities include continuous compliance with all aspects of the site safety plan.

- To the extent possible, a log of every person, including workers and visitors, who may have close contact with other individuals at the work site or area must be maintained; excluding deliveries that are performed with appropriate PPE or through contactless means. Log should contain contact information, such that all contacts may be identified, traced and notified in the event an employee is

diagnosed with COVID-19. Cooperation with local health departments contact tracing efforts is required.

- Employers and employees should take the following actions related to COVID-19 symptoms and contact:
  - If an employee has COVID-19 symptoms AND EITHER tests positive for COVID-19 OR did not receive a test, the employee may only return to work after completing a 14-day self-quarantine. If an employee is critical to the operation or safety of a site, the local health department and the most up-to-date CDC and DOH standards on the minimum number of days to quarantine before an employee is safely able to return to work with additional precautions to mitigate the risk of COVID-19 transmission may be consulted.
  - If an employee does NOT have COVID-19 symptoms BUT tests positive for COVID-19, the employee may only return to work after completing a 14-day self-quarantine. If an employee is critical to the operation or safety of a site, the local health department and the most up-to-date CDC and DOH standards on the minimum number of days to quarantine before an employee is safely able to return to work with additional precautions to mitigate the risk of COVID-19 transmission may be consulted.
  - If an employee has had close contact with a person with COVID-19 for a prolonged period of time AND is symptomatic, the employee should notify their employer and follow the above protocol for a positive case.
  - If an employee has had close contact with a person with COVID-19 for a prolonged period of time AND is NOT symptomatic, the employee should notify their employer and adhere to the following practices prior to and during their work shift, which should be documented:
    1) Regular monitoring: As long as the employee does not have a temperature or symptoms, they should self-monitor under the supervision of their employer's occupational health program.
    2) Wear a mask: The employee should wear a face mask at all times while in the workplace for 14 days after last exposure.
    3) Social distance: Employee should continue social distancing practices, including maintaining, at least, six feet distance from others.
    4) Disinfect and clean work spaces: Continue to clean and disinfect all areas such as offices, bathrooms, common areas, and shared electronic equipment routinely.
  - If an employee is symptomatic upon arrival at work or becomes sick during the day, the employee must be separated and sent home immediately, following the above protocol for a positive case.

## B. Tracing and Tracking

- The local health department and DOH must be notified immediately upon being informed of any positive COVID-19 test result by a worker at the site.

- In the case of a worker or visitor testing positive, cooperation with the local health department is required to trace all contacts in the workplace, and the local health department must be notified of all workers and visitors who entered the site dating back to 48 hours before the worker began experiencing COVID-19 symptoms or tested positive, whichever is earlier, but confidentiality must be maintained as required by federal and state law and regulations.

- Local health departments may, under their legal authority, implement monitoring and movement restrictions of infected or exposed persons including home isolation or quarantine.

- Employees who are alerted that they have come into close or proximate contact with a person with COVID-19, and have been alerted via tracing, tracking or other mechanism, are required to self-report to their employer at the time of alert and shall not be permitted to remain or return to the work site.

## IV. EMPLOYER PLANS

Completed safety plans must be conspicuously posted on site. The State has made available a business reopening safety plan template to guide business owners and operators in developing plans to protect against the spread of COVID-19.

### Additional safety information, guidelines, and resources are available at:

New York State Department of Health Novel Coronavirus (COVID-19) Website
https://coronavirus.health.ny.gov/

Centers for Disease Control and Prevention Coronavirus (COVID-19) Website
https://www.cdc.gov/coronavirus/2019-ncov/index.html

Occupational Safety and Health Administration COVID-19 Website
https://www.osha.gov/SLTC/covid-19/

### At the link below, affirm that you have read and understand your obligation to operate in accordance with this guidance:

https://forms.ny.gov/s3/ny-forward-affirmation

**Planning Checklist/Questionnaire for Site Mobilization**

**Date:**

**Site:**

1. Type of work to be performed (site visit, sampling/investigation, inspection, residential, construction, O&M, etc.):

2. Fund lead or PRP lead work:

3. Total number of people in the field at peak operation to perform work (EPA employees, contractors and subcontractors)**:**

4. Duration of proposed work per activity:

5. Local travel (daily travel to and from residence) or do people need to stay in a hotel (this includes both EPA and contractor personnel):

6. Entry onto residential properties required:

7. Entry into residential buildings required:

8. Entry into commercial buildings required:

9. Site location:

10. Community support:

11. Elected official support:

12. Has HASP been updated to address COVID 19 during field work to ensure compliance with state and CDC guidelines?

13. For sites with non-local travel, does the HASP address or reference procedures for addressing any crew member that is determined presumptive Covid-19?

14. Are office trailers needed for the Site?

15. Can social distancing be effectively implemented at the Site?

16. Which of the 10 regions of the State of New York is the site in?

17. Has the Region met the 7 metrics for loosening of COVID-19 restrictions?

**Recommendation:**

*de maximis, inc.*

# COVID-19 Self-Declaration Form

The safety of our employees, customers, families and visitors remains de maximis' overriding priority. As the coronavirus disease 2019 (COVID-19) outbreak continues to evolve and spreads globally, we are monitoring the situation closely and will periodically update company guidance based on current recommendations from the Center for Disease Control and the World Health Organization.

To prevent the spread of COVID-19 and reduce the potential risk of exposure to our employees and others, we are conducting a simple screening questionnaire. Your participation is important to help us take precautionary measures to protect you and everyone at this location. Thank you for your time.

| Name: | Phone Number (mobile/home): |
|---|---|
| Company/Organization: | de maximis Point of Contact: |
| Facility Name: | |

If the answer is "yes" to any of the following questions, access to the facility will be denied.

| **Self-Declaration** | |
|---|---|
| 1 | Have you tested positive for COVID-19 or has a doctor confirmed you have a case of COVID-19?<br>☐ Yes ☐ No |
| 2 | If the answer to question 1 is yes, have you been cleared by your doctor to return to work?<br>☐ Yes ☐ No |
| 3 | Have you had close contact with or cared for someone diagnosed with COVID-19 within the last 14 days?<br>☐ Yes ☐ No |
| 4 | Have you experienced any cold or flu-like symptoms (to include fever, cough, sore throat, respiratory illness, difficulty breathing)? If yes, has it been at least 7 days or more since you experienced those symptoms?<br>☐ Yes ☐ No |

Signature: _____ Date: _____

**Note: If you plan to be onsite for consecutive days, please immediately advise your de maximis point of contact if any of your responses change.**

Access to facility/project site (circle one): Approved Denied

All information and content in this guide is for information purposes only and is not medical advice, diagnosis, or treatment. All printed copies are uncontrolled.

Revision date: 7/6/2020

# APPENDIX H

# RESPIRATORY PROTECTION PROGRAM

# RESPIRATORY PROTECTION PROGRAM

## 1. Purpose and Scope

The purpose of this program is to protect all employees of working at the York Oil site from respiratory hazards, and to ensure that invasive activities are performed in compliance with OSHA 29 Code of Federal Regulation (CFR) §1910.134(c) Respiratory Protection Standard. Conditions at the site exist in which, engineering controls to control airborne hazards may not be feasible for many remediation operations at the York Oil site. In situations where airborne contaminants cannot be controlled within regulatory limits, respiratory protection and other types of personal protective equipment must be used to safeguard employees' health.

### Mandatory use of respirators

York Oil site workers are required to wear respiratory protection and other personal protective equipment (PPE) when the following situations exist:

- There is potential exposure to air contaminants above a specific action or exposure limit;
- If respirators or PPE are necessary to protect employee health;
- During specific routine work practices, processes or tasks identified by the job hazard assessment as requiring use of a respiratory protection and PPE.

In all cases, employees participating in respiratory protection programs do so at no cost to themselves. The expenses associated with training, medical evaluations and equipment will be paid by the company contracted to perform each scope of work requiring the use of respiratory protection.

### Voluntary use of respirators

If an employee desires to wear a respirator during certain operations in areas where airborne contaminants do not mandate the use of respiratory protection (non-hazardous areas), the Field Supervisor/ Health and Safety Officer (FS/HSO) will review each such request on a case-by-case basis.

An employee may use the respirator provided or may provide his/her own for voluntary use, if:

- doing so does not jeopardize the employee's health or safety, or that of his/her coworkers,
- the equipment itself does not create a workplace hazard and
- HSO has approved the use.

All employees voluntarily wearing respirators are required to receive a copy of "**Information for Employees Using Respirators When Not Required Under the Standard**." See Attachment 1.D (page D-12). The FS/HSO must review this OSHA information with each employee prior to their voluntary use of respiratory protective equipment.

In addition, employees voluntarily using tight-fitting respirators must follow the medical surveillance, cleaning, maintenance and storage procedures in this program. Employees voluntarily

wearing dust masks (filtering facepiece) or escape-only respirators are not subject to the program's medical evaluation. However, their equipment must be clean and free of contamination, and not interfere with the employee's ability to work safely. These employees are also provided a copy of Attachment 1.D and given a review of the information before their use of dust masks.

# 2. Program Administration

## FS/HSO Responsibilities

The FS/HSO will act as the Respiratory Protection HSO and is responsible for administering the Respiratory Protection Program. The FS/HSO's duties include the following:

- Developing and issuing the Job Hazard Assessment for each site activity;
- Identifying work areas, processes, or tasks that require workers to wear respirators, and evaluating the associated hazards;
- Selecting appropriate, approved respiratory protection options;
- Monitoring respirator use to ensure that respirators are used in accordance with their certifications;
- Arranging for and or conducting training;
- Ensuring proper storage and maintenance of respiratory protection equipment;
- Conducting qualitative fit testing;
- Administering the medical surveillance program;
- Maintaining required program records;
- Evaluating this respiratory protection program; and,
- Updating the written program, as necessary.
- Ensure supervised employees (including all new hires) receive appropriate training, fit testing, and annual medical evaluations.
- Ensure the availability of appropriate respirators and accessories.
- Be aware of tasks requiring the use of respiratory protection.
- Enforce the proper use of respiratory protection.
- Ensure that respirators are properly cleaned, maintained, and stored in accordance with the program.
- Monitor work areas and operations with sufficient frequency to identify respiratory hazards and select proper equipment.

## Employee Responsibilities

Each employee must wear his or her respirator when and where required, under the conditions specified by this program. They are also obligated to use the equipment according to the training procedures for each model. Employees are also responsible for the following:

- Being familiar with this program.
- Caring for and maintaining the respirators as instructed and store them in a clean sanitary location.
- Informing the supervisor if the respirator no longer fits well and request a new one that fits properly.
- Informing the FS/HSO of any potential respiratory hazards or other concerns regarding the program.

# 3. Program Elements

## Medical Evaluation

Any employee who is required to wear a respirator, or chooses to wear an air-purifying respirator (APR) voluntarily, must first pass a medical examination and have medical approval before wearing the equipment on the job.

Employees refusing the medical evaluation cannot work in areas requiring respirator use. The evaluation is conducted using the questionnaire provided in Attachment 6 or an actual physical examination by a physician or other licensed health care professional (PLHCP) that obtains the same information.

## Evaluation Procedures

- Every employee requiring medical evaluation is given a copy of the confidential medical questionnaire in Attachment 6 to be given to the PLHCP.
- To the extent feasible each company is required to accommodate employees unable to read the questionnaire. At an employee's request someone other than HSO may be asked to assist in reading the document. If this is not possible, the employee will be sent to the PLHCP for a medical evaluation.
- Follow-up medical exams are given to employees as required by the OSHA standard, or as deemed necessary by the PLHCP.

All employees can speak with the PLHCP about their medical evaluation.

- Any employee required by medical reasons to wear a positive pressure air purifying respirator will be provided a powered air purifying respirator.
- After an employee has received approval and started using a respirator, an additional medical evaluation is conducted for the following reasons:
    1. The employee reports signs and/or symptoms related to his/her ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing;
    2. The PLHCP informs the FS/HSO of a reevaluation need
    3. Information from this program, including observations made during fit testing and program evaluation, indicates a need for reevaluation; or
    4. A change occurs in the workplace conditions that may result in an increased physiological burden on the employee.

## Determination of fitness

The PLHCP evaluates the completed health care questionnaire. Prior to making a formal determination of fitness the PLHCP must be provided with the following information on respirator usage:

- the equipment's type and weight;
- use frequency and duration;
- expected work effort;
- additional personal protective clothing/equipment to be used; and

- estimated temperature and humidity extremes expected in the work area where the respirator is to be used.

The PLHCP provides an assessment of each employee's physical ability to wear a respirator and perform the assigned work. Such evaluations will be provided in writing according to one of the following three formats:

- The employee is qualified to perform assigned work and wear the assigned respirator.
- The employee is not qualified to perform assigned work and wear the assigned respirator.
- The employee is qualified to perform assigned work and wear the assigned respirator with the following limitations: (insert limitations and other considerations).

### Follow-up medical examination

If an employee responds positively to any of questions 1 through 8 in Section 2 of the questionnaire, or if the PLHCP deems it necessary, a follow-up exam is provided. This exam includes any medical tests, consultations, or diagnostic procedures that the PLHCP needs to make a final determination for safe respirator usage.

## Respirator Selection

The FS/ HSO will perform a job hazard analysis for all project tasks. The hazard analysis will identify the respiratory hazard(s) associated with the task and prescribe appropriate engineering and administrative controls to protect workers. The FS/HSO will determine the need for respiratory protection in compliance with the requirements of 29 CFR § 1910.1000, Air Contaminants Standard and 10 CFR Part 835 Appendix C, Derived Air Concentrations (DAC). Based on this information, and in accordance with the applicable OSHA Standards, the FS/HSO will select the respirator to be used for specific operations.

### Respirator Fit Testing

Fit testing is required for employees wearing respirators with a negative or positive pressure tight-fitting facepiece. The fit test is conducted using the respirator the employee will be wearing on the job. Fit testing is conducted:

- Prior to initial use of the respirator.
- If a different respirator facepiece (size, style, model or make) is used.
- On an annual basis.
- If the employee, FS/HSO, PLHCP, or Site Project Manager makes a visual observation of changes in the employee's physical condition that could affect respirator fit. This might include: facial scarring, dental changes, cosmetic surgery or a drastic change in weight.

A qualitative fit test (QLFT) or a quantitative fit test (QNFT) method as designated in Table 2 is required prior to respirator use. If an employee passes either test, but notifies the employer that the fit is unacceptable, the employee is allowed to select a different respirator, and will be retested.

**Table 2**
**Acceptable Fit-Testing Methods**

| | QLFT | QNFT |
|---|---|---|

| | | |
|---|---|---|
| Half-Face, Negative Pressure, Air Purifying Respirator (<100 fit factor) | Yes | Yes |
| Full-Face, Negative Pressure, Air Purifying Respirator (<100 fit factor) used in atmospheres up to 10 times the PEL | Yes | Yes |
| Full-Face, Negative Pressure, Air Purifying Respirator (>100 fit factor) | No | Yes |
| PAPR | Yes | Yes |
| Supplied-Air Respirators, or SCBA used in Negative Pressure (Demand Mode) (>100 fit factor) | No | Yes |
| Supplied-Air Respirators, or SCBA used in Positive Pressure (Pressure Demand Mode) | Yes | Yes |
| SCBA-Structural Fire Fighting, Positive Pressure | Yes | Yes |
| SCBA/SAR-IDLH, Positive Pressure | Yes | Yes |
| Mouth-bit Respirators | Fit-testing is not required | |
| Loose-fitting Respirators (e.g., hoods, helmets) | Fit-testing is not required | |

## Respirator Use

### General Use Instructions

Each time a respirator is worn, the wearer must conduct a “user seal check.” Employees may select either the positive or negative pressure check. Additional PPE, combined with respirator use, may be necessary to adequately prevent exposure. The use of eye, face or skin protection may be required during certain processes. Employees must consult supervision for the required equipment.

Tight fitting facepiece respirators are not permitted for use if:

- An employee has facial hair that interferes with either the sealing surface of the respirator and the face, or interferes with the valve function.
- Corrective glasses/goggles or other personal protective equipment interferes with the seal of the facepiece.
- Any other condition interferes with the facepiece seal.

The employee must vacate the respirator use area for the following reasons:

- To wash his/her face and respirator facepiece, as necessary to prevent respirator- induced eye or skin irritation;
- If vapor or gas breakthrough is detected;
- If there is a change in breathing resistance;
- If there is facepiece leakage; or
- To replace the respirator/filter or change the cartridge/canister.

### Cleaning, Maintenance, and Storage

Respirators are to be regularly cleaned and disinfected according to the manufacturer’s instructions. APR’s are to be cleaned and disinfected as often as necessary, but at least once each day they are used. SARs and emergency use respirators are to be cleaned and disinfected after each use.

## Cleaning

These seven steps are to be followed for cleaning and disinfecting respirators, unless the manufacturer directs otherwise:

- Disassemble respirator, removing all filters, canisters, or cartridges.
- Wash the facepiece and associated parts in a mild detergent with warm water. Do not use organic solvents or bleach.
- Rinse thoroughly in clean, warm water.
- Wipe the respirator with disinfectant wipes (70% isopropyl alcohol).
- Air dry in a clean area. If a clean area is not available, use clean disposable paper towels to blot excess moisture.
- Reassemble the respirator and replace any defective parts (noting the condition of the head straps and valve flaps).
- Place in a clean, dry plastic bag or other airtight container.

The FS/HSO is responsible for ensuring there is an adequate supply of cleaning and disinfecting supplies. If supplies are low, employees must notify their supervisor or the FS/HSO.

## Maintenance

After leaving the respirator use area, employees can do limited maintenance on their equipment only in an area that is free from respiratory hazards.

Maintenance involves a thorough visual inspection for cleanliness and/or defects. Worn or deteriorated parts must be replaced prior to equipment use. No components are replaced or repairs made beyond those recommended by the manufacturer. Regulator or alarm repairs of atmosphere-supplying respirators are to be conducted by the manufacturer.

## Respirator Inspection Checklist:

- Facepiece: cracks, tears, holes, facemask distortion, cracked or loose lenses/face shield.
- Head straps: breaks, tears, broken buckles/clasps, overstretched elastic bands.
- Valves: residue/dirt, cracks or tears in valve material, absence of valve flap.
- Filter/Cartridges: proper cartridge for hazard, approval designation, intact gaskets, cracks or dents in housing.
- Air Supply Systems: breathing air quality/grade, condition of supply hoses, hose connections, settings on regulators and valves.

Defective respirators or those with defective parts are taken out of service immediately. Employees should notify their supervisor about all respirator defects. It is the supervisor's responsibility to give the defective equipment either to the FS/HSO or to the individual charged with replacement/repair. The appropriate person then decides whether to:

- Temporarily take the respirator out of service until it can be repaired;
- Have it repaired; or
- Dispose of it if the problem is irreparable.

### Storage

APRs are stored in a clean, dry area and following the manufacturer's recommendations. Employees inspect and clean their own respirators according to the provisions of this program. The equipment is stored in plastic bags or airtight containers. Each bag/container is marked with an employee name, and only that particular employee can use it for their equipment storage.

### Cartridge and Canister Change Out Schedules

Organic vapor/acid gas cartridges/canisters with a P-100 prefilter that are used in areas where volatile organic compounds are present must be changed after 8 hours of use or at the end of the shift, whichever is shorter.
Employees wearing APR with P-100 filters for protection against other particulates must change their cartridges when they experience difficulty breathing (i.e., resistance).

### Equipment Malfunction

#### *Air-Purifying Respirators (APR)*

If an APR or any of its components malfunctions (breakthrough, facepiece leakage, or faulty valve), the wearer must leave the respirator use area immediately and notify the supervisor about the malfunction. The supervisor is then responsible for ensuring that the employee receives the necessary repair parts or a new functional respirator.

#### *Supplied-Air Respirator (SAR)*

Usually, employees using SAR work in pairs. If one experiences an SAR malfunction, then he/she notifies the partner of the problem by using hand signals. The partner then escorts the affected employee outside the respirator use area.

Supplied-air respirators use only Grade D breathing air as described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989. The oxygen content (v/v) is between 19.5% and 23.5%; hydrocarbon (condensed) content must be less than 5 mg/m3; and carbon monoxide must be less than 1 mg/m3.

## 4. Training

The FS/HSO provides training to respirator users on:

- Contents of the respiratory protection program;
- Responsibilities of employees and supervisors;
- Requirements of OSHA's respiratory protection standard.

All training occurs prior to any respirator use in the workplace. Supervisors receive their training prior to supervising employees required to use respirators.

The training program covers the following topics:

- All elements of the respiratory protection program;

- The information covered under OSHA Standard 29 C.F.R. 1910.134;
- The information covered under OSHA Standard 10 C.F.R. 835;
- Respiratory hazards encountered at the worksite;
- Proper selection and use of respirators;
- Additional PPE;
- Respirator limitations;
- How to perform user seal (fit) checks;
- Fit testing;
- Emergency respirator use procedures;
- Respirator maintenance and storage;
- Medical signs and symptoms limiting effective respirator use.

Employees are required to demonstrate their understanding of the topics covered in the training through hands-on exercises and a written quiz. The FS/HSO documents respirator training. This documentation includes the type, model, and size of respirator on which each employee has been trained and fit tested. Employees are retrained annually, or as needed.

## 5. Program Evaluation

The FS/HSO will conduct periodic evaluations of the workplace to ensure that the provisions of this program are being implemented.

These evaluations include regular consultations with both the employees using respirators and their supervisors. This is done to identify areas for improvement and to address problems. Records' reviews, site inspections and periodic air monitoring also assist in program review.

## 6. Documentation and Recordkeeping

The FS/HSO maintains the following records:

- A written copy of this program and the OSHA standard. This information is available to any interested employee.
- All training and fit testing records. These records are updated as new employees are trained; when existing employees receive refresher training; and/or when new fit testing is conducted.
- All written recommendations from the PLHCP on an employee's ability to use respirators. (Medical evaluations are maintained in accordance with the OSHA Medical Records Standard 29 C.F.R. 1910.1020.)

# QUALITY ASSURANCE PROJECT PLAN

# YORK OIL OPERABLE UNIT 1 & 2 SUPERFUND SITE
# OPERATIONS, MAINTENANCE & MONITORING
# MOIRA, NEW YORK

*Prepared by:*

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# 1.0 PROJECT DESCRIPTION

## 1.1 Introduction

This Quality Assurance Project Plan (QAPP) has been prepared for conducting groundwater and natural attenuation monitoring at the York Oil Superfund Site (herein referred to as the "site") in Moira, New York. Ongoing post-remediation monitoring programs are being conducted on a semi-annual basis at the remediated waste sites at both Operable Unit No. 1 (OU-1) and Operable Unit No. 2 (OU-2).

The purpose of this QAPP is to establish necessary procedures and actions that will ensure that the data generated is precise, accurate, representative, comparable and complete and will reflect the objectives described in the individual post-closure monitoring and operation and maintenance plans.

This QAPP addresses general sampling, analysis and quality assurance (QA) issues. It will be amended as necessary when future decisions are reached in one of two ways:

- by amending the QAPP in part or in whole; and/or
- by proposing variances from QAPP procedures in action-specific work plans or in recommendations made as part of the annual post-remediation report produced for the remediated site.

This QAPP provides guidance and specifications to ensure that:

- Field determinations and analytical results regarding sampling and analysis are valid through the implementation of preventative maintenance, equipment calibration, and approved analytical protocols.
- Sampling is conducted using sample tracking systems and chain-of-custody procedures which identify samples being collected and control the samples through approved analytical techniques and data reduction.
- Records are produced and retained as documentary evidence of the quality of the samples collected and analyzed, the validity of approved procedures and the completeness of the remedial investigation in relation to the approved scope of the project.
- Data generated is valid and appropriate for their intended use.

The requirements of this QAPP are applicable for the post-remediation monitoring activities at the York Oil Superfund Site. They will address the general activities anticipated to be necessary to implement the work at each operable unit as approved by the United States Environmental

Protection Agency (USEPA). Specific QA procedures including level of reporting and scheduling of duplicates and blanks will appear in action-specific work plans. The USEPA has the lead government responsibility, due to the site status as a Federal Superfund site. The New York State Department of Environmental Conservation (NYSDEC) will also provide government review and input through the USEPA.

### 1.2 Project Summary

This section presents a summary of background information for the York Oil Superfund Site. Historical information related to past site usage and a brief summary of remediation activities conducted to date are discussed.

#### 1.2.1 Site Location and Description

The York Oil Site is located about one-mile northwest of the hamlet of Moira, in the Town of Moira, Franklin County, New York. The site is approximately 20 miles southeast of Massena, New York and 10 miles west of Malone, New York. Figure 1-1 presents a site location map, and Figure 1-2 presents a site area plan with all existing monitoring well locations shown.

The fenced portion of OU-1 slopes to the southwest and has generally sparse to moderate vegetative cover. Within the fenced portion of OU-1 was the location of three former lagoons, which is now an area of covered, treated soil resulting from the remediation of OU-1 during 1999 and the remediation of the Western Wetland located west of OU-1 in 2001. Adjacent to the fenced portion of OU-1 is the Town of Moira garage to the north, North Lawrence Road (County Route 6) to the northeast, an abandoned milk house to the east, an abandoned railroad bed along the southern boundary of OU-1, and the Southern Wetland south of the abandoned railroad bed. Surface water from OU-1 drains to the southwest via a drainage ditch before entering a beaver pond within the Western Wetland portion of OU-2.

The geographical boundary of OU-2 is defined to be the potential extent of migration of compounds via surface water and groundwater from OU-1 into areas outside of the OU-1 boundary.

OU-1 and OU-2 do not presently contain any inhabitable buildings; additionally, institutional controls are in-place to prevent unacceptable uses of soil and groundwater. Current owners of the property located downgradient of the site use the parcels for hunting and recreational purposes only. Review of the Franklin County Tax Assessor's and the Town of Moira Building Inspector files indicates no current plans for development of the York Oil property or any downgradient properties.

### 1.2.2 Site History

The York Oil Site was first used in 1954 by the York Oil Company, which recycled used oils collected from service stations, car dealers, certain federal facilities, and a variety of industrial facilities. The oil was processed with heat and a silica-based substance to remove impurities and dirt, and then resold to a number of businesses. This operation was discontinued around 1962.

From 1962 to 1977, Pierce Brothers Oil Services Inc. stored and processed used oils within the fenced portion of the York Oil Site. Processing of used oils at the site was discontinued in the mid-1960s; thereafter until 1977 the site was an oil storage facility. Some oil accepted by the facility contained polychlorinated biphenyls (PCBs) and other contaminants. Oil was stored in eight metal storage tanks, at least one underground tank at the north end of the site, and in three unlined lagoons in the southern portion of the site. Residuals that settled in the lagoons were separated from light oils that were decanted and then sold as fuel oil.

### 1.2.3 Summary of Remedial Activities to Date

The primary source of impacted groundwater at the site was waste oil deposited in the unlined lagoons and aboveground storage tanks prior to 1977. The aboveground tanks and their contents were removed for offsite disposal as part of the removal action activities performed at the site during the 1980s, many years prior to OU-1 being remediated. The initial remedial investigation that was completed in 1987 on behalf of the New York State Department of Environmental Conservation (NYSDEC) outlined the potential contaminants of concern in the groundwater as PCBs, and Volatile Organic Compounds (VOCs) including benzene, toluene, ethylbenzene and xylenes (“BTEX”), 1,1-dichloroethane (DCA) and *cis*-1,2-dichloroethene (cDCE). Since then, cDCE has been the constituent found most widely in groundwater in OU-2 above New York State Water Quality Standards (NYSWQS) (5 µg/l).

OU-1 was remediated during 1999 in accordance with OU-1 Statement of Work requirements. Remediation at OU-1 consisted of excavating soil/source material, using a PCB concentration greater than 10 mg/kg as the definition of source material. The stockpiled, excavated material was placed in a pugmill, cement was added to solidify/stabilize the material, and the treated material was placed above the high-water table onsite. Additionally, sediment material exceeding 1 mg/kg PCB concentration from the Western Wetland portion of OU-2 was removed, solidified/stabilized, and the treated material was placed in the landfill, covered and capped in 2001. The covered and capped area is designated “Landfill” on Figure 1-2.

Groundwater within OU-1 and a limited area within OU-2, south of OU-1 are impacted with VOCs associated with the oil sludge. The groundwater cleanup levels in the OU-1 Record of Decision (ROD) for VOCs are 50 µg/l, with 5 µg/l for benzene and 2 µg/l for vinyl chloride. OU-1 groundwater now meets the OU-1 ROD cleanup levels. The cleanup levels for OU-2 are lower, at 5 µg/l for VOCs and 2 µg/l for vinyl chloride. The remedy for OU-2 groundwater is natural attenuation. The difference in cleanup levels between the two Operable Units, necessitated

controlling migration of OU-1 impacted groundwater into OU-2. Migration was controlled by a pump and treat system from 2000 until September 19, 2009, by *in situ* chemical reduction from 2009 to 2015, by *in situ* bioremediation via enhanced reductive dechlorination in 2016, and by liquid activated carbon in 2018.

Natural attenuation remains the remedial alternative for OU-2. Following the November 2002 sampling round, certain wells within OU-2 needed to be replaced due to a variety of factors, including: physical damage, physical limitations of wells with less than 1-inch inner diameter, screened intervals that penetrated two different geological strata, and concern about reproducibility of sampling results from round to round. Additional wells were required to monitor natural attenuation accurately, to determine the leading edge of the contaminant plume, and to satisfy landfill monitoring requirements.

Between January 28, 2003 and May 5, 2003, 14 existing groundwater monitoring wells were abandoned, and 14 new 2-inch groundwater monitoring wells were installed at the York Oil Site. The abandoned wells were WQ-2, YO-02, YO-02R, YO-12, YO-12U, YO-12A, YO-12R, YO-14, YO-14AU, YO-14AL, YO-29S, YO-29D, YO-30S, and YO-30D. The following replacement wells were installed at a minimum of 10 ft. away from the wells that they replaced: YO-14ALX, YO-14X, YO-02X, YO-02RX, YO-12AX, YO-12RX, YO-29SX, YO-29DX, YO-30SX, and YO-30DX. The following new monitoring wells were also installed: YO-110S, YO-110D, YO-113D, and YO-56D. A description of the well abandonment and installation is presented in Section 2 of the *Monitored Natural Attenuation Documentation Report No. 3*, prepared by CDM Smith and submitted to NYSDEC on October 24, 2003.

In August 2004, two additional new bedrock wells, YO-111D and YO-112D were installed in the downgradient portion of OU-2. The new wells were intended to further delineate the downgradient limits of the volatile organic compound (VOC) plume.

Source control measures at OU-1 were completed during the fall of 2001 and sampling for monitored natural attenuation (MNA) was performed until April 2005. In correspondence dated April 11, 2005 from the OU-1 and OU-2 Project Coordinator at ***de maximis, inc.*** (*de maximis*) to Mr. George Jacob of the U.S. Environmental Protection Agency (USEPA), Alcoa requested changes to the groundwater analytical program and method of sample collection. With USEPA concurrence, the groundwater analytical program was reduced to VOCs only for all groundwater monitoring wells in the fall of 2005. This change was supported by eight rounds of MNA sampling data from April 2001 through April 2005, each of which demonstrated the same redox/biodegradation conditions across the study area. In addition, the method of collection was changed from low flow sampling to passive diffusion bags (PDBs) after a side-by-side comparison indicated comparable results. The landfill monitoring program (OU-1) is included in the groundwater monitoring program that was submitted to the USEPA and will be discussed with the other OU-2 wells.

In June 2006, five wells were installed in OU-2. The new wells included three bedrock wells (YO-114R, YO-115R and YO-116R) and two overburden wells (YO-116D and YO-116S). These new wells were installed to allow for additional site characterization and groundwater monitoring.

1.2.3.1 In Situ Chemical Reduction Plot Study

Groundwater extraction and treatment was selected in the OU-1 ROD to treat a plume of groundwater contamination, originally thought to consist of total phenolic compounds. The ROD anticipated reaching clean up targets within three years of operation of the groundwater extraction and treatment system. Consistent with the OU-1 ROD, a pump and treat system was designed and constructed, which achieved full operation in March 2002. Phenolics were not found to be an issue; however, a chlorinated volatile organic compound (cVOC), cDCE, was the primary constituent in the system influent.

An investigation was conducted in the spring of 2009 of the former lagoon area immediately upgradient from the groundwater treatment system (GWTS), which revealed approximately 2,000 cubic yards of subsurface soil containing total petroleum hydrocarbons (TPH). In addition to the TPH, some soil samples contained cDCE and tetrachloroethene (PCE). PCE degrades to cDCE through an intermediate product, trichloroethene (TCE). PCE and TCE have partitioned into the TPH, and continually dissolve into the groundwater. TPH could potentially serve as an electron donor that facilitates biological degradation to cDCE.

Previous analysis of MNA data identified the lack of electron donor as a limiting factor for successful biological degradation of cDCE. Full-scale biostimulation using soluble electron donors has been successfully applied at a number of sites, suggesting that installing a line of injection wells and injecting a soluble electron donor could successfully stimulate biodegradation of residual cDCE emanating from the OU-1 Site, and complete the degradation process within the OU-2 plume.

An evaluation of feasible alternatives was performed, and EHC® was identified as a preferred *in situ* remedial option for OU-1 groundwater. EHC® is a patented combination of controlled-release carbon and zero valent iron (ZVI) particles used for stimulating *in situ* chemical reduction (ISCR) of otherwise persistent organic compounds in groundwater. The evaluation considered not only the implementability, effectiveness and cost, but the sustainability and effect on greenhouse gas emissions of the various options.

The EHC® process was proposed to the USEPA at a meeting in February 2009, and a full-scale pilot study was proposed in July 2009 and approved by the USEPA in August 2009. In September 2009,

the groundwater extraction and treatment system was shut down on September 21, 2009 and the system was drained for long-term inactivation.

Phase I of the *in situ* chemical reduction pilot study was completed in October 2009 with the installation of a 200-foot long EHC®-amended permeable reactive barrier (PRB) at a targeted depth of 6 to 35 feet below ground surface (bgs). Quarterly groundwater sampling was initiated following the EHC® injection. Post-injection groundwater level measurements in the vicinity of the PRB did not indicate any changes to the direction of groundwater flow. Groundwater sampling was reduced to semiannual during 2012.

As part of the *In Situ* Chemical Reduction Pilot Study, five new monitoring wells (YO-117S, YO-117D, YO-118, YO-119, and YO-120) were installed in October 2009.

1.2.3.2 In Situ Chemical Reduction Plot Study – Phase II

In October 2011, in a letter to USEPA, on behalf of Alcoa, *de maximis* proposed a Phase II to the *in situ* chemical reduction pilot study, with the goal of enhancing the performance of the PRB through application of additional EHC®. The EHC® was to be injected using direct push technology (DPT), with locations spaced closer together as compared to Phase I to ensure creation of a continuous treatment zone. In addition, the barrier would extend further to the west to create a greater influence on the YO-12 well cluster area. The total length of the PRB would be approximately 240 feet and extend to a depth of 6 to 43 feet bgs. To address the recent detections of BTEX compounds, *de maximis* recommended that an EHC® product containing a sulfate salt be used to further stimulate the degradation of BTEX by anaerobic oxidation via sulfate reduction.

From October 31 to November 1, 2011, Paragon Environmental Construction, Adventus, *de maximis* and CDM Smith were onsite to perform the Phase II EHC® injection via DPT. Numerous attempts were made to direct push to 43 feet bgs that were ultimately unsuccessful due to subsurface conditions (cobble layer). One injection point was drilled to depth, but the EHC® could not be injected because the injection tip would not open. Once the injection tip was retrieved it was evident the cobble layer had damaged the injection tip, rendering the rod unusable.

After two field days of unsuccessful attempts, the Phase II EHC® injection was abandoned. Adventus, *de maximis*, Alcoa and CDM Smith decided to explore new avenues for possible EHC® injection in spring 2012. Meanwhile, the December 2011 groundwater sampling round indicated only one well where the OU-1 cleanup standards were exceeded. Based on the difficulties encountered during the October 2011 injection attempt and the subsequent improvements in groundwater quality, semi-annual groundwater monitoring was extended through 2014.

1.2.3.3 In Situ Bioremediation via Enhanced Reductive Dechlorination Pilot Study

On November 6th, 2015, on behalf of Alcoa, *de maximis* proposed a Work Plan to the USEPA to inject LactOil® at the York Oil Superfund Site. The lack of an electron donor was identified as a limiting factor for successful biodegradation of cDCE. From November through December 2015, five new wells were installed in OU-1. YO-121, YO-122, YO-123, and YO-124 are overburden wells used for injection of LactOil®.

An environmental fracturing process was used to emplace enhanced permeability sand lenses out to a radius of approximately 15 to 20 feet from the injection boreholes. The permeability enhancement injection process (environmental fracturing) caused a "tensile parting" of the soil to emplace a sand and guar mixture in a planar lens extending out from the injection borehole. Once the guar breaks down or is extracted during well development, the sand-filled lens remains to provide a high permeability injection pathway that can be used multiple times to inject electron donor to sustain a biological treatment zone between OU-1 and OU-2.

The use of injection wells means that instead of the solid/slurry EHC, a liquid reagent was used. A 5 percent solution of LactOil® was pumped into the four injection wells, with a total of 5,000 pounds, approximately 1,400 gallons of LactOil® injected using hydraulic fracturing into the subsurface in the fall of 2015. Groundwater monitoring occurred during 2016 to evaluate effectiveness of this treatment.

1.2.3.4 In situ Sorption/Bioremediation via PlumeStop® Liquid Activated Carbon (LAC) Pilot Study

On October 29th, 2018, on behalf of Alcoa, *de maximis* proposed a Work Plan to the USEPA to inject PlumeStop®, a liquid activated carbon (LAC) at the York Oil Superfund Site. PlumeStop® was selected to address increasing BTEX compounds in the upgradient portion of the OU2 Southern Wetlands. The LAC would also act as binding sites for both BTEX compounds and cVOCs.

From November 6, 2018 through November 9, 2018, representatives of Regenesis® were on-site to conduct the injection of the PlumeStop® product into the designated injection wells YO-121, YO-122, YO-123, and YO-124. The pressure exerted on each well was maintained at 10 psi while the concentration of the LAC/water slurry was varied throughout the injection. The initial application of 60% of the total LAC mass was followed by "chasing" that with the remaining 40% of the LAC mass dissolved in significantly more water. This served to move the LAC out of the sand zones emplaced during the hydro-fracturing when the injection wells were installed. Approximately 4,800 gallons of LAC/water slurry was injected into each well. The wells are planned to be sampled as part of the routine 2019 sampling program in April. The results of the

2019 sampling rounds will be used to assess the effectiveness of ongoing bioremediation and the PlumeStop® injection.

### 1.3 Site Hydrogeology

The Southern Wetland overburden and shallow bedrock can be classified as two groundwater zones, consistent with the *OU-2 Contamination Pathways Investigations Report* (Blasland, Bouck and Lee, Inc. (BBL), 1998). The shallow zone consists of unconsolidated glaciated material, located from the surface to approximately 15 to 35 ft. bgs. It is less dense and coarser than the dense till directly beneath.

The deep zone begins approximately 15 to 35 ft. bgs and consists of the dense till and 10 to 15 ft. of weathered bedrock. The bedrock underlying the overburden in OU-2 comprises the Theresa Formation (sedimentary layers of sandy dolomite and calcareous sandstone) and Potsdam Sandstone.

Previous site groundwater quality data indicate that the primary migration pathway for constituents of concern appears to be the deep zone within the Southern Wetland. This is due to shallow groundwater from OU-1 migrating vertically to the deep zone within OU-1 and then horizontally downgradient to the south to the Southern Wetland in OU-2. The monitoring wells sampled during the 2018 monitoring rounds are shown on Figure 1-2. The *Contamination Pathways Investigations Report* (BBL, 1998) uses historical data to calculate the average hydraulic conductivities for the shallow and deep aquifers, calculations show the conductivities are 3.25 x $10^{-4}$ cm/sec and 3.05 x $10^{-5}$ cm/sec, respectively.

### 1.4 Groundwater Migration to Potential Receptors

There are no existing potable drinking water wells downgradient (i.e., south) of OU-1 that could be impacted by groundwater migrating from OU-1. The Southern Wetland borders OU-1 and extends approximately 2,500 ft. to the south as undeveloped land. A detailed discussion of migration pathways and receptors was presented in the *Contamination Pathways Remedial Investigation Report* (BBL, 1998). The results of the study concluded that groundwater flow is generally to the south from the OU-1 site, and the likely point of groundwater discharge to surface water is Lawrence Brook. As there are currently no potable water wells in the area between the OU-1 site and Lawrence Brook, **"**human exposure to groundwater is not considered a viable exposure pathway under current conditions. Moreover, future exposure via potable groundwater use is considered extremely unlikely due to the physical characteristics of the southern wetland; i.e., the fact that it is a wetland area would preclude residential or other development due to the physical and regulatory constraints" (BBL, 1998).

Based on an estimated approximate groundwater travel velocity in the deep OU-2 zone of 1.2 ft. to 7.1 ft. per year determined from 2018 groundwater elevation data, groundwater may have traveled 277 ft. to 632 ft. over the 64 years since startup of the York Oil recycling operation. This

estimate does not account for the effect of the OU-1 pump and treat system "pulling" groundwater back toward OU-1 between 2000 and 2009, when the pump and treat system was operational. Recent monitoring data contradicts the travel distances calculated from the groundwater elevation data and suggests that preferential flow paths might exist in the deep aquifer, possibly due to fracture flow. This fracture flow could facilitate a small amount of higher velocity transport than is expected for the bulk groundwater flow. The ultimate discharge point for groundwater still appears to be Lawrence Brook. The nearest potential current human receptors are homes located approximately one-half mile (2,840 ft.) south of OU-1 along US Route 11 on the far side of Lawrence Brook. Based on the estimated average groundwater advective travel velocities in the deep zone, it would take approximately 575 years for site groundwater to reach these homes if the groundwater flow were to pass below Lawrence Brook. Institutional Controls that prohibit the installation of supply wells and the use of groundwater have been implemented according to the York Oil OU-2 Record of Decision (ROD) requirements and as further requested by the USEPA to minimize the possibility that impacted groundwater could affect human health. An Environmental Protection Easement and Declaration of Restrictive Covenants have been placed on the three properties where the plume is located. These include tracts identified on the Franklin County tax maps as 120-1-9, 120-5-3 and 120-5-6 (section-block-lot numbers). These deed restrictions preclude the installation of groundwater wells and prohibit any use of the property that would interfere with investigative or remedial work. The locations of the parcels with Institutional Controls are shown on Figure 1-3.

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

### 2.1 Overview

The responsibilities of the various team members are summarized below by organization. A project organization outline, including the principal data user and decision makers, is included in Table 2-1.

*Project Coordinator*
Responsibilities and duties include:

- communicate with USEPA, CT DEEP, Project Team, and other stakeholders;
- direct Project Team;
- oversee all aspects of the OM&M work; and
- provide approval for major project deliverables.

*Project Managers*
The OM&M components will be managed by various Task Managers. Duties of each Task Manager include, as appropriate:

- manage relevant day-to-day activities;
- develop, establish and maintain files on relevant site activities;
- review data reductions from the relevant site activities;
- perform final data review of field data reductions and reports on relevant site activities;
- verify that corrective actions are taken for deficiencies cited during audits of relevant site activities;
- perform overall QA/QC of the relevant portions of the site activities;
- review relevant field records and logs; and
- instruct personnel working on relevant site activities.

*Field Program Coordinator*
Responsibilities and duties include:

- coordinate field and laboratory schedules pertaining to relevant site activities;
- request sample bottles from laboratory;
- review field instrumentation, maintenance and calibration to meet quality objectives;
- prepare reports pertaining to relevant field activities;
- maintain field and laboratory files of notebooks/logs, data reductions and calculations; and
- provide complete copies to the Project Coordinator.

*Field Project Manager*
Responsibilities and duties include:

- perform field procedures associated with the investigations as set forth in the OM&M Plan;
- perform field analyses and collect QA samples;

- calibrate, operate and maintain field equipment;
- record field data;
- maintain sample custody; and
- prepare field records and logs.

*QA Manager*

Responsibilities and duties include:

- review laboratory data packages;
- oversee and interface with the analytical laboratory;
- coordinate field QA/QC procedures with Task Managers (including audits of field activities), concentrating on field analytical measurements and practices to meet data quality objectives (DQOs);
- review field reports;
- perform and review audit reports as necessary and appropriate;
- prepare interim QA/QC compliance reports as necessary and appropriate;
- prepare a QA/QC report in accordance with USEPA guidelines, including an evaluation of field and laboratory data, and data usability reports; and
- five percent QA/QC check of imported field and laboratory results versus the hardcopy.

*Database Manager*

- data collected in field will be transcribed from field form or notebooks and tabulated into database;
- analytical results provided by the laboratory in the form of an electronic data deliverable (EDD) will imported into the database;
- tabulation of the data to end users; and
- Report/Graphics preparation.

*QA Coordinator*

Responsibilities and duties include:

- preparation of QAPP; and
- maintain QAPP.

### 2.1.1 Analytical Laboratories

General responsibilities and duties of the analytical laboratories include:

- perform sample analyses and associated laboratory QA/QC procedures;
- supply sampling containers and shipping cartons;
- maintain laboratory custody of sample; and
- adhere to all protocols in the QAPP.

*Project Manager*

Responsibilities and duties include:

- serve as primary communication link between field staff and laboratory technical staff;
- monitor workloads and maintain availability of resources;

- oversee preparation of analytical reports; and
- supervise in-house chain of custody.

*Laboratory QA Manager*
Responsibilities and duties include:
- supervise personnel reviewing and inspecting all project-related laboratory activities; and
- conduct audits of all laboratory activities.

**2.1.2 United States Environmental Protection Agency**

*Remedial Project Manager*
Responsibilities and duties include:
- provide the USEPA's reviews and approvals of submitted documents;
- coordinate with other agency stakeholders; and
- monitor progress of site activities.

*QA Technical Staff*
Responsibilities and duties include:
- review and approval of the QAPP;
- review of the QA/QC portion of any submitted report; and
- perform field and laboratory audits, if necessary.

## 3.0 QUALITY ASSURANCE OBJECTIVES

### 3.1 General

This section presents criteria for developing and assessing the quality of a sampling and analysis program. The data quality associated with the environmental measurement data is a function of the sampling process used to collect the data and the analytical process used to analyze the sample. Each component has its own potential sources of error and biases that can affect the overall measurement process.

The basic data quality objectives for all data collection activities are that:

- Data is appropriate to the task;
- Data is as complete as possible;
- Data is traceable to a certified source; and
- Data gathered by different staff members or at different times is comparable.

Data quality is assessed in terms of its precision, accuracy, representativeness, completeness and compatibility. The appropriateness and completeness of collected data are primarily determined by the judgement of technical personnel with considerable experience in the field of site investigation.

Data reduction, validation and reporting are discussed in Section 8.

### 3.2 Specific Program Objectives

Program data objectives are generally based on requirements to conform to NYSDEC groundwater and surface water quality standards (WQS) discharge limits. These criteria will dictate the type of analyses required and are discussed below.

#### 3.2.1 Water Quality Standards

NYSDEC has established water quality standards and guidance values for organic and inorganic parameters in each class of surface water and groundwater. Surface waters and groundwater are classified based on the best usage of the water, which, for example, could include uses such as potable water supply, fish habitat or contact recreation.

These standards and guidance values are used as target concentrations to determine the effectiveness of remedial and post-closure operation measures and to assist in the determination of whether modified or additional surface or groundwater management measures are required.

Table 3-1 presents the parameter list used at the site for semi-annual sampling.

### 3.3 Analytical Methods

This subsection presents criteria for selecting appropriate analytical methods based on the objectives of the sampling program.

Laboratory analysis will be conducted for general monitoring purposes following procedures outlined in either the USEPA Contract Laboratories Procedure (CLP) or New York State Analytical Services Protocol (ASP) Category B purposes.

General monitoring work is typically conducted using standard USEPA SW-846 or USEPA 40 CFR Part 136 analytical protocols and reporting requirements.

General monitoring analyses are typically performed using USEPA 40 CFR Part 136 or SW-846 Methods. Results are presented in laboratory reports typically containing:

- narrative;
- results; and
- supporting documentation, such as: time of sampling, time of receipt by laboratory, date/time of extraction (if any), date/time of analysis, chain-of-custody records and results of quality control analyses which may include: matrix spike/matrix spike duplicate, method blanks, surrogate spike standards and laboratory control samples.

CLP analyses are typically performed using CLP or ASP Category B protocols. These protocols are highly standardized and provide much greater data documentation than the standard USEPA water/wastewater or SW-846 protocols. CLP and ASP Category B reports include additional information such as internal chain-of-custody documentation, raw data and calculations, chromatograms and instrument calibration data. Report format is also strictly stipulated in the protocols. CLP reporting protocols are employed in methods specifically designated as CLP methods. ASP Category B protocols can be applied when CLP methods are not available in order to produce a laboratory report containing a similar level of detail to a CLP report. CLP analyses and ASP Category B reporting methods must be performed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) CLP certified laboratory.

A selected analytical method specifies not only the procedure for conducting the laboratory analysis, but also the list of analytes and the standard detection limits for the analysis. Instances occur when the objectives of a sampling and analysis program require a modified list of analytes or lower quantitation limits than published in this document. If laboratories are made aware of

project objectives, they can often accommodate these changes without method modification. It is important, therefore, to specify the required analytes and detection limits in the program-specific sampling analysis work plans and to discuss feasibility of achieving them with the QA Manager and the laboratory selected to do the analytical work prior to the sampling program. If objectives are not achievable without method modification, the modifications must have written approval from the NYSDEC Quality Assurance Section (QAS).

The methods for the analysis of organic compounds include extensive lists of parameters. A Target Compound List (TCL) for organic compounds and a Target Analyte List (TAL) for inorganic compounds have been developed for NYSDEC CLP program work and for waste characterization in the RCRA program. The York Oil Site currently uses a more abbreviated list of analytes because the groundwater and surface waters are now well-characterized.

The following descriptions of analytical methods are designed to assist in the selection of the most appropriate analysis method for a program. Unless there is a reason for changing methods, the standard methods in this section should be used. Lists of analytes, holding times and standard reporting/quantitation limits for the methods are included in Table 3-2.

It is critically important that method numbers, holding times, specific analyte lists, and detection limits be specified in each sampling and analysis work plan and documented in the resultant analytical reports. It is equally important that these issues be discussed with the selected analytical laboratory prior to conducting the work. Critical issues to consider are:

- Holding time requirements for remediation work in New York differ from those enforced by USEPA and most other states. The significant difference is that NYSDEC requires that samples be received at the laboratory within 48 hours of collection. This requirement is known as the Verified Time of Sample Receipt (VTSR). The holding time for the first process in the analytical protocol is referenced to the VTSR.
- NYSDEC policy prohibits filtering of metals samples. If program objectives require the analysis of filtered samples, an unfiltered sample must also be analyzed unless specific approval is received from the NYSDEC.

The analyte lists should normally be specified for most analytical programs requiring analysis for volatile organics, phenols, cresols or polycyclic aromatic hydrocarbons (PAHs). The specification of target lists should be communicated to the analytical laboratory through submission of a project plan and be documented on the chain-of-custody form submitted with the samples.

### 3.3.1 Assurance of Detection Limits

Quantitation limits are the concentrations at which the analyte can usually be reliably quantified. In some cases, the laboratory may be able to achieve lower limits. However, sometimes because of reasons such as dilution or matrix interference, the quantitation limits reported by the laboratory may be elevated. Method or instrument detection limits are generally the lowest concentration of an analyte that must be present in order for the analyte to be detected using the respective method under ideal conditions. Whenever possible, the laboratory should report results below the quantitation limit but above the detection limits as qualified (estimated) data.

Table 3-2 presents the standard list of analytes and various quantitation limits for aqueous samples for USEPA CLP methods.

In order to select an appropriate method, the standard list of analytes and detection limits should be carefully reviewed. If compliance with specific concentration standards is required, that information should be conveyed to the contract laboratory prior to the submission of samples. Requirements for specific quantitation limits should also be included in the sample chain-of-custody record submitted to the laboratory.

### 3.3.2 Holding Times

Sample holding times for organic and inorganic parameters are specified in the NYSDEC ASP protocols. The New York State holding time requirements are used in this QAPP and must be included in each sampling.

NYSDEC ASP holding times are specified from VTSR by the laboratory. In addition, the laboratory must receive the samples within a maximum of 48 hours from time of sample collection.

### 3.3.3 Standard Analytical Methods for CLP/NYSDEC ASP Category B Work

All sample analysis conducted for CLP purposes will be Superfund CLP analysis as specified in the 1995 NYSDEC ASP or an updated version in effect at the time of the sampling and analysis program. Methods are specified based on the sample matrix and the required detection limits. CLP methods are applicable to all Superfund TCL/TAL compounds.

Where CLP methods are not available for specific analytes or analytical techniques, the appropriate non-CLP method should be selected, and ASP Category B deliverables specified.

Table 3-2 summarizes the CLP methods, target compounds, required quantitation limits and hold time for the organic and inorganic parameters currently requested for the York Oil program.

### 3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population and provides a measure of parameter variations at a sampling point or an environmental condition. Representativeness will be assessed through field duplicates and trend analysis of historical data. It is best addressed by defining data quality objectives, preparing detailed sampling and analytical plans, and specifying and executing proper sampling standard operating procedures.

### 3.5 Precision and Accuracy

Precision measures the reproducibility of measurements under a given set of conditions and can be assessed by replicate measurements of reference materials, environmental samples or sample matrix spikes. Standard deviation and relative percent difference (RPD) are two commonly used estimates of precision. The overall precision of environmental measurement data is a mixture of sampling and analytical precision.

RPD is calculated according to the following equation:

$$RPD = \frac{|(x1 - x2)|}{(x1 + x2)/2} \times 100$$

where:

x1 = first sample value

x2 = second sample value (duplicate sample)

Accuracy expresses the amount of bias that exists in a measurement system. It is a determination of how close a measurement is to the true value of the parameter being measured.

Accuracy is commonly estimated by the comparison of the true value of a reference material or matrix spike with the actual observed value obtained from the analysis or by the percent recovery of a known amount of a target analyte added to the sample matrix prior to analysis (matrix spike).

Major sources of bias encountered in a measurement system are false positive and false negative results. The use of surrogate and matrix spikes safeguard against false negatives. The routine analysis of blanks provides the data required to eliminate false positives from the measurement system. The overall accuracy of the laboratory component of the environmental measurements will be monitored through the use of laboratory matrix spikes, surrogate spikes and laboratory check standards as well as through the use of laboratory, trip and field blanks.

The QA objectives in Tables 3-3 and 3-4 are presented as goals and will be used for comparison in internal data usability assessments. Table 3-3 displays precision and completeness goals for aqueous and solid phase samples for York Oil. Precision goals are based on the RPD of field duplicates and the RPD between matrix spiked duplicates. Table 3-4 displays Percent Recovery, (%R) goals which are based on laboratory control sample and matrix spike percent recovery.

Site-specific sampling and analysis work plans may further define the analytical procedures, deliverables, packages and QA objectives required.

**3.6 Completeness**

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. A completeness goal is required to assure that enough data of sufficient quality are obtained from the measurement system to fulfill the objectives of the project.

$$\text{Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100$$

For all programs, the goal is 100 percent completeness. Field or laboratory conditions may result in program completeness of less than 100 percent due to lost samples or test results rejected through the data validation process. Deviations from this goal will be discussed in the sampling and analysis reports, in the laboratory case narrative and evaluated in the data validation report and data usability assessment. The goals published in Table 3-3 represent completeness typically achieved in USEPA field and laboratory programs.

## 4.0 SAMPLING PROCEDURES

### 4.1 General

This section describes the sampling protocols and procedures to be followed before and during collection of groundwater samples. Protocols include the methods for sample container preparation and sample preservation. Sampling equipment and procedures are addressed.

Prior to sampling, the following procedures shall be followed:

1. Prepare an equipment list and check operations of all mechanical apparatus (generators, meters, etc.). Have a maintenance/tool kit on site to provide the means for simple repairs.
2. Review the site plan for sampling locations and plan the order of sampling. Preferably sample least contaminated locations first to reduce the possibility of cross-contamination.
3. Notify the contracted lab of the sampling dates, the types of analyses required, and the quantity of sample containers needed.
4. Pre-arrange the method for transporting the collected samples to the laboratory to minimize the travel time.
5. Organize the daily work plan to reduce the chance of cross-contamination by placing equipment on plastic sheeting or using a truck tailgate for field instruments. Keep all trash in plastic bags to maintain good housekeeping.
6. Review site H&S Plan for personal safety equipment requirements.
7. When field measurements are required, the instruments will be calibrated as follows:
   - *Calibration verification standards for all field test equipment need to be analyzed and recorded at the start and end of each day.*
   - *The pH meter will be calibrated and checked with three standards (pH 4, pH 7 and pH 10) at the beginning and end of each day and during sampling as necessary to maintain calibration. Calibration check measurements will be recorded in the field logs.*
   - *The conductivity meter will be calibrated with known standards of potassium chloride at the beginning and end of each day.*
   - *The oxidation/reduction potential meter will be calibrated with known standards at the beginning and end of each day.*
   - *The turbidimeter will be calibrated with known standards according to the manufacturer's instructions at the beginning of each day. Check standards need to be analyzed and recorded at the start and end of each day.*
   - *The dissolved oxygen meter will be calibrated using the known barometric pressure from a local weather service at the beginning and end of each day.*

- *All calibration verification information will be recorded in a field log book. Manufacturers' names and model numbers of equipment will also be recorded in a log book.*

### 4.2 Sample Container Preparation

Sample containers will be provided by the contract laboratories. New pre-cleaned sample containers will be used for the collection of all samples. For CLP/ASP Category B work, laboratory preparation of sample containers must meet USEPA requirements as delineated in OSWER Directive No. 9240.0-05, July 1989 (I/Chem Series 300 or NYSDEC ASP Exhibit I equivalent). For other analytical work, sample container preparation shall, at a minimum, meet the standards of I-Chem Certified ™ 200 Series or NYS ASP Exhibit I equivalent. The container size and material (glass or polyethylene) for each parameter is presented in Table 4-1.

### 4.3 Sample Preservation

The recommended preservatives for various constituents are given in Table 4-1. Other information provided in the table is an estimation of the amount of sample required for the analysis and the suggested type of sample container. These should be verified through the contract laboratory prior to sampling.

### 4.4 Groundwater Sampling Protocol

#### 4.4.1 Introduction

This section describes the purging and sampling protocols for the groundwater monitoring well sampling. The methods used at the York Oil site include:

- sampling by PDB, and;
- low-flow purge and sample with a peristaltic pump.

Every well that is included in the York Oil sampling program is currently fitted with dedicated tubing. If a reduction in tracked parameters in the groundwater monitoring program occurs, each well will be fitted with a PDB sampler. The procedures defined in Sections 4.5.4 and 4.5.5 are appropriate to the method of sampling.

The method(s) selected for a sampling event depend on the type of wells being sampled and the objectives of the sampling program. General procedures for sampling monitoring wells include pre-sampling procedures, water level measurement, well purging and sample collection. Sampling protocols must be strictly followed to ensure that the collected groundwater samples

are representative of actual subsurface conditions. Correct procedures are particularly important at hazardous materials sites where, in addition to sample integrity, other considerations such as cross-contamination, safety and legal responsibility are of concern.

The number of QA/QC samples to be collected is presented in Section 9 of this document.

**4.4.2 Pre-Sampling Procedures**

Prior to sampling, general information concerning the weather, site, well, and sampling techniques should be recorded in the field sample log. Data will be recorded in a complete and thorough manner. Items to be recorded for each sample include:

- site name;
- weather conditions;
- date and day;
- well identification number;
- time of collection;
- sample number;
- depth and diameter of well;
- type of sample;
- preservation type;
- appearance and any other relevant data;
- filter size and procedure (if used); and
- sampler's initials.

The condition of the well shall also be described in the field sample log. Features of the well which should be inspected include the well casing, lock, and downhole equipment. The grout around the outside of the casing should also be inspected. Field personnel shall pay particular attention to discolorations, foreign substances, deterioration and the integrity of the well casing grout seal. Locks which are either rusted or frozen shut should be cut and replaced. At no time will field personnel use petroleum based lubricating oils or solvent-based deicers to free a well lock. Vegetable-based oils may be used if approved by the QA Manager.

Decontaminated sampling equipment must not touch bare ground. If necessary, plastic sheeting should be placed around the well so decontaminated equipment can be stored.

### 4.4.3 Water Level Measurements

The water level of each well will be measured to ± 0.01-foot with an electronic detector (M-scope) prior to purging each well. If a water level round is to be taken at the site as part of the sampling round, water levels will be taken at every well before purging and sampling begins. If there is dedicated equipment in the well and the M-scope can fit down the casing, do not remove the equipment prior to taking the water level. If dedicated equipment must be removed from below the static water level, the water level should be allowed to stabilize prior to taking the water level reading.

The water column height, which is used to calculate purge volume, is the difference between the water level and the depth to the bottom of the well (from the well installation record). The purge volume can then be calculated from the volume of the water column (Table 4-2). The water level probe (M-scope) should be rinsed with deionized, distilled water.

Sounding the well to determine the depth to bottom of screen is not recommended at each sampling event as this disturbs sediment that may have accumulated at the bottom of the well. Also, the decontamination of the electronic probe and a significant length of cable is time-consuming and increases the potential for cross-contamination. Well sounding should, however, be done once a year.

### 4.4.4 Well Purging

Purging is only required when using a peristaltic pump. If PDBs are installed, the well has already reached steady-state conditions and purging in not needed. Therefore Section 4.5.4 and all subsections will focus on low-flow purge via peristaltic pump and dedicated tubing.

#### 4.4.4.1 Purge Method

Wells to be sampled by use of PDB need not be purged prior to deployment.

For wells to be sampled by the low-flow sampling method, a peristaltic pump with tubing dedicated to the well will be used. The well is pumped at a low flow rate with a constant water column depth. The field parameters (temperature, pH, specific conductivity and turbidity) should be measured periodically. When these parameters have stabilized over three consecutive readings, the sample should be collected.

Purging shall be conducted with the equipment provided at each well. Existing monitoring wells are typically about 15-60 feet deep and 2 inches in diameter. The method of purging is low flow

sampling with a peristaltic pump. The low-flow purge and sample methodology is used to minimize sample turbidity.

If the purging equipment requires electrical power, a gasoline generator may be used. The sampling teams should be aware that gasoline and/or gasoline containing equipment must be kept separate from sampling equipment and containers. Sampling team members will wash hands and use new gloves after handling gasoline containing equipment. The gasoline generator must be operated as far as possible and downwind from the wellhead.

**4.4.5 Sampling Monitoring Wells**

4.4.5.1 Low-Flow Sampling with Submersible or Peristaltic Pump

The low-flow purge and sample method consists of using a submersible or peristaltic pump to both purge and sample a well. The well is purged and sampled by pumping at a low flow rate (maximum of ½ gpm but preferably ¼ gpm). Pumping at a low flow rate causes water to flow into the well slowly and minimizes the turbidity generated by flow through the well pack and screen. It also reduces the turbidity caused by the agitation of sediment that may accumulate at the bottom of a well (the plunging effect of bailers and the Waterra system cause this type of agitation in a well).

If dedicated equipment is not installed in the well, the pump assembly (submersible) or suction tubing (submersible) should be lowered carefully into the well and set approximately at the middle of the screen. The well is then pumped at a low flow rate establishing a constant water column depth (measured with an electronic detector – M-Scope) maintained over the pump intake. It is very important that the pump flow rate be adjusted so that a constant water level is maintained in the well. The method states a minimal drawdown, but a maximum for water level draw down should be at least one foot above the top of the well screen. The field parameters (including temperature, pH, specific conductance and turbidity) should be measured periodically. When these parameters have stabilized over three consecutive readings, the pump is drawing water from the formation and the well can be sampled.

After the well has been purged and the field parameters have stabilized, the sample should be collected. To collect the sample, the pump flow rate should be reduced gradually to a maximum rate of 100 ml/min. Sufficient water should then be pumped at this rate to purge the pump discharge line. After one discharge line volume has been purged, the samples should be taken without changing the pump flow rate. Samples should be taken according to the procedures discussed in Section 4.5.6.

The pump must not be turned off between purging and sampling, otherwise purging must be restarted until parameters are stable again. Because the pump is part of the sampling apparatus, if the pump and tubing are not dedicated to the well, they must be decontaminated according to the procedure discussed for bailers. It is recommended that dedicated pumps and tubing be used to minimize decontamination time.

4.4.5.2 Passive Diffusion Bag (PDB) Sampling

Sampling by use of PDB offers a potentially more efficient method of sampling and should be decided on a well-by-well basis based on the parameters to be sampled and analyzed. Samples collected by use of PDB are typically confined to VOC analysis only.

This method utilizes a bag typically made of low-density polyethylene (LDPE) containing laboratory grade organic-free deionized water. A weight is attached, and both are lowered by rope into the well. The apparatus is positioned and anchored at the center point of the screened interval of the well.

After deployment, VOCs will diffuse through the polyethylene until an equilibrium is established. The amount of time that the sampler should remain in the well prior to recovery depends on the time required by the PDB sampler to equilibrate with ambient water and the time required for the environmental disturbance caused by sampler deployment to return to ambient conditions. This typically occurs within two weeks.

At the time of sampling, the PDBs are carefully removed from the well, cut at one corner, and the water is transferred into sample containers.

**4.5.6 Bottle Preparation and Filling**

Prepare bottles and label with site name, well and sample identification, sampler's initials, time and date of collection, type of sample, and preservative type and amount. Detailed labeling procedures are described in Section 5.1.

After sampling is completed, correct labeling and shipping procedures and sample chain-of-custody must be adhered to. These procedures are presented in Section 5.

The most sensitive parameters will be collected first and in the following order:

- volatile organics (purgeable aromatics, purgeable halocarbons);
- TOC;

- metals (total - unfiltered); and
- other inorganics.

4.5.6.1 Volatile Organics

VOC vials will be provided with preservative already in them.

Collect samples with a minimum of agitation and air contact. Fill each of the vials slowly to a high meniscus and screw caps on snugly, with the Teflon side of the cap liner down. Laboratories may require two or three vials. The vials are then turned upside down, tapped gently and checked for entrapped air. If bubbles are present, remove cap and add additional sample to form a high meniscus, close the cap and check for entrapped air.

Put labeled vials in a small plastic bag and immediately place on ice in a cooler.

4.5.6.2 TOC

Samples should be collected with a minimum of agitation. The bottle should be filled slowly so that about 5 percent by volume headspace is present. Immediately place labeled samples on ice in a cooler.

4.5.6.3 Metals, Dissolved and Total

NYSDEC protocols generally prohibit the filtering of samples to be analyzed for metals. If a turbid well is encountered and well redevelopment proves ineffective, it may be desirable to collect both a filtered and unfiltered sample for analysis. If a filtered sample is desired, samples will be filtered through a 0.45-micron membrane filter as soon as practical after collection and prior to preservation.

4.5.6.4 Sulfates and Chlorides

Fill bottles slowly, leaving about a 5 percent by volume headspace. Following collection, mix thoroughly and place sample bottles on ice in a cooler. Preserve samples, as necessary, as defined in Table 4-1.

4.5.7 Chain-of-Custody Forms and Shipment

Sample chain-of-custody forms shall be completed in accordance with the procedures presented in Section 5. Sample shipment procedures are also included in Section 5.

### 4.6 Per- and Polyfluoroalkyl Substances (PFAS)

Samples collected for PFAS analysis will be performed as outlined in the *NYSDEC Guidelines for Sampling and Analysis of PFAS* (January 2020). This guidance is included in Appendix A. Samples collected using the following protocol are intended to be analyzed for per- and polyfluoroalkyl substances (PFAS) by Modified (Low Level) Test Method 537. Sampling and analytical methods for PFAS may change based on technological advancement. The list of PFAS is shown on Table 4-3.

#### 4.6.1 Monitoring Wells and Surface Water Sample Protocol

The Modified (Low Level) Test Method 537 provides PFAS results with reporting limits of approximately 2 nanograms per liter.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFAS. NOTE: Grundfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grundfos pumps and low-density polyethylene (LDPE) bladders for bladder pumps). Selection of sampling devices must be carefully researched. All sampling equipment components and sample containers should not come in contact with aluminum foil, LDPE, glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse should be considered for equipment that does come in contact with polyfluorinated materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with polyfluorinated materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFAS.

All clothing worn by sampling personnel must have been laundered multiple times and dried without using dryer sheets of any type. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples. Collect one field duplicate for every sample batch, not to exceed 20 samples. Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

Prohibited Materials and Equipment

1. Teflon®-containing materials, when possible, should be avoided (e.g., tubing, bailers, tape, and plumbing paste). In cases where Teflon® -containing materials are unavoidable, ensure adequate purging is performed prior to sampling (e.g., in-well pumps) and/or rinse blanks are collected prior to sampling.
2. LDPE or polypropylene containing materials (e.g., bags or containers used to transport samples)
3. Paper products such as waterproof field books, plastic clipboards, binders, spiral hard cover notebooks, sticky notes or glue materials
4. Markers
5. Chemical (blue) ice packs
6. Decontamination soaps containing fluoro-surfactants such as Decon 90
7. Water that is not verified to be "PFAS-free" to be used for trip and decontamination blanks and decontamination processes
8. Water resistant, waterproof, stain-treated clothing or shoes including Gore-Tex™ and Tyvek® materials

Recommended Materials and Equipment

1. HDPE and silicon
2. Materials include: tubing, bailers, tape, plumbing paste
3. Acetate liners for direct push technologies
4. Nitrile gloves – change often
5. Loose paper with Masonite or aluminum clipboards
6. Pens
7. Bags of ice
8. Alconox® or Liquinox®
9. Laboratory supplied and verified "PFAS-free" water to be used for trip and decontamination blanks and decontamination processes
10. Cotton construction is recommended for field clothing and should be laundered a minimum of 6 times from time of purchase due to possible PFAS related treatments.

Fabric softener and dryer sheets must be avoided. Rain gear should be made from polyurethane and wax-coated materials.

**4.7 Sampling for 1,4-Dioxane**

1,4-Dioxane was added as a stabilizer in 1,1,1-trichloroethane (TCA) at percent levels. The detection limit for 1,4-dioxane should be no higher than 0.2 µg/L (ppb).

The only analytical method that Environmental Laboratory Accreditation Program (ELAP) offers certification for is EPA method 8260C. In order to get the detection limits needed, the laboratory will need to use the mass spectrometer in "selective ion monitoring" (SIM) mode. In addition to EPA 8260C SIM, other analytical methods that can achieve the required detection limits include EPA 8270 SIM and EPA 522. The analytical method accepted by the state currently is 8270SIM, the use of 8260 may be accepted when justified by site conditions. EPA Method 8270 SIM provides a more robust extraction procedure and is the preferred method. EPA 522 is reportedly the lowest cost alternative and has the lowest detection limit (in drinking/potable water).

At sites where solvents are not a contaminant of concern, and where 1,4-dioxane is not otherwise a contaminant of concern, 1,4-dioxane should be included in the analyte list for EPA Method 8260C, but the use of SIM mode is not required.

Samples analyzed by EPA 8260C SIM should be collected in three 40 ml vials. Samples analyzed by EPA Method 8270 SIM should be collected in two 1 Liter amber glass jars. Samples analyzed by EPA Method 522 should be collected in bottles fitted with screw caps. Clothing that contains 1,4-dioxane materials must be avoided. Avoid laundry detergents, dish soap, shampoos, and other cleaning products that contain 1,4-dioxane when sampling. An example list of detergent products reported to be free of 1,4-dioxane are listed below:

1. Honest Company
2. Seventh Generation Free & Clear laundry detergent
3. Dreft powdered detergent
4. Sun Burst
5. Planet Ultra Liquid laundry detergent
6. Clorox Green Works Natural laundry detergent
7. Ecos laundry detergent (Earth Friendly Products)
8. Life Tree Laundry Liquid
9. Method Squeaky Green Laundry detergent

The list is referenced from https://www.honest.com/about-us/honestly-free-guarantee and https://www.naturalnews.com/028846_laundry_detergents_dioxane.html.

The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill pre-cleaned bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples. Collect one field duplicate for every sample batch, not to exceed 20 samples.

Sampling and analytical methods for 1,4-dioxane may change based on technological advancement. Any changes will be submitted as an amendment for approval by EPA and NYSDEC.

## 5.0 SAMPLE CUSTODY

This section describes the procedures used to ensure that sample integrity and chain-of-custody are maintained throughout the sampling and analysis program.

A self-adhesive label will be attached to each container.

Sample containers and coolers will be picked up from the laboratory sample custodian, shipped by the laboratory to the site or prepared by the sampling program contractor and stored at a secure location on site.

### 5.1 Field Procedures

During sampling operations, information as outlined in Section 4 will be recorded in the field notebook or on location specific field sheets. As each sample is collected, the bottle label is completed and will contain the following information:

- client name;
- date and time of collection;
- sample identification;
- analysis requested;
- preservative used, if any;
- laboratory name and address;
- sample matrix; and
- sampler's name.

The coolers containing the samples and coolant will be picked up by the laboratory courier from the sampling site. If this doesn’t occur, the cooler is packed for shipping.

A multi-part chain-of-custody record is completed by the sampler and contains the following information:

- project name and number;
- field log book reference number;
- sample number and identification;
- date and time collected;
- sample location/site;
- sample type (matrix);
- analysis request;

- number of containers per sample;
- method of shipment; and
- signature(s) of sampling personnel.

An example chain-of-custody form to be used is shown in Figure 5-1. Similar forms produced by laboratories may be used.

The record is signed in the appropriate place each time possession of the sample changes. With the signature of the relinquisher and the receiver, proper chain-of-custody is maintained at all times. The samples are delivered or shipped to the laboratory at the end of each day and a copy of the record is retained for the files. Samples must be shipped so that they are received at the laboratory within 48 hours of sample collection.

**5.2 Sample Shipment**

This section describes the procedures to be used when samples are to be shipped off site to the laboratory by common carrier.

40 CFR Part 261.4 generally exempts samples of solid waste or samples of water, soil or air which are collected "for the sole purpose of testing to determine its characteristics or composition" from the requirements of:

- 40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste;
- 40 CFR Part 263 – Standards Applicable to Transporters of Hazardous Waste;
- 40 CFR Part 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities;
- 40 CFR Part 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities;
- 40 CFR Part 266 – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities;
- 40 CFR Part 267 - Standards for Owners and Operators of Hazardous Waste Facilities Operating under a Standardized Permit;
- 40 CFR Part 268 – Land Disposal Restrictions;
- 40 CFR Part 270 - USEPA Administered Permit Programs: The Hazardous Waste Permit Program; and
- 40 CFR Part 124 - Procedures for Decision Making.

Provided:

- the sample is being transported to a laboratory for the purpose of testing; or
- the sample is being transported back to the sample collector after testing; or
- the sample is being stored by the sample collector before transport to a laboratory for testing; or
- the sample is being stored in a laboratory before testing; or
- the sample is being stored in a laboratory after testing but before it is returned to the sample collector; or
- the sample is being stored temporarily in the laboratory after testing for a specific purpose (for example, until conclusion of a court case or enforcement action where further testing of the sample may be necessary).

In order to qualify for the exemption, a sample collector shipping samples to a laboratory or a laboratory returning samples to a sample collector must:

- comply with United States Department of Transportation (USDOT), United States Postal Service (USPS) or any other applicable shipping requirements; or
- comply with the following requirements if the sample collector determines that USDOT, USPS or other shipping requirements do not apply to the shipment of the sample. The following information must accompany the sample:
    - Assure that the following information accompanies the sample:
        - *the sample collector's name, mailing address and telephone number;*
        - *the laboratory's name, mailing address and telephone number;*
        - *the quantity of the sample;*
        - *the date of shipment; and*
        - *a description of the sample.*

Samples are to be securely packed into a shipping cooler furnished with coolant ("blue ice" or contained wet ice) and sealed as described earlier in this section.

If the samples are non-hazardous by the above criteria, they can be shipped with the following designation on the shipping label:

- analytical sample;
- non-USDOT regulated; and
- non-USEPA-RCRA regulated.

**5.3 Sample Identification**

A coding system will be used to identify each sample taken during the sampling program. This coding system will provide a tracking record to allow retrieval of information about a particular sample and assure that each sample is uniquely identified.

The following coding system will be used to identify each sample:

| | |
|---|---|
| MW | Monitoring Well |
| P | Piezometer |
| SG | Staff Gauge |

Each location corresponding to each code will be assigned a location ID number in the sampling plan. This number will be sequential for the applicable code. Each water sample collected will be given a three-digit sequential identification number. These numbers will be provided to the sampling contractor prior to each sampling event.

Quality control samples (blanks and duplicates) will be coded in a similar way as ordinary samples. The coding will be blind to the laboratory.

All samples collected will be recorded in field notebooks or field sheets.

## 6.0 CALIBRATION PROCEDURES AND FREQUENCY

### 6.1 Field Instruments

The sampling contractor is responsible for providing, calibrating and maintaining field instruments. Field instruments that are routinely used for sampling activities include a pH meter, temperature probe, conductivity meter, oxidation/ reduction potential meter and turbidimeter. Calibration procedures for other field instruments are presented below. Note that if manufacturer's instructions provided with the instruments differ from those in this section, the manufacturer's instructions must be followed.

#### 6.1.1 Photoionization Detector

Follow the instrument manufacturer's instructions to calibrate the photoionization detector.

The photoionization detector should be calibrated to both a zero-air standard and the manufacturer's recommended isobutylene calibration gas at the beginning of each day of use. More frequent calibration may be necessary depending on adverse weather conditions, battery failure, excess dust or any condition requiring maintenance and repair.

Record in field book the following information:

- instrument calibrated (I.D. or serial number);
- date of calibration;
- method of calibration;
- results of calibration;
- identification of person who calibrated the instrument; and
- identification of the calibration gas (source, type, concentration, lot number).

#### 6.1.2 YSI Field Meter

Follow the instrument manufacturer's instructions to steps to calibrate the YSI field meter.

When field measurements are required, the instruments will be calibrated as follows:

- The pH meter will be calibrated and checked with three standards (pH 4, pH 7 and pH 10) at the beginning of each day and thereafter as necessary to maintain calibration. Calibration check measurements will be recorded in the field logs.
- The conductivity meter will be calibrated with known standards of potassium chloride and the beginning of each day and thereafter as necessary to maintain calibration.

- The oxidation/ reduction potential meter will be calibrated with known standards at the beginning of each day and thereafter as necessary to maintain calibration.
- The dissolved oxygen meter will be calibrated using the known barometric pressure from a local weather service at the beginning and end of each day.
- The turbidimeter will be calibrated with known standards according to manufacturer's instructions at the beginning of each day. Check standards need to be analyzed and recorded at the start and end of each day.
- All calibration verification information will be recorded in a field log book. Manufacturers' names and model numbers of equipment will be also recorded in the log book.

## 7.0 FIELD ANALYTICAL PROCEDURES

### 7.1 General

Laboratory analytical protocols are presented in Section 3.

Field analytical procedures are limited to the use of organic vapor analyzers and the combination pH-temperature-conductivity-turbidimeter. Meter manufacturer's instructions must be followed in making field measurements.

Calibration requirements for field equipment are defined in Section 6.

All field measurements must be recorded in the field logs, dated and signed.

Measurements must be made on sample portions separate from those being submitted to the laboratory. Probes should not contact samples to be tested for trace constituents.

Sufficient time should be allowed for the output readings on sample probes to stabilize. Differing temperature from storage or calibration measurements to field samples may require a few minutes for the meter reading to stabilize.

Test probes should be rinsed and cleaned in between each sample in accordance with the manufacturer's recommendations and Section 6.

Test results should be recorded and reported to three significant figures for all tests.

Quality control procedures defined in Section 6 as well as manufacturer instructions must be followed.

## 8.0 DATA REDUCTION, VALIDATION AND REPORTING

### 8.1 Data Reduction

Data reduction entails the assembling and summarizing of data into a cohesive presentation document, including analytical sample results and the results of quality control sampled. Whenever practical, summary tables and graphical representation of results will be used.

### 8.2 Data Validation

Data validation of the environmental analytical data produced in support of this project will be performed on two levels. The analytical laboratories are expected to assess their results and identify non-conforming data. Outliers should be flagged for easy identification and the analytical report narrative should discuss potential causes of the nonconformance and take appropriate action to eliminate or mitigate its impact on the present data set and future testing.

External validation is performed for all samples collected at the site. The external validator be responsible for the data usability assessment and data validation. Data usability assessments will be applied to analytical results from all laboratory reports relevant to this program. All data packages received will be reviewed internally by the project QA Manager or their designee.

#### 8.2.1 General Monitoring Data

Sample results for engineering support, including routine monitoring in a data package that includes all sample information (date and time collected, chain-of-custody, condition upon receipt), test results, testing detail (method, test date/ time), results of all internal quality control checks associated with the field samples, and a project narrative describing any data anomalies or work not to conforming to standard operating procedures. These data are reviewed in a process termed data quality assessments (DQA). Reported results are reviewed by the project QA Manager or their designee against criteria established in the reference method and in USEPA Region 2 data validation procedures.

This QAPP represents a level of quality assurance independent of the laboratory. This plan covers both the sampling and analytical component of the of the total measurement system. As such, the information generated by following the plan will reflect both laboratory and field sampling performance. This QAPP specifies the inclusion of field blanks, duplicate samples, and other QC samples into the analytical system. These QC samples are prepared by the sampling team so that their true identity is unknown to the laboratory personnel.

An estimate of bias is determined by evaluation of blanks (field blanks, trip blanks, laboratory blanks). The presence of target analytes in any blank and the effect on the sample data will be assessed. Bias is also assessed through the recovery of known amounts or target analytes in LCS, MS/MSD samples and the recovery of system monitoring compounds (also known as surrogates) in certain trace organic tests. The bias element for MS/MSD and system monitoring compounds is compared to reference method criteria, USEPA Region 2 guidance or laboratory generated values.

The results of this review are tabulated and described in a DQA memorandum along with a judgement as to the suitability of the data for its intended use. Discussed in the DQA, sample test results are either acceptable for use as reported, acceptable for use with minor stipulation (such as a modified quantitation limit), qualified for use as an estimated value (flagged with a J-qualifier), or rejected as unusable (flagged with an R-qualifier). Analytical data will be prepared and submitted to NYSDEC after each sampling event, outlining which samples met or did not meet the stated performance goals.

Additional data quality objectives for particular sample programs may be given in site specific work plans.

**8.3 Data Reporting**

Figure 8-1 presents a flow chart depicting the overall data handling and reporting scheme. Data will be reported in standard units, and computer-generated data summaries and graphs deemed applicable will be presented in the final report. In addition to the analytical results and QC data, the final report will include the identification of “outlying” data, details regarding the corrective actions taken, and a discussion of any necessary deviations from the protocols established in the reference methods.

Generally, data reporting will be in standard commercial format. These data reports will include analytical results, chain-of-custody documentation and internal laboratory QC documentation. Electronic data deliverables in addition to hard-copy reports are generally requested.

## 9.0 QUALITY CONTROL SAMPLE LEVEL OF EFFORT

### 9.1 General

Quality control sample results provide a means to assess the overall quality of an associated data set. These samples include, but are not limited to:

- QC Reference Sample - A sampled prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. An independent standard is defined as a standard composed of the analyte(s) of interest from a different source than that used in preparation of standards for use in the calibration curve.
- Field Blank - A sample of known origin that is as free of analytes. This solution is transferred into a sample container at the sampling site and is then presented and shipped with other samples. This serves as a check reagent and environmental contamination.
- Field Duplicate - A separate sample taken from the same source as a primary sample, collected and submitted for analysis.
- Trip Blank - An aqueous solution that is as free of analytes as possible and is transported with VOC samples to the sampling site and to the analytical laboratory without being opened. This serves as a check on VOC sample contamination originating from sample methodologies, sample containers, transport or site conditions.
- Equipment Rinsate Blank - A solution that is as free of analytes as possible that is passed through or over the sample collection device, collected and submitted for analysis. This serves as a check on sample device cleanliness and the possibility of sample memory effects or carryover.
- Reagent Blank - A sample that is as free of analytes as possible to which are added all reagents. This sample is carried though all of the same preparation procedures as the samples. This result is used to correct for possible contamination resulting from sample preparation or processing.
- Sample Replicates Duplicate - Sample aliquots taken from the same sample.
- Matrix Spike - A predetermined quantity of analyte(s) is added to a site sample replicate and is then prepared and analyzed.
- Matrix Spike Duplicate - The matrix spike procedure is carried out on another sample replicate.
- Split Samples - Field duplicate samples analyzed by separate entities.

The level of effort afforded to quality control samples will be determined by site specific data quality objective as:

- Samples analyzed for compliance purposes will have quality control samples to meet NYSDEC ASP specifications.
- Samples analyzed for general monitoring purposes will at a minimum, meet quality guidelines established in USEPA, SW-846 third edition, Chapter One and incorporated into specific methods.

Minimum requirements are outlined in Tables 9-1 and 9-2.

## 11.0 PREVENTATIVE MAINTENANCE

Preventative maintenance is applied to field analytical instruments and sampling equipment. Prior to field operations, equipment is performance certified and, if necessary, calibrated. Instruments for field use include M-scopes, organic vapor analyzers, pH, temperature, conductivity, turbidity probes and multi-parameter meters.

Equipment examples include sampling pumps and generators.

Spare parts are normally needed to ensure continuous and accurate operations are stored by the by the instrument owner or custodian or must be obtained from the appropriate supplier.

## 12.0 CALCULATION OF DATA QUALITY INDICATORS

A discussion of data quality and the manner in which it will be assessed was presented in Section 3 of this document. The data quality performance goals for this project are listed in Tables 3-3 and 3-4. This section discusses the specific procedures to be used to calculate the precision, accuracy, completeness and the method detection limit.

### 12.1 Precision

For the critical measurements listed in Tables 3-3 and 3-4, precision will be estimated by calculation of the Percent Recovery of field duplicate samples and laboratory matrix spike/matrix spike duplicate samples according to the equation presented in Section 3.5.

Field duplicate and laboratory matrix spike/matrix spike duplicate samples will be collected and analyzed at a frequency of one duplicate sample for every 20 samples collected for each sample matrix and critical parameter.

### 12.2 Accuracy

As specified in Section 3, the accuracy of environmental measurements will be estimated by the calculation of the percent recovery of laboratory matrix spikes and laboratory check standards. Percent recovery will be calculated according to the following equation:

$$\%R = 100 \times \frac{C^i - C^o}{C^t}$$

where:

| | | |
|---|---|---|
| %R | = | Percent recovery |
| $C^i$ | = | Measured concentration in spiked sample aliquot |
| $C^o$ | = | Measured concentration in unspiked sample aliquot |
| $C^t$ | = | Actual concentration for spike added |

The laboratory shall analyze laboratory matrix spikes or laboratory QC reference samples according to the specifications given in the laboratory QA plan.

### 12.3 Completeness

Completeness criteria for the critical parameters are specified in Table 3-3 of this document. The formula presented in Section 3.6 will be used to determine completeness.

**12.4 Method Quantitation Limit**

The determination of method quantitation limits is a method-specific procedure that is specified for individual procedures. Method quantitation limits will be determined for the analyses conducted in accordance with the analytical procedures referenced in Section 3. The method quantitation limit goals specified should be attainable using the specified procedures if the samples are reasonably free of contamination or matrix interferences.

## 13.0 CORRECTIVE ACTION

### 13.1 General

All staff and field members will be responsible for notifying the Field Manager, Project Manager, Task Manager or the QA Manager when they discover a condition that may impair the quality of the work being performed. In most cases, corrective action will be implemented as part of normal operating procedures by project staff. If normal procedures do not solve the problem, the QA Manager will be responsible for investigating the problem and initiating a Corrective Action Request, if necessary. The Field Manager is responsible for the completion of the appropriate corrective action.

### 13.2 Work Assignment Requirements

#### 13.2.1 Corrective Action Resulting from Routine Activities

All staff members are responsible for notifying the appropriate personnel (Task Managers or QA Manager) when they discover a condition that may impair the quality of the work being performed. In most cases, corrective action will be implemented as part of normal operating procedures by project staff. If normal procedures do not solve the problem, an individual may initiate a Corrective Action Request form (discussed below) and forward the form to Project Management and the QA Manager. The QA Manager is responsible for investigating the problem and following up on resolution of the problem. The work assignment manager is responsible for the completion of appropriate corrective action.

#### 13.2.2 Corrective Action Resulting from QA Audits

If deficiencies are encountered during a QA audit, they should be corrected as soon as possible. The work assignment manager is responsible for completion of appropriate corrective actions. The procedures intended to expedite corrective actions are:

- Auditor verbally notifies the project manager of deficiencies found.
- Project Manager institutes corrective action as soon as possible.
- Auditor initiates Corrective Action Form for uncorrected deficiencies and includes it in the audit report.
- QA Manager distributes the audit report promptly.

#### 13.2.3 Use of Corrective Action Request Forms

The QA Manager or Project Manager will be required to use the Corrective Action Request form shown in Figure 13-1 or an equivalent form. The Corrective Action Request form documents the

deficiency, requests corrective action by a specified date, and requires follow-up on completion of the corrective action. The person finding the quality problem is responsible for initiating the form, following up on completion of the corrective action, and providing the Corrective Action Request to the Project Manager and QA Manager. If the problem is found during an audit, the auditor should initiate a Corrective Action Request form no later than six working days after the audit for deficiencies, not corrected within that time. This must be done promptly to enable the corrective action to proceed.

The QA Manager is responsible for setting a date for completion of the corrective action, distributing the Corrective Action Request form, following up on and accepting the corrective action. The Work Assignment Manager is responsible for instituting and completing the corrective action.

To process the Corrective Action Request, the staff member requesting the corrective action should:

1. Fill in the top half of the form, listing deficiencies found in bullet fashion. Number each deficiency or type of deficiency.
2. In the “Corrective Action” box, sign in the “Relinquished By” space and enter the Project Manager’s name in the “Responsible for Action: space. Enter the current date.
3. Submit the corrective Action Request to the QA Manager who will enter a date, not to exceed 15 working days from the current date, in the “Response Due to Requestor By” space. The QA Manager will distribute the Corrective Action Request.
4. Follow up on the corrective action. If response has not been received by the due date, he/she will check with the Work Assignment Manager. If corrective action has not been taken, or if it appears questionable in completeness or effectiveness, notify the QA Manager.
5. When the Project Manager receives response (Corrective Action Request form listing the corrective action taken) from the Work Assignment Manager, he/she shall enter the date the response was received on the Corrective Action Request form. Submit the completed Corrective Action Request form to the QA Manager.

The QA Manager will renew the completed Corrective Action Request form to determine the acceptability of the corrective action. If the corrective action is acceptable, the QA Manager will sign the “Corrective Action Accepted by” space on the Corrective Action Request and distribute the completed form or a memo noting that the corrective action has been completed. If the Corrective Action Request resulted from an audit, the audit report will be reviewed to determine acceptability of the corrective action. If deemed acceptable by the QA Manager, an Audit Completion Notice will be issued.

If the corrective action is deemed unacceptable, or if no action has been taken, the QA Manager will reissue the request on a new Corrective Action Request form with a copy of the original Corrective Action Request attached. The reissued Corrective Action Request will list both the Project Manager and Work Assignment Manager as responsible for the corrective action. A new response date, not to exceed 15 working days from date of reissue, will be identified. It is hoped that this reissue procedure will seldom need to be used. Its chief purpose is to encourage timely corrective action.

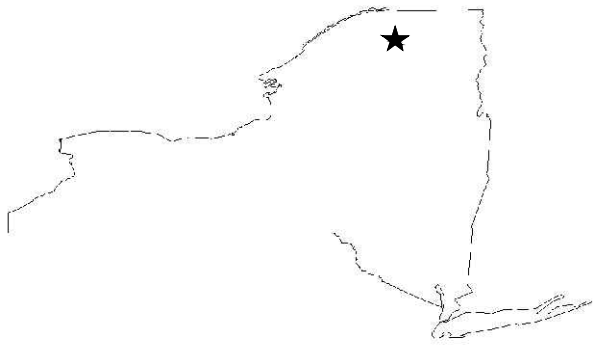
## 14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The QA Manager will prepare and submit status reports to the client, to the USEPA at their request, and to the Project Manager or the site manager. The QA Manager will also provide comments, recommendations, and feedback to management including the following:

- Changes to the QAPP, if any;
- Limitations or constraints on the use or applicability of the data, if any;
- A discussion of the QA objectives that were met and not met;
- If QA objectives were not met, a discussion of the impact to the project for not having met them and corrective actions;
- Results of technical systems and/ or performance audits;
- Quality related training; and
- General discussion of the quality of the data produced in terms of precision and accuracy.

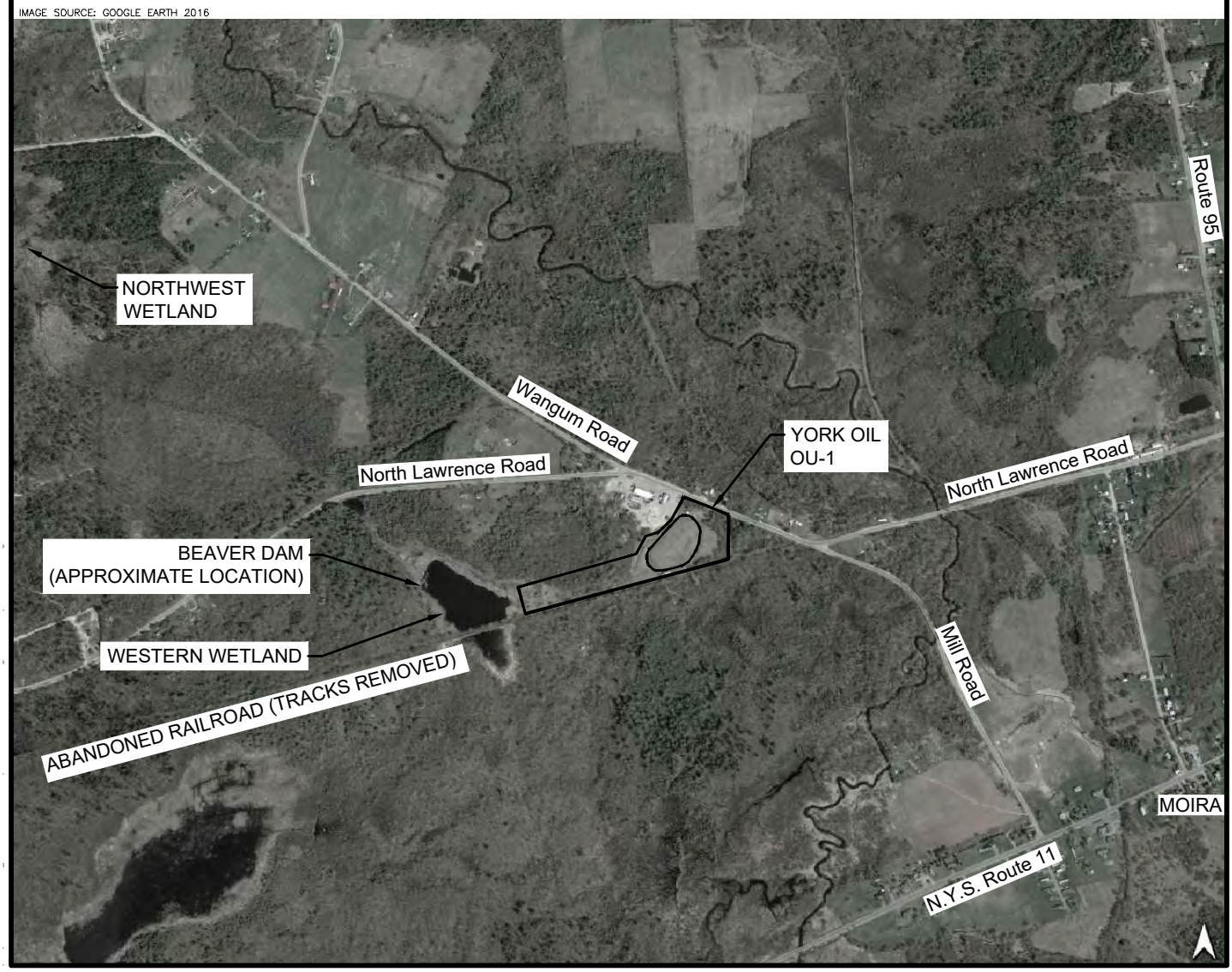
In the final report for each activity, a separate QA section will summarize the data quality information obtained for each analysis type. This section will document that QA/QC activities support data credibility and validity of conclusions.

**FIGURES**



SITE LOCATION MAP

IMAGE SOURCE: GOOGLE EARTH 2016



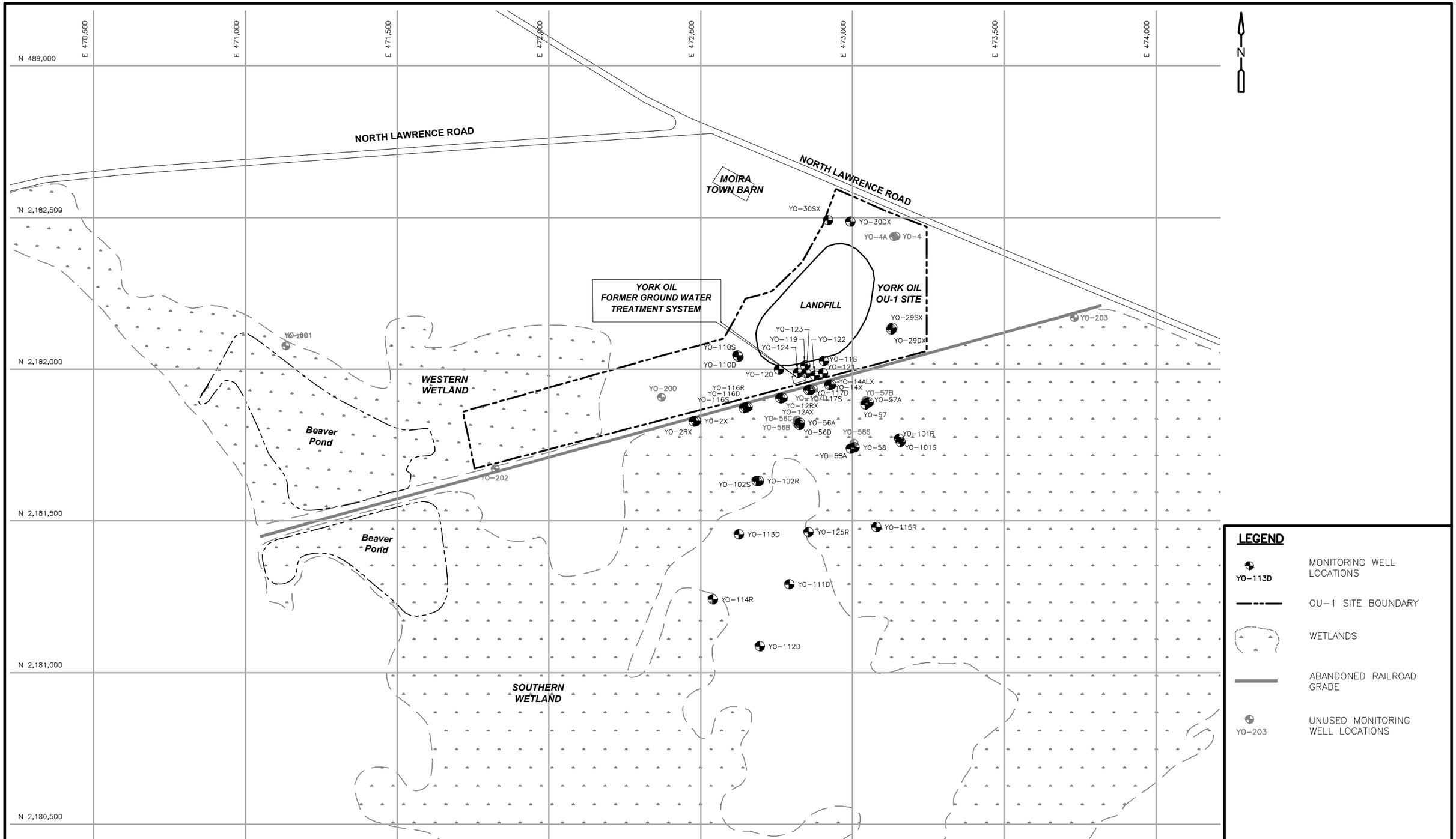

York Oil Superfund Site - Moira, New York

de maximis, inc.

1" = 1200'

600 0 1200

FIGURE 1-1
YORK OIL SITE LOCATION MAP



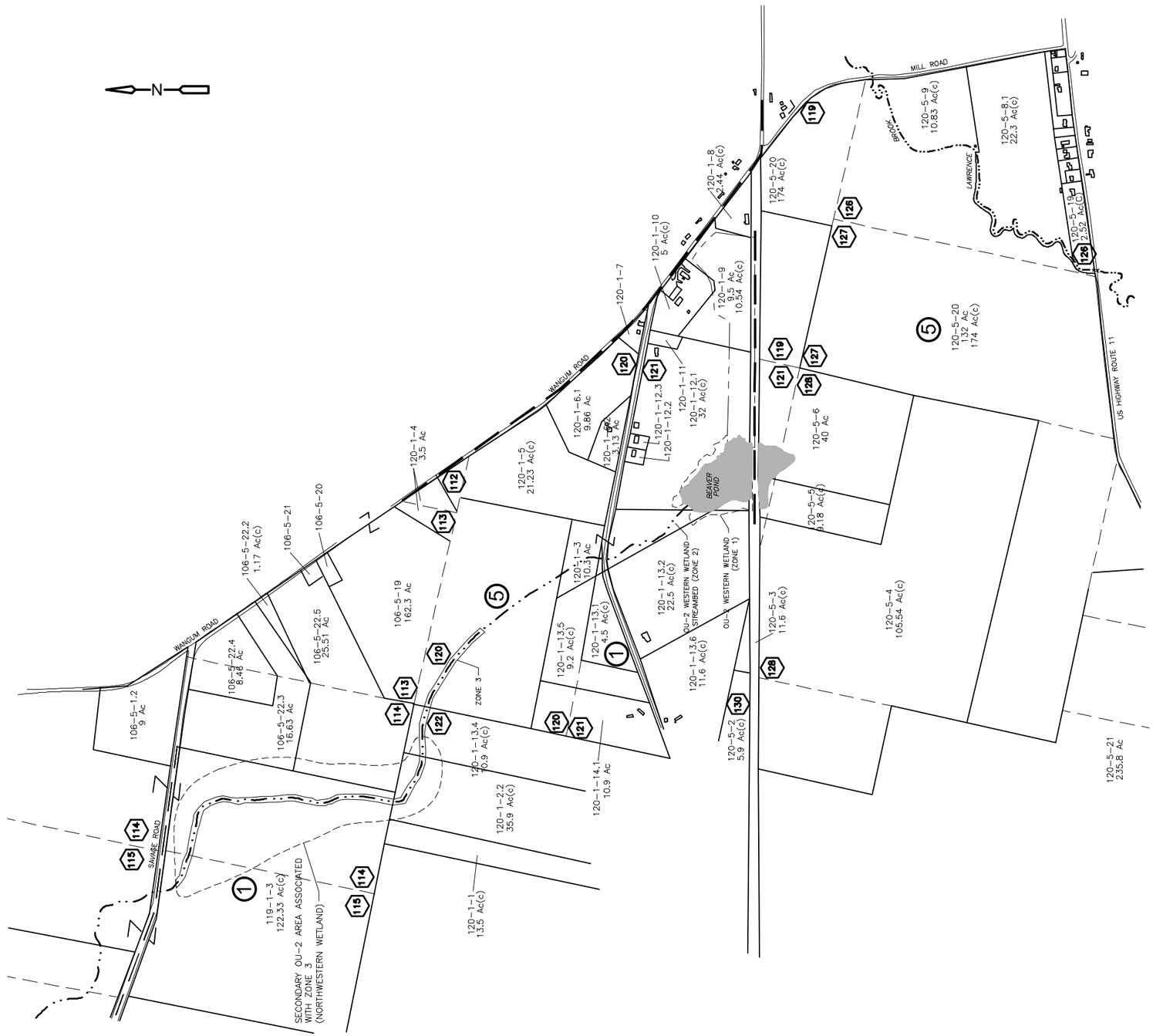

de maximis, inc.

1" = 300'

150 0 300

York Oil Superfund Site - Moira, New York

FIGURE 1-2
MONITORING WELL LOCATION PLAN




## NOTE

PROPERTY LINES ON THIS MAP ARE APPROXIMATED FROM TOWN OF MOIRA PROPERTY TAX MAPS (106, 119 AND 120). ZONES, NORTHWEST WETLANDS AND WATERLINES DERIVED FROM BLASLAND, BOUCK & LEE, INC., "CONTAINMENT PATHWAYS FEASIBILITY STUDY"; YORK OIL SUPERFUND SITE, MOIRA, NEW YORK REVISED DECEMBER 1997, AUTOCAD FIGURES 11 AND 12. THIS MAP SHALL BE USED FOR INFORMATION PURPOSES ONLY. FIELD SURVEY CHECKS ARE RECOMMENDED WHEREVER RESULTS APPEAR QUESTIONABLE.

## LEGEND

| | |
|---|---|
| 120-1-5 | SECTION-BLOCK-LOT NO. |
| 21.23 Ac(c) | AREA (CALCULATED) |
| 21.23 Ac | AREA (FROM DEED) |
| 120 | PATENT OR REALTY LOT NO. |
| 1 | BLOCK AREA NO. |
| | YORK OIL SITE BOUNDARY |
| | PROPERTY LINE |
| | PATENT OR REALTY LOT LINE |
| | BLOCK LIMIT LINE |
| | LAND HOOK |
| | WATER |
| | ROADS |
| | NORTHWESTERN WETLAND |

de maximis, inc.

NOT TO SCALE

York Oil Superfund Site - Moira, New York

FIGURE 1-3
TAX MAP BOUNDARIES WITHIN OU-1 AND OU-2

**CORRECTIVE ACTION REQUEST**

Work Assignment No./Name: _____

Team/Firm: _____

Project Manager: _____

Deficiencies Found (Attach Additional Pages as Required):

Corrective Action
Requested By: _____ Date: _____

Response for Action: _____

Corrective Action Taken (Attach Additional Pages as Required):

Response Due to Requester By: _____

Response Received by Requester: _____

Corrective Action Accepted By: _____

QAM Director: _____ Date: _____

**Figure 13-1**
**Corrective Action Request**

**NEW YORK CHAIN OF CUSTODY**

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

**Service Centers**
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page
of

Date Rec'd in Lab

ALPHA Job #

**Client Information**

Client:
Address:
Phone:
Fax:
Email:

**Project Information**

Project Name:
Project Location:
Project #
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

**Turn-Around Time**

Standard ☐ Due Date:
Rush (only if pre approved) ☐ # of Days:

**Deliverables**

☐ ASP-A ☐ ASP-B
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

**Billing Information**

☐ Same as Client Info
PO #

**Regulatory Requirement**

☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

**Disposal Site Information**

Please identify below location of applicable disposal facilities.

Disposal Facility:
☐ NJ ☐ NY
☐ Other:

These samples have been previously analyzed by Alpha ☐

**Other project specific requirements/comments:**

**Please specify Metals or TAL.**

**ANALYSIS**

***Sample Filtration***
☐ **Done**
☐ **Lab to do**
***Preservation***
☐ **Lab to do**
***(Please Specify below)***

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | | | | | | | | | Sample Specific Comments | Total Bottle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

| Container Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Preservative | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-25 HC (rev. 30-Sept-2013)

EXAMPLE

Figure 5-1
Example Chain-of-Custody Form

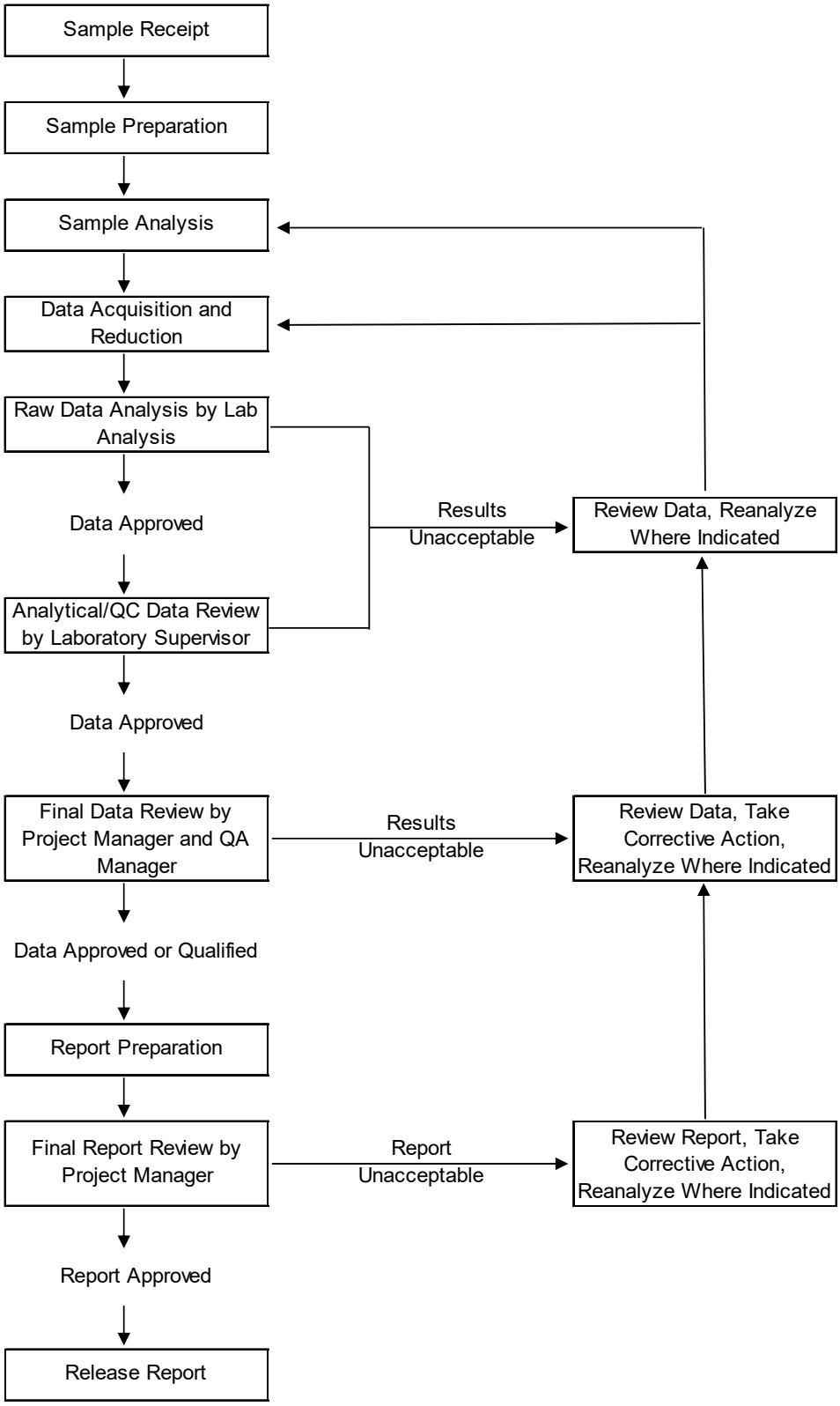


**Figure 8-1**
**Data Handling and Reporting Scheme**

**TABLES**

| OU1 Wells | Purpose | Analytes | Frequency |
|---|---|---|---|
| YO-30SX | Background | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| YO-30DX | Background | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| YO-119 | Downgradient of Landfill | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| **OU2 Wells** | **Purpose** | **Analytes** | **Frequency** |
| YO-58 | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-14X | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-111D | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-117S | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-117D | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-12RX | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO- 12D | Plume Monitoring (downgradient sentinel) | VOCs, 1,4-dioxane | Annual |
| YO-14ALX | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-56D | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-101R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-102R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-113D | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-115R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-125R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |

**Table 1-1**
**Groundwater Sampling Schedule**

| Name | **Title** | **Organizational Affiliation** |
|---|---|---|
| George Jacobs | Remedial Project Manager | USEPA |
| Nicole Hinze | Project Manager | NYSDEC |
| Bruce Thompson | Project Coordinator | ***de maximis, inc.*** |
| Todd Majer | Alternate Project Coordinator Project Manager<br>QA Coordinator | ***de maximis, inc.*** |
| Amy Hoffmann | Field Program Coordinator<br>QA Coordinator | ***de maximis, inc.*** |
| Polly Newbold | QA Manager<br>Data Validator | ddms, Inc. |
| Beth Roberts | Database Manager | ddms, Inc |
| Sean Hutchins | Field Project Manager | O&M, Inc. |
| Dave Sanford | Laboratory Project Manager | Alpha Analytical Westborough |
| Jim Todaro | Laboratory QA Manager | Alpha Analytical Westborough |
| Pete Henriksen | Laboratory Project Manager | Alpha Analytical Mansfield |

**Table 2-1**
**Project Organization and Personnel Responsibilities**

| Groundwater Analytical Parameters | |
|---|---|
| ***Volatile Organic Compounds*** | ***Volatile Organic Compounds (cont.)*** |
| 1,1,1-Trichloroethane | Dibromochloromethane |
| 1,1,2,2-Tetrachloroethane | Dichlorodifluoromethane |
| 1,1,2-Trichloroethane | Ethylbenzene |
| 1,1-Dichloroethane | Freon-113 |
| 1,1-Dichloroethene | Isopropylbenzene |
| 1,2,3-Trichlorobenzene | Methyl Acetate |
| 1,2,4-Trichlorobenzene | Methyl cyclohexane |
| 1,2-Dibromo-3-chloropropane | Methyl tert butyl ether |
| 1,2-Dibromoethane | Methylene chloride |
| 1,2-Dichlorobenzene | o-Xylene |
| 1,2-Dichloroethane | p/m-Xylene |
| 1,2-Dichloropropane | Styrene |
| 1,3-Dichlorobenzene | Tetrachloroethene |
| 1,4-Dichlorobenzene | Toluene |
| 1,4-Dioxane | trans-1,2-Dichloroethene |
| 2-Butanone | trans-1,3-Dichloropropene |
| 2-Hexanone | Trichloroethene |
| 4-Methyl-2-pentanone | Trichlorofluoromethane |
| Acetone | Vinyl chloride |
| Benzene | ***Anions by Ion Chromatography*** |
| Bromochloromethane | Chloride |
| Bromodichloromethane | Sulfate |
| Bromoform | *Dissolved Gases by GC* |
| Bromomethane | Methane |
| Carbon disulfide | Ethene |
| Carbon tetrachloride | Ethane |
| Chlorobenzene | ***General Chemistry*** |
| Chloroethane | Alkalinity, Total |
| Chloroform | Iron, Dissolved |
| Chloromethane | Solids, Total Suspended |
| cis-1,2-Dichloroethene | Nitrogen, Nitrate |
| cis-1,3-Dichloropropene | Total Organic Carbon |
| Cyclohexane | |

**Table 3-1**
**Groundwater Analytical Parameters**

| Analyte | CAS # | Reporting Limit | Units | Analytical Method | Holding Time |
|---|---|---|---|---|---|
| Alkalinity, Total | 471-34-1 | 2 | mg CaCO3/L | 2320B | 14 days |
| Total Organic Carbon | 7440-44-0 | 0.5 | mg/l | 5310C | 28 days |
| Nitrogen, Nitrate | 14797-55-8 | 0.1 | mg/l | 4500NO3-F | 48 hours |
| Solids, Total Suspended | NONE | 1 | mg/l | 2540D | 7 days |
| Sulfate | 14808-79-8 | 1 | mg/l | 300.0 | 28 days |
| Chloride | 16887-00-6 | 0.5 | mg/l | 300.0 | 28 days |
| Iron, Dissolved | 7439-89-6 | 0.05 | mg/l | 200.7 | 180 days |
| Methane | 74-82-8 | 1 | ug/l | 117 | 14 days |
| Ethene | 74-85-1 | 0.5 | ug/l | | |
| Ethane | 74-84-0 | 0.5 | ug/l | | |
| Methylene chloride | 75-09-2 | 2.5 | ug/l | EPA 8260C | 14 days |
| 1,1-Dichloroethane | 75-34-3 | 2.5 | ug/l | | |
| Chloroform | 67-66-3 | 2.5 | ug/l | | |
| Carbon tetrachloride | 56-23-5 | 0.5 | ug/l | | |
| 1,2-Dichloropropane | 78-87-5 | 1 | ug/l | | |
| Dibromochloromethane | 124-48-1 | 0.5 | ug/l | | |
| 1,1,2-Trichloroethane | 79-00-5 | 1.5 | ug/l | | |
| Tetrachloroethene | 127-18-4 | 0.5 | ug/l | | |
| Chlorobenzene | 108-90-7 | 2.5 | ug/l | | |
| Trichlorofluoromethane | 75-69-4 | 2.5 | ug/l | | |
| 1,2-Dichloroethane | 107-06-2 | 0.5 | ug/l | | |
| 1,1,1-Trichloroethane | 71-55-6 | 2.5 | ug/l | | |
| Bromodichloromethane | 75-27-4 | 0.5 | ug/l | | |
| trans-1,3-Dichloropropene | 10061-02-6 | 0.5 | ug/l | | |
| cis-1,3-Dichloropropene | 10061-01-5 | 0.5 | ug/l | | |
| 1,3-Dichloropropene, Total | 542-75-6 | 0.5 | ug/l | | |
| Bromoform | 75-25-2 | 2 | ug/l | | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 0.5 | ug/l | | |
| Benzene | 71-43-2 | 0.5 | ug/l | | |
| Toluene | 108-88-3 | 2.5 | ug/l | | |
| Ethylbenzene | 100-41-4 | 2.5 | ug/l | | |
| Chloromethane | 74-87-3 | 2.5 | ug/l | | |
| Bromomethane | 74-83-9 | 2.5 | ug/l | | |
| Vinyl chloride | 75-01-4 | 1 | ug/l | | |
| Chloroethane | 75-00-3 | 2.5 | ug/l | | |
| 1,1-Dichloroethene | 75-35-4 | 0.5 | ug/l | | |
| trans-1,2-Dichloroethene | 156-60-5 | 2.5 | ug/l | | |
| Trichloroethene | 79-01-6 | 0.5 | ug/l | | |
| 1,2-Dichlorobenzene | 95-50-1 | 2.5 | ug/l | | |
| 1,3-Dichlorobenzene | 541-73-1 | 2.5 | ug/l | | |
| 1,4-Dichlorobenzene | 106-46-7 | 2.5 | ug/l | | |
| Methyl tert butyl ether | 1634-04-4 | 2.5 | ug/l | | |
| p/m-Xylene | 179601-23-1 | 2.5 | ug/l | | |
| o-Xylene | 95-47-6 | 2.5 | ug/l | | |
| Xylene (Total) | 1330-20-7 | 2.5 | ug/l | | |
| cis-1,2-Dichloroethene | 156-59-2 | 2.5 | ug/l | | |
| 1,2-Dichloroethene (total) | 540-59-0 | 2.5 | ug/l | | |
| Styrene | 100-42-5 | 2.5 | ug/l | | |
| Dichlorodifluoromethane | 75-71-8 | 5 | ug/l | | |
| Acetone | 67-64-1 | 5 | ug/l | | |
| Carbon disulfide | 75-15-0 | 5 | ug/l | | |
| 2-Butanone | 78-93-3 | 5 | ug/l | | |

**Table 3-2**
**Analytical Methods for CLP**

| Parameter Name | Precision (RPD) | | Completeness (%) | |
|---|---|---|---|---|
| | Aqueous | Soil | Aqueous | Soil |
| **Organics** | | | | |
| Total Organic Carbon | 20 | 50 | 80 | 80 |
| Volatile Organics | 30 | 50 | 80 | 80 |
| **Conventionals** | | | | |
| pH | NA | NA | 90 | 90 |
| Specific Conductance | NA | 50 | 80 | 80 |
| Temperature | NA | 50 | 80 | 80 |
| Alkalinity | 10 | 50 | 80 | 80 |
| Chloride | 30 | 50 | 80 | 80 |
| Nitrate-Nitrogen | 30 | 50 | 80 | 80 |
| Total Suspended Solids | 30 | 50 | 80 | 80 |
| Sulfate | 30 | 50 | 80 | 80 |
| **Metals** | | | | |
| Dissolved Iron | 30 | 50 | 80 | 80 |
| **Dissolved Gases** | | | | |
| Methane | 25 | NA | 80 | NA |
| Ethene | 25 | NA | 80 | NA |
| Ethane | 25 | NA | 80 | NA |

**Table 3-3**
**Accuracy Objectives**

| Parameter Name | Percent Recovery (%R) |
|---|---|
| **Organics** | |
| 1,1-Dichloroethene - MS/MSD | 81-145 |
| Trichloroethene - MS/MSD | 71-120 |
| Benzene - MS/MSD | 76-127 |
| Toluene - MS/MSD | 76-125 |
| Chlorobenzene - MS/MSD | 76-130 |
| All Other VOCs - MS/MSD | 80-120 |
| All VOCs - LCS | 80-120 |
| All VOCs - Surrogates | 80-120 |
| Total Organic Carbon | 80-120 |
| **Conventionals** | |
| Alkalinity - MS/MSD | 86-116 |
| Chloride - MS/MSD | 80-120 |
| Nitrate-Nitrogen - MS/MSD | 90-110 |
| Sulfate - MS/MSD | 90-110 |
| All Conventionals - LCS | 90-110 |
| **Metals** | |
| All - MS/MSD | 75-125 |
| All - LCS | 85-115 |
| **Dissolved Gases** | |
| All VOCs - MS/MSD | 80-120 |
| All VOCs - LCS | 80-120 |

**Table 3-4**
**Quality Assurance Objectives**

| Analyte | Amount Required per Container | Containers | Preservative |
|---|---|---|---|
| Alkalinity, Total | 250 ml | 1 plastic | unpreserved/No Headspace |
| Total Organic Carbon | 40 ml | 2 glass vials | H2SO4 preserved |
| Nitrogen, Nitrate | 250 ml | 1 plastic | unpreserved |
| Solids, Total Suspended | 950 ml | 1 plastic | unpreserved |
| Sulfate | 500 ml | 1 plastic | unpreserved |
| Chloride | 250 ml | 1 plastic | unpreserved |
| Iron, Dissolved | 500 ml | 1 plastic | HNO3 preserved |
| Methane | | | |
| Ethene | | | |
| Ethane | 20 ml | 2 glass vials | HCL preserved |
| Methylene chloride | | | |
| 1,1-Dichloroethane | | | |
| Chloroform | | | |
| Carbon tetrachloride | | | |
| 1,2-Dichloropropane | | | |
| Dibromochloromethane | | | |
| 1,1,2-Trichloroethane | | | |
| Tetrachloroethene | | | |
| Chlorobenzene | | | |
| Trichlorofluoromethane | | | |
| 1,2-Dichloroethane | | | |
| 1,1,1-Trichloroethane | | | |
| Bromodichloromethane | | | |
| trans-1,3-Dichloropropene | | | |
| cis-1,3-Dichloropropene | | | |
| 1,3-Dichloropropene, Total | | | |
| Bromoform | | | |
| 1,1,2,2-Tetrachloroethane | | | |
| Benzene | | | |
| Toluene | | | |
| Ethylbenzene | | | |
| Chloromethane | 40 ml | 3 glass vials | HCL preserved |
| Bromomethane | | | |
| Vinyl chloride | | | |
| Chloroethane | | | |
| 1,1-Dichloroethene | | | |
| trans-1,2-Dichloroethene | | | |
| Trichloroethene | | | |
| 1,2-Dichlorobenzene | | | |
| 1,3-Dichlorobenzene | | | |
| 1,4-Dichlorobenzene | | | |
| Methyl tert butyl ether | | | |
| p/m-Xylene | | | |
| o-Xylene | | | |
| Xylene (Total) | | | |
| cis-1,2-Dichloroethene | | | |
| 1,2-Dichloroethene (total) | | | |
| Styrene | | | |
| Dichlorodifluoromethane | | | |
| Acetone | | | |
| Carbon disulfide | | | |
| 2-Butanone | | | |

**Table 4-1**
**Sample Volumes, Containers, and Preservatives for Groundwater Samples**

| Diameter of Piezometer (Inches) | Gallons per Foot of Depth | Cubic Feet per Foot of Depth |
|---|---|---|
| 1 | 0.041 | 0.005 |
| 1.5 | 0.092 | 0.012 |
| 2 | 0.163 | 0.022 |
| 2.5 | 0.255 | 0.034 |
| 3 | 0.367 | 0.049 |
| 3.5 | 0.5 | 0.067 |
| 4 | 0.653 | 0.087 |
| 4.5 | 0.826 | 0.11 |
| 5 | 1.02 | 0.136 |
| 5.5 | 1.234 | 0.165 |
| 6 | 1.469 | 0.196 |
| 7 | 1.999 | 0.267 |
| 8 | 2.611 | 0.349 |
| 9 | 3.305 | 0.442 |
| 10 | 4.08 | 0.545 |
| 11 | 4.936 | 0.66 |
| 12 | 5.875 | 0.785 |
| 14 | 7.996 | 1.069 |
| 16 | 10.444 | 1.369 |
| 18 | 13.218 | 1.767 |
| 20 | 16.319 | 2.182 |
| 22 | 19.746 | 2.64 |
| 24 | 23.499 | 3.142 |
| 26 | 27.579 | 3.687 |
| 28 | 31.985 | 4.276 |
| 30 | 36.717 | 4.909 |
| 32 | 52.873 | 7.069 |

**Table 4-2**
**Volume of Water in a Piezometer**

| Class | PFAS Name | Abbreviation | Cas No. |
|---|---|---|---|
| Perfluoroalkyl sulfonates | **Perfluorobutanesulfonic acid** | **PFBS** | **375-73-5** |
| | **Perfluorohexanesulfonic acid** | **PFHxS** | **355-46-4** |
| | Perfluoroheptanesulfonic acid | PFHpS | 375-92-8 |
| | **Perfluorooctanessulfonic acid** | **PFOS** | **1763-23-1** |
| | Perfluorodecanesulfonic acid | PFDS | 335-77-3 |
| Perfluoroalkyl carboxylates | Perfluorobutanoic acid | PFBA | 375-22-4 |
| | Perfluoropentanoic acid | PFPeA | 2706-90-3 |
| | Perfluorohexanoic acid | PFHxA | 307-24-4 |
| | **Perfluoroheptanoic acid** | **PFHpA** | **375-85-9** |
| | **Perfluorooctanoic acid** | **PFOA** | **335-67-1** |
| | **Perfluorononanoic acid** | **PFNA** | **375-95-1** |
| | Perfluorodecanoic acid | PFDA | 335-76-2 |
| | Perfluoroundecanoic acid | PFUA/PFUdA | 2058-94-8 |
| | Perfluorododecanoic acid | PFDoA | 307-55-1 |
| | Perfluorotridecanoic acid | PFTriA/PFTrDA | 72629-94-8 |
| | Perfluorotetradecanoic acid | PFTA/PFTeDA | 376-06-7 |
| Fluorinated Telomer Sulfonates | 6:2 Fluorotelomer sulfonate | 6:2 FTS | 27619-97-2 |
| | 8:2 Fluorotelomer sulfonate | 8:2 FTS | 39108-34-4 |
| Perfluorooctane-sulfonamides | Perfluroroctanesulfonamide | FOSA | 754-91-6 |
| Perfluorooctane-sulfonamidoacetic acids | N-methyl perfluorooctanesulfonamidoacetic acid | N-MeFOSAA | 2355-31-9 |
| | N-ethyl perfluorooctanesulfonamidoacetic acid | N-EtFOSAA | 2991-50-6 |

Note:

1. Bold entries depict the 6 original UCMR3 chemicals

**Table 4-3**
**PFAS Target Analyte List**

| Sample | Frequency |
| --- | --- |
| Field Blank | One per 20 samples or 1 per 5 sampling days whichever is more frequent. |
| Field Duplicate | One per 20 samples or 1 per 5 sampling days whichever is more frequent. |
| Trip Blank | One per cooler shipped of VOC samples per day. |
| Equipment Blank | One per equipment piece per sampling work shift. |

**Table 9-1**
**Minimum Field Quality Control Sample Level of Effort**

| Sample | Frequency |
| --- | --- |
| Reagent Blank | One per batch of 1 per 20 samples, whichever is greater. |
| Matrix Spike (MS) or QC Reference Sample (where applicable) | One per 20 samples, or 1 per sample delivery group, whichever is more frequent. |
| Sample Replicate or Matrix Spike Duplicate | One per 20 samples, or one per sample delivery group whichever is more frequent. |
| Surrogates | For all trace organic tests |

Note:
Consult site specific QAPP for referenced standard procedure (method) for more detail.

**Table 9-2**
**Minimum Laboratory Quality Control Sample Level of Effort**

# APPENDIX A

## GUIDANCE FOR SAMPLING AND ANALYSIS OF PFAS UNDER NYSDEC'S PART 375 REMEDIAL PROGRAMS

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

# GUIDELINES FOR SAMPLING AND ANALYSIS OF PFAS

## Under NYSDEC's Part 375 Remedial Programs

January 2020

www.dec.ny.gov

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ERRATA SHEET for

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January 2020

# Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

## Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis and reporting of PFAS, DER has developed this document to summarize procedures and update previous DER technical guidance pertaining to PFAS.

## Applicability

Sampling for PFAS has already been initiated at numerous sites under DER-approved work plans, in accordance with specified procedures. All future work plans should include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

## Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day or one per twenty samples, whichever is more frequent.

## Data Assessment and Application to Site Cleanup

Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10.

Water Sample Results

PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt). In addition, further assessment of water may be warranted if either of the following screening levels are met:

a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or
b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L

If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase.

Sites in the site management phase should evaluate for PFAS to determine if modification to any components of the SMP is necessary (e.g., monitoring for PFAS, upgrading treatment facilities, or performing an RSO).

## Testing for Imported Soil

Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the *PFAS Analyte List* (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs.

If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

## Analysis and Reporting

As of January 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix F) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP) does not offer certification for PFAS in matrices other than finished drinking water. However, laboratories analyzing environmental samples for PFAS (e.g., soil, sediments, and groundwater) under DER's Part 375 remedial programs need to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537.1 or ISO 25101. Laboratories should adhere to the guidelines and criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids). Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist.

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay). Commercially methods are also available for biota and air samples.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.

Please note that TOP Assay analysis of highly-contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

# Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

## General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP-approved lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

## Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by LC-MS/MS for PFAS using methodologies based on EPA Method 537.1
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537.1, EPA Method 533, or ISO 25101
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per matrix

# Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

## General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

## Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

## Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

## Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification. Previous results of "non-detect" for PFAS from the UCMR3 water supply testing program are acceptable as verification.

## Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

## Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

## Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

## Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

## Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

# Appendix C - Sampling Protocols for PFAS in Monitoring Wells

## General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

## Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

## Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

## Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

## Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

## Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

## Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank every day that sampling is conducted and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

## Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

## Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

# Appendix D - Sampling Protocols for PFAS in Surface Water

## General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

## Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

## Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

## Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

## Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

## Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

## Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank every day that sampling is conducted and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

## Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

## Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

# Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

## General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

## Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

## Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

## Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

## Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., wash room sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

## Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

## Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank every day that sampling is conducted and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

## Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

## Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

# Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the latest guidelines developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8).

**Procedure Name:** General Fish Handling Procedures for Contaminant Analysis

**Number:** FW-005

**Purpose:** This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

**Organization:** Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

**Version:** 8

**Previous Version Date:** 21 March 2018

**Summary of Changes to this Version:** Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

**Originator or Revised by:** Wayne Richter, Jesse Becker

**Date:** 26 April 2019

**Quality Assurance Officer and Approval Date:** Jesse Becker, 26 April 2019

**NEW YORK STATE**
**DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

# GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

   2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

   3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

   1. Project and Site Name.

   2. DEC Region.

   3. All personnel (and affiliation) involved in the collection.

   4. Method of collection (gill net, hook and line, etc.)

   5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

   1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

   2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

   3. Date collected.

   4. Sample location (waterway and nearest prominent identifiable landmark).

   5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate "Age" column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish's tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION**
**DIVISION OF FISH AND WILDLIFE**
**FISH COLLECTION RECORD**



Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: ☐Electrofishing ☐Gill netting ☐Trap netting ☐Trawling ☐Seining ☐Angling ☐Other _____

Preservation Method: ☐Freezing ☐Other _____ Notes (SWFDB survey number): _____

| FOR LAB USE ONLY- LAB ENTRY NO. | COLLECTION OR TAG NO. | SPECIES | DATE TAKEN | LOCATION | AGE | SEX &/OR REPROD. CONDIT | LENGTH ( ) | WEIGHT ( ) | REMARKS |
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richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

# NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
# CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

_____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20_____.

_____ _____
Signature Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ _____
Signature Date

| | | |
|---|---|---|
| SECOND RECIPIENT (Print Name) | TIME & DATE | PURPOSE OF TRANSFER |
| SIGNATURE | UNIT | |
| THIRD RECIPIENT (Print Name) | TIME & DATE | PURPOSE OF TRANSFER |
| SIGNATURE | UNIT | |
| FOURTH RECIPIENT (Print Name) | TIME & DATE | PURPOSE OF TRANSFER |
| SIGNATURE | UNIT | |
| RECEIVED IN LABORATORY BY (Print Name) | TIME & DATE | REMARKS |
| SIGNATURE | UNIT | |
| LOGGED IN BY (Print Name) | TIME & DATE | ACCESSION NUMBERS |
| SIGNATURE | UNIT | |

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

## NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

## HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

# Appendix G – PFAS Analyte List

| Group | Chemical Name | Abbreviation | CAS Number |
|---|---|---|---|
| Perfluoroalkyl sulfonates | Perfluorobutanesulfonic acid | PFBS | 375-73-5 |
| | Perfluorohexanesulfonic acid | PFHxS | 355-46-4 |
| | Perfluoroheptanesulfonic acid | PFHpS | 375-92-8 |
| | Perfluorooctanesulfonic acid | PFOS | 1763-23-1 |
| | Perfluorodecanesulfonic acid | PFDS | 335-77-3 |
| Perfluoroalkyl carboxylates | Perfluorobutanoic acid | PFBA | 375-22-4 |
| | Perfluoropentanoic acid | PFPeA | 2706-90-3 |
| | Perfluorohexanoic acid | PFHxA | 307-24-4 |
| | Perfluoroheptanoic acid | PFHpA | 375-85-9 |
| | Perfluorooctanoic acid | PFOA | 335-67-1 |
| | Perfluorononanoic acid | PFNA | 375-95-1 |
| | Perfluorodecanoic acid | PFDA | 335-76-2 |
| | Perfluoroundecanoic acid | PFUA/PFUdA | 2058-94-8 |
| | Perfluorododecanoic acid | PFDoA | 307-55-1 |
| | Perfluorotridecanoic acid | PFTriA/PFTrDA | 72629-94-8 |
| | Perfluorotetradecanoic acid | PFTA/PFTeDA | 376-06-7 |
| Fluorinated Telomer Sulfonates | 6:2 Fluorotelomer sulfonate | 6:2 FTS | 27619-97-2 |
| | 8:2 Fluorotelomer sulfonate | 8:2 FTS | 39108-34-4 |
| Perfluorooctane-sulfonamides | Perfluroroctanesulfonamide | FOSA | 754-91-6 |
| Perfluorooctane-sulfonamidoacetic acids | N-methyl perfluorooctanesulfonamidoacetic acid | N-MeFOSAA | 2355-31-9 |
| | N-ethyl perfluorooctanesulfonamidoacetic acid | N-EtFOSAA | 2991-50-6 |

# Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids

## General

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) developed the following guidelines for laboratories analyzing environmental samples for PFAS under DER programs. If laboratories cannot adhere to the following guidelines, they should contact DER's Quality Assurance Officer, Dana Maikels, at dana.maikels@dec.ny.gov prior to analysis of samples.

## Isotope Dilution

Isotope dilution techniques should be utilized for the analysis of PFAS in all media.

## Extraction

For water samples, the entire sample bottle should be extracted, and the sample bottle rinsed with appropriate solvent to remove any residual PFAS.

For samples with high particulates, the samples should be handled in one of the following ways:

1. Spike the entire sample bottle with isotope dilution analytes (IDAs) prior to any sample manipulation. The sample can be passed through the SPE and if it clogs, record the volume that passed through.
2. If the sample contains too much sediment to attempt passing it through the SPE cartridge, the sample should be spiked with isotope dilution analytes, centrifuged and decanted.
3. If higher reporting limits are acceptable for the project, the sample can be diluted by taking a representative aliquot of the sample. If isotope dilution analytes will be diluted out of the sample, they can be added after the dilution. The sample should be homogenized prior to taking an aliquot.

If alternate sample extraction procedures are used, please contact the DER remedial program chemist prior to employing. Any deviations in sample preparation procedures should be clearly noted in the case narrative.

## Signal to Noise Ratio

For all target analyte ions used for quantification, signal to noise ratio should be 3:1 or greater.

## Blanks

There should be no detections in the method blanks above the reporting limits.

## Ion Transitions

The ion transitions listed below should be used for the following PFAS:

| | |
|---|---|
| PFOA | 413 > 369 |
| PFOS | 499 > 80 |
| PFHxS | 399 > 80 |
| PFBS | 299 > 80 |
| 6:2 FTS | 427 > 407 |
| 8:2 FTS | 527 > 507 |
| N-EtFOSAA | 584 > 419 |
| N-MeFOSAA | 570 > 419 |

## Branched and Linear Isomers

Standards containing both branched and linear isomers should be used when standards are commercially available. Currently, quantitative standards are available for PFHxS, PFOS, NMeFOSAA, and NEtFOSAA. As more standards become available, they should be incorporated in to the method. All isomer peaks present in the standard should be integrated and the areas summed. Samples should be integrated in the same manner as the standards.

Since a quantitative standard does not exist for branched isomers of PFOA, the instrument should be calibrated using just the linear isomer and a technical (qualitative) PFOA standard should be used to identify the retention time of the branched PFOA isomers in the sample. The total response of PFOA branched and linear isomers should be integrated in the samples and quantitated using the calibration curve of the linear standard.

## Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated for each target analyte and the ratio compared to standards. Lab derived criteria should be used to determine if the ratios are acceptable.

## Reporting

Detections below the reporting limit should be reported and qualified with a J qualifier.

The acid form of PFAS analytes should be reported. If the salt form of the PFAS was used as a stock standard, the measured mass should be corrected to report the acid form of the analyte.

# Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

## General

These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report. Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Maikels, at dana.maikels@dec.ny.gov.

## Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 14 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

| | |
|---|---|
| Temperature greatly exceeds 6ºC upon arrival at the lab* | Use professional judgement to qualify detects and non-detects as estimated or rejected |
| Holding time exceeding 28 days to extraction | Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded |

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

## Initial Calibration

The initial calibration should contain a minimum of five standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%. Linear fit calibration curves should have an $R^2$ value greater than 0.990.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

| | |
|---|---|
| %RSD >20% | J flag detects and UJ non detects |
| $R^2$ >0.990 | J flag detects and UJ non detects |
| Low-level calibration check <50% or >150% | J flag detects and UJ non detects |
| Mid-level calibration check <70% or >130% | J flag detects and UJ non detects |

## Initial Calibration Verification

An initial calibration verification (ICV) standard should be from a second source (if available). The ICV should be at the same concentration as the mid-level standard of the calibration curve.

| | |
|---|---|
| ICV recovery <70% or >130% | J flag detects and non-detects |

## Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

| | |
|---|---|
| CCV recovery <70 or >130% | J flag results |

## Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

| Blank Result | Sample Result | Qualification |
|---|---|---|
| Any detection | <Reporting limit | Qualify as ND at reporting limit |
| Any detection | >Reporting Limit and >10x the blank result | No qualification |
| >Reporting limit | >Reporting limit and <10x blank result | J+ biased high |

## Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

| | |
|---|---|
| RPD >30% | Apply J qualifier to parent sample |

## Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

| | |
|---|---|
| Recovery <70% or >130% (lab derived criteria can also be used) | Apply J qualifier to detects and UJ qualifier to non detects |

## Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

| | |
|---|---|
| Recovery <70% or >130% (lab derived criteria can also be used) | Apply J qualifier to detects and UJ qualifier to non detects of parent sample only |
| RPD >30% | Apply J qualifier to detects and UJ qualifier to non detects of parent sample only |

## Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

| | |
|---|---|
| Recovery <50% or >150% | Apply J qualifier |
| Recovery <25% or >150% for poor responding analytes | Apply J qualifier |
| Isotope Dilution Analyte (IDA) Recovery <10% | Reject results |

## Secondary Ion Transition Monitoring

Quantifier and qualifier ions should be monitored for all target analytes (PFBA and PFPeA are exceptions). The ratio of quantifier ion response to qualifier ion response should be calculated from the standards for each target analyte. Lab derived criteria should be used to determine if the ratios are acceptable. If the ratios fall outside of the laboratory criteria, qualify results as an estimated maximum concentration.

## Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

## Branched and Linear Isomers

Observed branched isomers in the sample that do not have a qualitative or quantitative standard should be noted and the analyte should be qualified as biased low in the final data review summary report. Note: The branched isomer peak should also be present in the secondary ion transition.

## Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

## Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

# FIELD SAMPLING PLAN (FSP)

# YORK OIL OPERABLE UNIT 1 & 2 SUPERFUND SITE
# OPERATIONS, MAINTENANCE & MONITORING
# MOIRA, NEW YORK

*Prepared by:*

***de maximis, inc.***

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August 2020

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# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

This Field Sampling Plan (FSP) has been prepared on behalf of the Settling Defendants for the Operable Unit No. 1 (OU1) and No. 2 (OU2) Consent Decrees (CD) and Statements of Work (SOW) for Remedial Design/Remedial Action (RD/RA) at the York Oil Superfund Site in Moira, NY (Site) (Figures 1-1 and 1-2).

The OU1 CD (Civil Action Nos. 83-CV-1623, 92-CV-562) was entered by the Court on August 10, 1996. The Aluminum Company of America (Alcoa) was named as the Performing Party in the OU1 RD/RA CD. On November 1, 2016, Alcoa split into two new entities, Alcoa Corporation and Arconic, Inc. (Arconic). Management responsibility for the York Oil Site was assigned to Arconic. The OU2 RD/RA CD (Civil Action No. 83-CV-1623) was entered by the Court on November 30, 2000. Alcoa (now Arconic) was named as the party to manage and perform the Work under the OU2 RD/RA CD. Arconic retained ***de maximis, inc.*** *(de maximis)* as its' Project Coordinator for the RD/RA. In March 2020, Arconic retained *de maximis* as its' General Contractor to manage or perform all necessary Operations, Maintenance and Monitoring (OM&M) work.

The OM&M Plan to which this FSP is amended summarizes the anticipated operation, maintenance, inspection, and monitoring components (collectively, the "OM&M activities") associated with the "operations and maintenance" phase of the remedy. The OM&M Plan provides a comprehensive summary of the various OM&M activities required for the Site including implementation of the groundwater monitoring program and periodic inspections to document the continued performance, functionality, and/or effectiveness of other completed remedial components (e.g., the RCRA cap).

The purpose of this FSP is to provide a consolidated summary of the various sample collection and field monitoring methods and procedures to be followed to ensure that sampling and investigatory activities at the Site are conducted in a consistent manner and in accordance with technically acceptable protocols. Sample collection and field monitoring methods and procedures presented in this FSP are consistent with prior work conducted at the York Oil Site. This FSP provides Standard Operating Procedures (SOPs) for environmental monitoring activities expected or likely to be conducted during the OM&M Phase of the work (see Attachment A).

This FSP ensures that collection of environmental monitoring data meets the Data Quality Objectives (DQOs) established in the OM&M Plan and summarized in the Quality Assurance Project Plan (QAPP) (Appendix B of the OM&M Plan). Additionally, specific handling and analytical methods for each sample medium, indicating appropriate sample containers, preservation, and holding times are provided in the QAPP.

### 1.2 Document Content and Format

The remainder of this FSP is organized into three Section, each of which is identified and briefly described as flows:

- **Section 2 – Background Information**: Section 2 of this FSP summarizes pertinent background information, including location, operational history, regulatory status, remedial actions to date and site conceptual model.
- **Section 3 – Technical Methodology**: Section 3 of this FSP describes field sampling activities and methods (applicable Standard Operating Procedures [SOPs] provided in Attachment A) that will be common throughout the OM&M activities.

## 2.0. BACKGROUND INFORMATION

This section presents a summary of background information for the York Oil Superfund Site. Historical information related to past site usage and a brief summary of remediation activities conducted to date are discussed.

### 2.1 Site Location and Description

The York Oil Site is located about one-mile northwest of the hamlet of Moira, in the Town of Moira, Franklin County, New York. The site is approximately 20 miles southeast of Massena, New York and 10 miles west of Malone, New York. Figure 1-1 presents a site location map, and Figure 1-2 presents a site area plan with all existing monitoring well locations shown.

The fenced portion of OU-1 slopes to the southwest and has generally sparse to moderate vegetative cover. Within the fenced portion of OU-1 was the location of three former lagoons, which is now an area of covered, treated soil resulting from the remediation of OU-1 during 1999 and the remediation of the Western Wetland located west of OU-1 in 2001. Adjacent to the fenced portion of OU-1 is the Town of Moira garage to the north, North Lawrence Road (County Route 6) to the northeast, an abandoned milk house to the east, an abandoned railroad bed along the southern boundary of OU-1, and the Southern Wetland south of the abandoned railroad bed. Surface water from OU-1 drains to the southwest via a drainage ditch before entering a beaver pond within the Western Wetland portion of OU-2.

The geographical boundary of OU-2 is defined to be the potential extent of migration of compounds via surface water and groundwater from OU-1 into areas outside of the OU-1 boundary.

OU-1 and OU-2 do not presently contain any inhabitable buildings; additionally, institutional controls are in-place to prevent unacceptable uses of soil and groundwater. Current owners of the property located downgradient of the site use the parcels for hunting and recreational purposes only. Review of the Franklin County Tax Assessor's and the Town of Moira Building Inspector files indicates no current plans for development of the York Oil property or any downgradient properties.

### 2.2 Site History

The York Oil Site was first used in 1954 by the York Oil Company, which recycled used oils collected from service stations, car dealers, certain federal facilities, and a variety of industrial facilities. The oil was processed with heat and a silica-based substance to remove impurities and dirt, and then resold to a number of businesses. This operation was discontinued around 1962.

From 1962 to 1977, Pierce Brothers Oil Services Inc. stored and processed used oils within the fenced portion of the York Oil Site. Processing of used oils at the site was discontinued in the mid-

1960s; thereafter until 1977 the site was an oil storage facility. Some oil accepted by the facility contained polychlorinated biphenyls (PCBs) and other contaminants. Oil was stored in eight metal storage tanks, at least one underground tank at the north end of the site, and in three unlined lagoons in the southern portion of the site. Residuals that settled in the lagoons were separated from light oils that were decanted and then sold as fuel oil.

### 2.3 Summary of Remedial Activities to Date

The primary source of impacted groundwater at the site was waste oil deposited in the unlined lagoons and aboveground storage tanks prior to 1977. The aboveground tanks and their contents were removed for offsite disposal as part of the removal action activities performed at the site during the 1980s, many years prior to OU-1 being remediated. The initial remedial investigation that was completed in 1987 on behalf of the New York State Department of Environmental Conservation (NYSDEC) outlined the potential contaminants of concern in the groundwater as PCBs, and Volatile Organic Compounds (VOCs) including benzene, toluene, ethylbenzene and xylenes ("BTEX"), 1,1-dichloroethane (DCA) and *cis*-1,2-dichloroethene (cDCE). Since then, cDCE has been the constituent found most widely in groundwater in OU-2 above New York State Water Quality Standards (NYSWQS) (5 µg/l).

OU-1 was remediated during 1999 in accordance with OU-1 Statement of Work requirements. Remediation at OU-1 consisted of excavating soil/source material, using a PCB concentration greater than 10 mg/kg as the definition of source material. The stockpiled, excavated material was placed in a pugmill, cement was added to solidify/stabilize the material, and the treated material was placed above the high-water table onsite. Additionally, sediment material exceeding 1 mg/kg PCB concentration from the Western Wetland portion of OU-2 was removed, solidified/stabilized, and the treated material was placed in the landfill, covered and capped in 2001. The covered and capped area is designated "Landfill" on Figure 1-2.

Groundwater within OU-1 and a limited area within OU-2, south of OU-1 are impacted with VOCs associated with the oil sludge. The groundwater cleanup levels in the OU-1 Record of Decision (ROD) for VOCs are 50 µg/l, with 5 µg/l for benzene and 2 µg/l for vinyl chloride. OU-1 groundwater now meets the OU-1 ROD cleanup levels. The cleanup levels for OU-2 are lower, at 5 µg/l for VOCs and 2 µg/l for vinyl chloride. The remedy for OU-2 groundwater is natural attenuation. The difference in cleanup levels between the two Operable Units, necessitated controlling migration of OU-1 impacted groundwater into OU-2. Migration was controlled by a pump and treat system from 2000 until September 19, 2009, by *in situ* chemical reduction from 2009 to 2015, by *in situ* bioremediation via enhanced reductive dechlorination in 2016, and by liquid activated carbon in 2018.

Natural attenuation remains the remedial alternative for OU-2. Following the November 2002 sampling round, certain wells within OU-2 needed to be replaced due to a variety of factors, including: physical damage, physical limitations of wells with less than 1-inch inner diameter,

screened intervals that penetrated two different geological strata, and concern about reproducibility of sampling results from round to round. Additional wells were required to monitor natural attenuation accurately, to determine the leading edge of the contaminant plume, and to satisfy landfill monitoring requirements.

Between January 28, 2003 and May 5, 2003, 14 existing groundwater monitoring wells were abandoned, and 14 new 2-inch groundwater monitoring wells were installed at the York Oil Site. The abandoned wells were WQ-2, YO-02, YO-02R, YO-12, YO-12U, YO-12A, YO-12R, YO-14, YO-14AU, YO-14AL, YO-29S, YO-29D, YO-30S, and YO-30D. The following replacement wells were installed at a minimum of 10 ft. away from the wells that they replaced: YO-14ALX, YO-14X, YO-02X, YO-02RX, YO-12AX, YO-12RX, YO-29SX, YO-29DX, YO-30SX, and YO-30DX. The following new monitoring wells were also installed: YO-110S, YO-110D, YO-113D, and YO-56D. A description of the well abandonment and installation is presented in Section 2 of the *Monitored Natural Attenuation Documentation Report No. 3*, prepared by CDM Smith and submitted to NYSDEC on October 24, 2003.

In August 2004, two additional new bedrock wells, YO-111D and YO-112D were installed in the downgradient portion of OU-2. The new wells were intended to further delineate the downgradient limits of the volatile organic compound (VOC) plume.

Source control measures at OU-1 were completed during the fall of 2001 and sampling for monitored natural attenuation (MNA) was performed until April 2005. In correspondence dated April 11, 2005 from the OU-1 and OU-2 Project Coordinator *de maximis* to Mr. George Jacob of the U.S. Environmental Protection Agency (USEPA), Alcoa requested changes to the groundwater analytical program and method of sample collection. With USEPA concurrence, the groundwater analytical program was reduced to VOCs only for all groundwater monitoring wells in the fall of 2005. This change was supported by eight rounds of MNA sampling data from April 2001 through April 2005, each of which demonstrated the same redox/biodegradation conditions across the study area. In addition, the method of collection was changed from low flow sampling to passive diffusion bags (PDBs) after a side-by-side comparison indicated comparable results. The landfill monitoring program (OU-1) is included in the groundwater monitoring program that was submitted to the USEPA and will be discussed with the other OU-2 wells.

In June 2006, five wells were installed in OU-2. The new wells included three bedrock wells (YO-114R, YO-115R and YO-116R) and two overburden wells (YO-116D and YO-116S). These new wells were installed to allow for additional site characterization and groundwater monitoring.

### 2.3.1 In Situ Chemical Reduction Plot Study

Groundwater extraction and treatment was selected in the OU-1 ROD to treat a plume of groundwater contamination, originally thought to consist of total phenolic compounds. The ROD

anticipated reaching clean up targets within three years of operation of the groundwater extraction and treatment system. Consistent with the OU-1 ROD, a pump and treat system was designed and constructed, which achieved full operation in March 2002. Phenolics were not found to be an issue; however, a chlorinated volatile organic compound (cVOC), cDCE, was the primary constituent in the system influent.

An investigation was conducted in the spring of 2009 of the former lagoon area immediately upgradient from the groundwater treatment system (GWTS), which revealed approximately 2,000 cubic yards of subsurface soil containing total petroleum hydrocarbons (TPH). In addition to the TPH, some soil samples contained cDCE and tetrachloroethene (PCE). PCE degrades to cDCE through an intermediate product, trichloroethene (TCE). PCE and TCE have partitioned into the TPH, and continually dissolve into the groundwater. TPH could potentially serve as an electron donor that facilitates biological degradation to cDCE.

Previous analysis of MNA data identified the lack of electron donor as a limiting factor for successful biological degradation of cDCE. Full-scale biostimulation using soluble electron donors has been successfully applied at a number of sites, suggesting that installing a line of injection wells and injecting a soluble electron donor could successfully stimulate biodegradation of residual cDCE emanating from the OU-1 Site, and complete the degradation process within the OU-2 plume.

An evaluation of feasible alternatives was performed, and EHC® was identified as a preferred *in situ* remedial option for OU-1 groundwater. EHC® is a patented combination of controlled-release carbon and zero valent iron (ZVI) particles used for stimulating *in situ* chemical reduction (ISCR) of otherwise persistent organic compounds in groundwater. The evaluation considered not only the implementability, effectiveness and cost, but the sustainability and effect on greenhouse gas emissions of the various options.

The EHC® process was proposed to the USEPA at a meeting in February 2009, and a full-scale pilot study was proposed in July 2009 and approved by the USEPA in August 2009. In September 2009, the groundwater extraction and treatment system was shut down on September 21, 2009 and the system was drained for long-term inactivation.

Phase I of the *in situ* chemical reduction pilot study was completed in October 2009 with the installation of a 200-foot long EHC®-amended permeable reactive barrier (PRB) at a targeted depth of 6 to 35 feet below ground surface (bgs). Quarterly groundwater sampling was initiated following the EHC® injection. Post-injection groundwater level measurements in the vicinity of the PRB did not indicate any changes to the direction of groundwater flow. Groundwater sampling was reduced to semiannual during 2012.

As part of the *In Situ* Chemical Reduction Pilot Study, five new monitoring wells (YO-117S, YO-117D, YO-118, YO-119, and YO-120) were installed in October 2009.

### 2.3.2 In Situ Chemical Reduction Plot Study – Phase II

In October 2011, in a letter to USEPA, on behalf of Alcoa, *de maximis* proposed a Phase II to the *in situ* chemical reduction pilot study, with the goal of enhancing the performance of the PRB through application of additional EHC®. The EHC® was to be injected using direct push technology (DPT), with locations spaced closer together as compared to Phase I to ensure creation of a continuous treatment zone. In addition, the barrier would extend further to the west to create a greater influence on the YO-12 well cluster area. The total length of the PRB would be approximately 240 feet and extend to a depth of 6 to 43 feet bgs. To address the recent detections of BTEX compounds, *de maximis* recommended that an EHC® product containing a sulfate salt be used to further stimulate the degradation of BTEX by anaerobic oxidation via sulfate reduction.

From October 31 to November 1, 2011, Paragon Environmental Construction, Adventus, *de maximis* and CDM Smith were onsite to perform the Phase II EHC® injection via DPT. Numerous attempts were made to direct push to 43 feet bgs that were ultimately unsuccessful due to subsurface conditions (cobble layer). One injection point was drilled to depth, but the EHC® could not be injected because the injection tip would not open. Once the injection tip was retrieved it was evident the cobble layer had damaged the injection tip, rendering the rod unusable.

After two field days of unsuccessful attempts, the Phase II EHC® injection was abandoned. Adventus, *de maximis*, Alcoa and CDM Smith decided to explore new avenues for possible EHC® injection in spring 2012. Meanwhile, the December 2011 groundwater sampling round indicated only one well where the OU-1 cleanup standards were exceeded. Based on the difficulties encountered during the October 2011 injection attempt and the subsequent improvements in groundwater quality, semi-annual groundwater monitoring was extended through 2014.

### 2.3.3 In Situ Bioremediation via Enhanced Reductive Dechlorination Pilot Study

On November 6$^{th}$, 2015, on behalf of Alcoa, *de maximis* proposed a Work Plan to the USEPA to inject LactOil® at the York Oil Superfund Site. The lack of an electron donor was identified as a limiting factor for successful biodegradation of cDCE. From November through December 2015, five new wells were installed in OU-1. YO-121, YO-122, YO-123, and YO-124 are overburden wells used for injection of LactOil®.

An environmental fracturing process was used to emplace enhanced permeability sand lenses out to a radius of approximately 15 to 20 feet from the injection boreholes. The permeability

enhancement injection process (environmental fracturing) caused a "tensile parting" of the soil to emplace a sand and guar mixture in a planar lens extending out from the injection borehole. Once the guar breaks down or is extracted during well development, the sand-filled lens remains to provide a high permeability injection pathway that can be used multiple times to inject electron donor to sustain a biological treatment zone between OU-1 and OU-2.

The use of injection wells means that instead of the solid/slurry EHC, a liquid reagent was used. A 5 percent solution of LactOil® was pumped into the four injection wells, with a total of 5,000 pounds, approximately 1,400 gallons of LactOil® injected using hydraulic fracturing into the subsurface in the fall of 2015. Groundwater monitoring occurred during 2016 to evaluate effectiveness of this treatment.

### 2.3.4 In situ Sorption/Bioremediation via PlumeStop® Liquid Activated Carbon (LAC) Pilot Study

On October 29th, 2018, on behalf of Alcoa, *de maximis* proposed a Work Plan to the USEPA to inject PlumeStop®, a liquid activated carbon (LAC) at the York Oil Superfund Site. PlumeStop® was selected to address increasing BTEX compounds in the upgradient portion of the OU2 Southern Wetlands. The LAC would also act as binding sites for both BTEX compounds and cVOCs.

From November 6, 2018 through November 9, 2018, representatives of Regenesis® were on-site to conduct the injection of the PlumeStop® product into the designated injection wells YO-121, YO-122, YO-123, and YO-124. The pressure exerted on each well was maintained at 10 psi while the concentration of the LAC/water slurry was varied throughout the injection. The initial application of 60% of the total LAC mass was followed by "chasing" that with the remaining 40% of the LAC mass dissolved in significantly more water. This served to move the LAC out of the sand zones emplaced during the hydro-fracturing when the injection wells were installed. Approximately 4,800 gallons of LAC/water slurry was injected into each well. The wells are planned to be sampled as part of the routine 2019 sampling program in April. The results of the 2019 sampling rounds will be used to assess the effectiveness of ongoing bioremediation and the PlumeStop® injection.

## 2.4 Site Hydrogeology

The Southern Wetland overburden and shallow bedrock can be classified as two groundwater zones, consistent with the *OU-2 Contamination Pathways Investigations Report* (Blasland, Bouck and Lee, Inc. (BBL), 1998). The shallow zone consists of unconsolidated glaciated material, located from the surface to approximately 15 to 35 ft. bgs. It is less dense and coarser than the dense till directly beneath.

The deep zone begins approximately 15 to 35 ft. bgs and consists of the dense till and 10 to 15 ft. of weathered bedrock. The bedrock underlying the overburden in OU-2 comprises the Theresa Formation (sedimentary layers of sandy dolomite and calcareous sandstone) and Potsdam Sandstone.

Previous site groundwater quality data indicate that the primary migration pathway for constituents of concern appears to be the deep zone within the Southern Wetland. This is due to shallow groundwater from OU-1 migrating vertically to the deep zone within OU-1 and then horizontally downgradient to the south to the Southern Wetland in OU-2. The monitoring wells sampled during the 2018 monitoring rounds are shown on Figure 1-2. The *Contamination Pathways Investigations Report* (BBL, 1998) uses historical data to calculate the average hydraulic conductivities for the shallow and deep aquifers, calculations show the conductivities are 3.25 x $10^{-4}$ cm/sec and 3.05 x $10^{-5}$ cm/sec, respectively.

**2.5 Groundwater Migration to Potential Receptors**

There are no existing potable drinking water wells downgradient (i.e., south) of OU-1 that could be impacted by groundwater migrating from OU-1. The Southern Wetland borders OU-1 and extends approximately 2,500 ft. to the south as undeveloped land. A detailed discussion of migration pathways and receptors was presented in the *Contamination Pathways Remedial Investigation Report* (BBL, 1998). The results of the study concluded that groundwater flow is generally to the south from the OU-1 site, and the likely point of groundwater discharge to surface water is Lawrence Brook. As there are currently no potable water wells in the area between the OU-1 site and Lawrence Brook, **"**human exposure to groundwater is not considered a viable exposure pathway under current conditions. Moreover, future exposure via potable groundwater use is considered extremely unlikely due to the physical characteristics of the southern wetland; i.e., the fact that it is a wetland area would preclude residential or other development due to the physical and regulatory constraints" (BBL, 1998).

Based on an estimated approximate groundwater travel velocity in the deep OU-2 zone of 1.2 ft. to 7.1 ft. per year determined from 2018 groundwater elevation data, groundwater may have traveled 277 ft. to 632 ft. over the 64 years since startup of the York Oil recycling operation. This estimate does not account for the effect of the OU-1 pump and treat system "pulling" groundwater back toward OU-1 between 2000 and 2009, when the pump and treat system was operational. Recent monitoring data contradicts the travel distances calculated from the groundwater elevation data and suggests that preferential flow paths might exist in the deep aquifer, possibly due to fracture flow. This fracture flow could facilitate a small amount of higher velocity transport than is expected for the bulk groundwater flow. The ultimate discharge point for groundwater still appears to be Lawrence Brook. The nearest potential current human receptors are homes located approximately one-half mile (2,840 ft.) south of OU-1 along US Route 11 on the far side of Lawrence Brook. Based on the estimated average groundwater advective travel velocities in the deep zone, it would take approximately 575 years for site

groundwater to reach these homes if the groundwater flow were to pass below Lawrence Brook. Institutional Controls that prohibit the installation of supply wells and the use of groundwater have been implemented according to the York Oil OU-2 Record of Decision (ROD) requirements and as further requested by the USEPA to minimize the possibility that impacted groundwater could affect human health. An Environmental Protection Easement and Declaration of Restrictive Covenants have been placed on the three properties where the plume is located. These include tracts identified on the Franklin County tax maps as 120-1-9, 120-5-3 and 120-5-6 (section-block-lot numbers). These deed restrictions preclude the installation of groundwater wells and prohibit any use of the property that would interfere with investigative or remedial work. The locations of the parcels with Institutional Controls are shown on Figure 2-1.

## 3.0 TECHNICAL METHODOLOLGY

The various field methods and anticipated SOPs relevant to the work associated with the OM&M activities described in the OM&M Plan are summarized in the following Sections. The SOPs are included as Attachment A.

### 3.1 General Field Procedures

Procedures relevant to general field procedures are summarized below. Additional field procedures focused on health and safety are provided in the Health and Safety Plan (HASP) (Attachment A of the OM&M Plan).

*Relevant Field SOPs:*
YO-001: Chain of Custody, Handling, Packing and Shipping; and
YO-002: Decontamination Procedures.

### 3.2 Environmental Media Sampling Collection

Project guidelines related to environmental media sampling activities performed during OM&M activities are listed below. Media-specific procedures are provided in the following subsections.

#### 3.2.1 Groundwater Sampling Collection

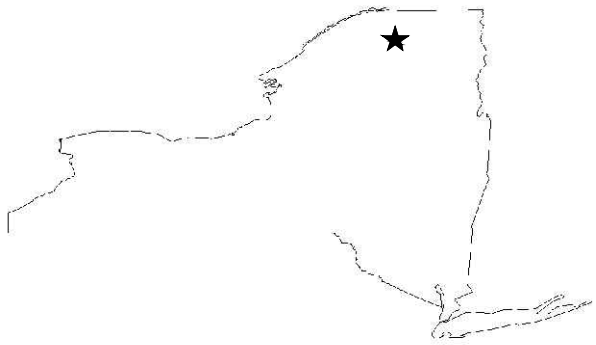
Long-term environmental monitoring includes groundwater sampling as summarized in Table 3-1. Groundwater will be monitored at the Site by sampling existing monitoring wells. The EPA Low-Flow/Minimal Drawdown method will be used for all groundwater samples where possible. Other sampling procedures, including no-purge procedures (e.g., HydroSleeve™ or passive diffusion bags), may be considered for future sampling so the relevant SOPs are also included.

*Relevant Field SOPs:*
YO-GW-001: Submersible Pump Operation;
YO-GW-002: Calibration of Field Instruments – Multiparameter (OPR, NTU, DO, etc.) Meters;
YO-GW-003: Water-Level Measurement Procedures;
YO-GW-004: Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells;
YO-GW-005: Groundwater Sampling with HydroSleeves™;
YO-GW-006: Groundwater Sampling for PFAS; and
YO-GW-007: Well Abandonment.

### 3.3 Sample Analysis Methods

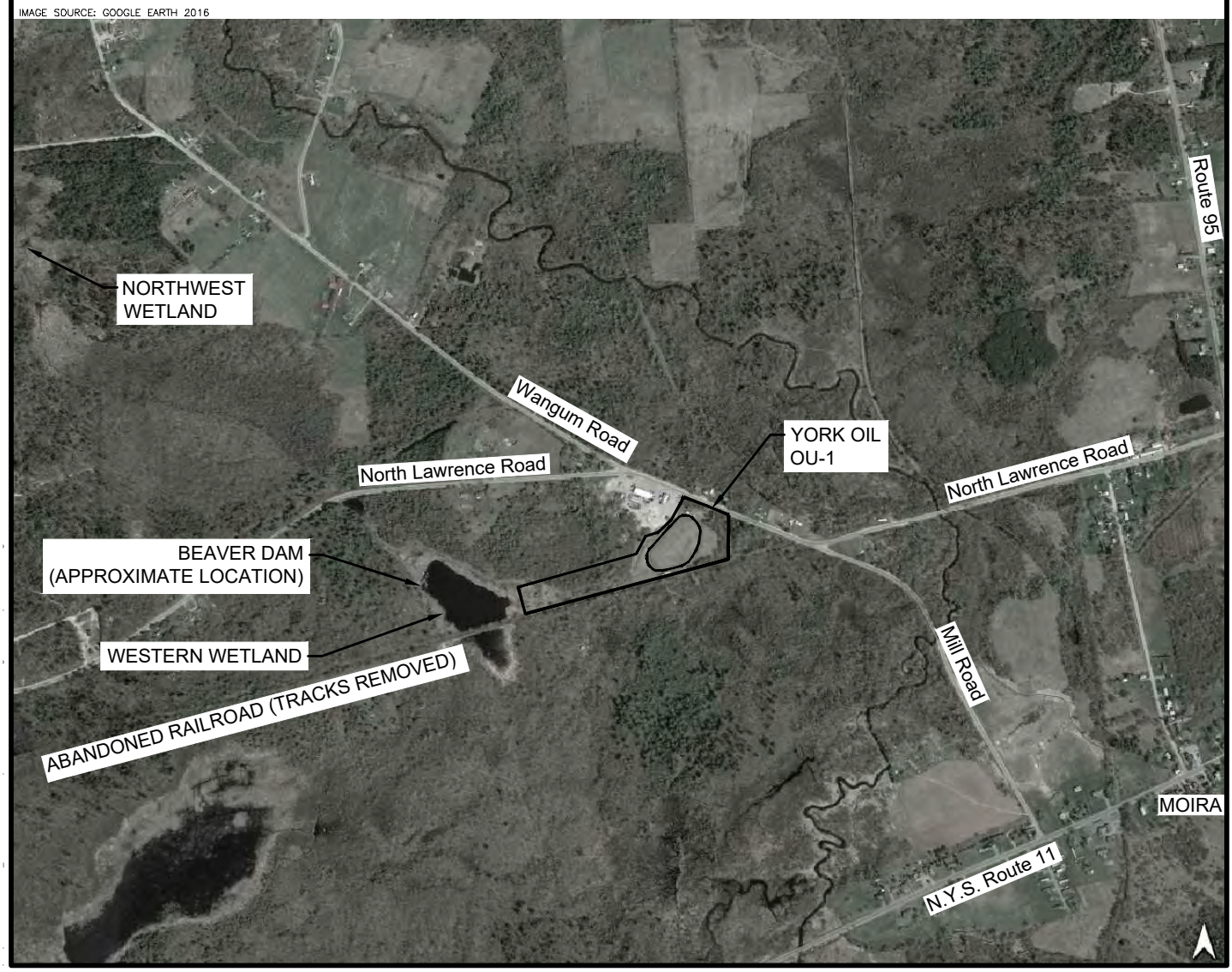
Samples collected according the procedures above will be analyzed for a variety of chemical properties. These analyses are listed in Table 3-1 and summarized in the OM&M Plan to which this FSP is amended, along with related analysis SOPs summarized in the QAPP (Attachment B of the OM&M Plan).

**FIGURES**



SITE LOCATION MAP

IMAGE SOURCE: GOOGLE EARTH 2016



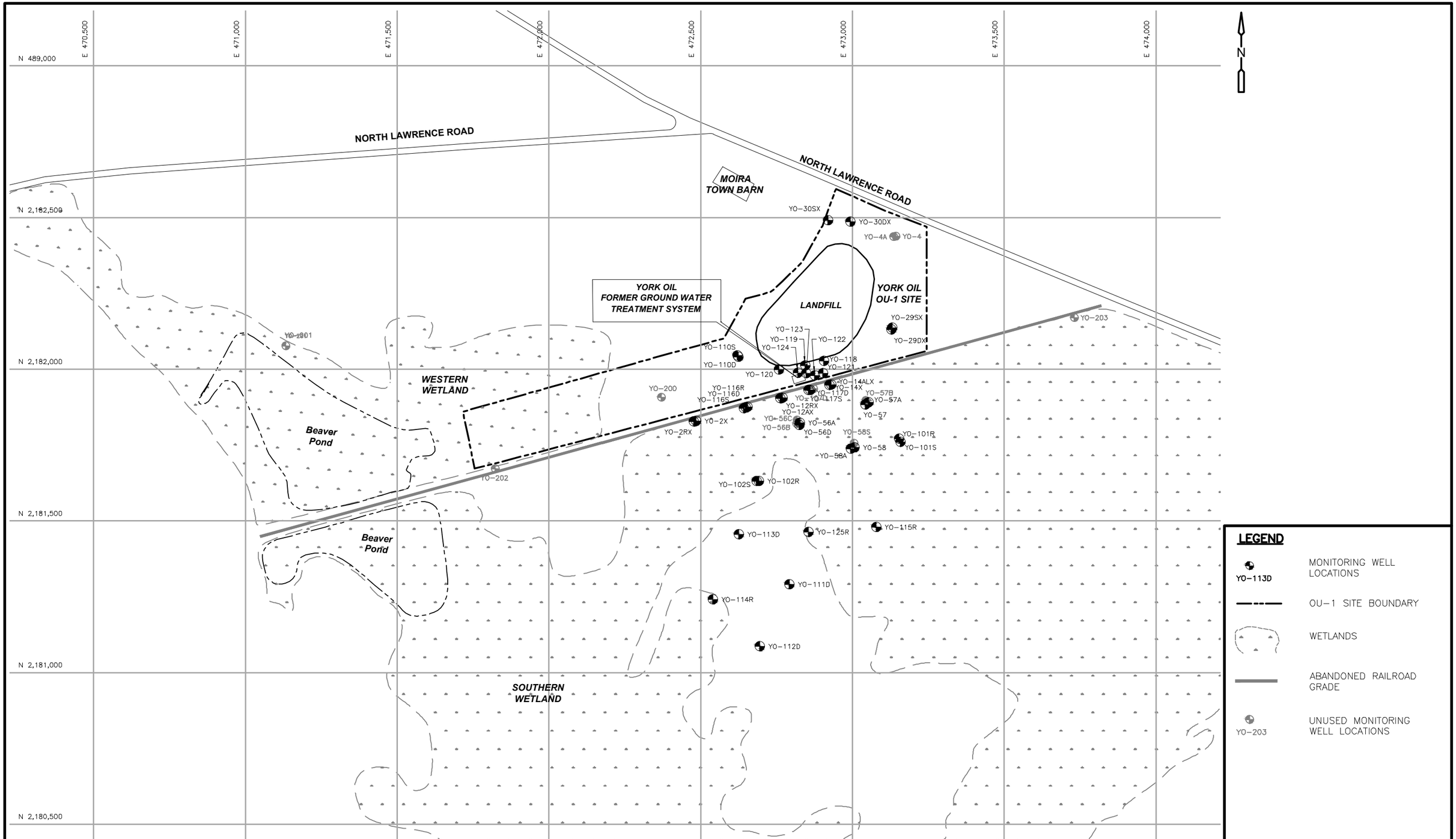

York Oil Superfund Site - Moira, New York

de maximis, inc.

1" = 1200'

600 0 1200

FIGURE 1-1
YORK OIL SITE LOCATION MAP



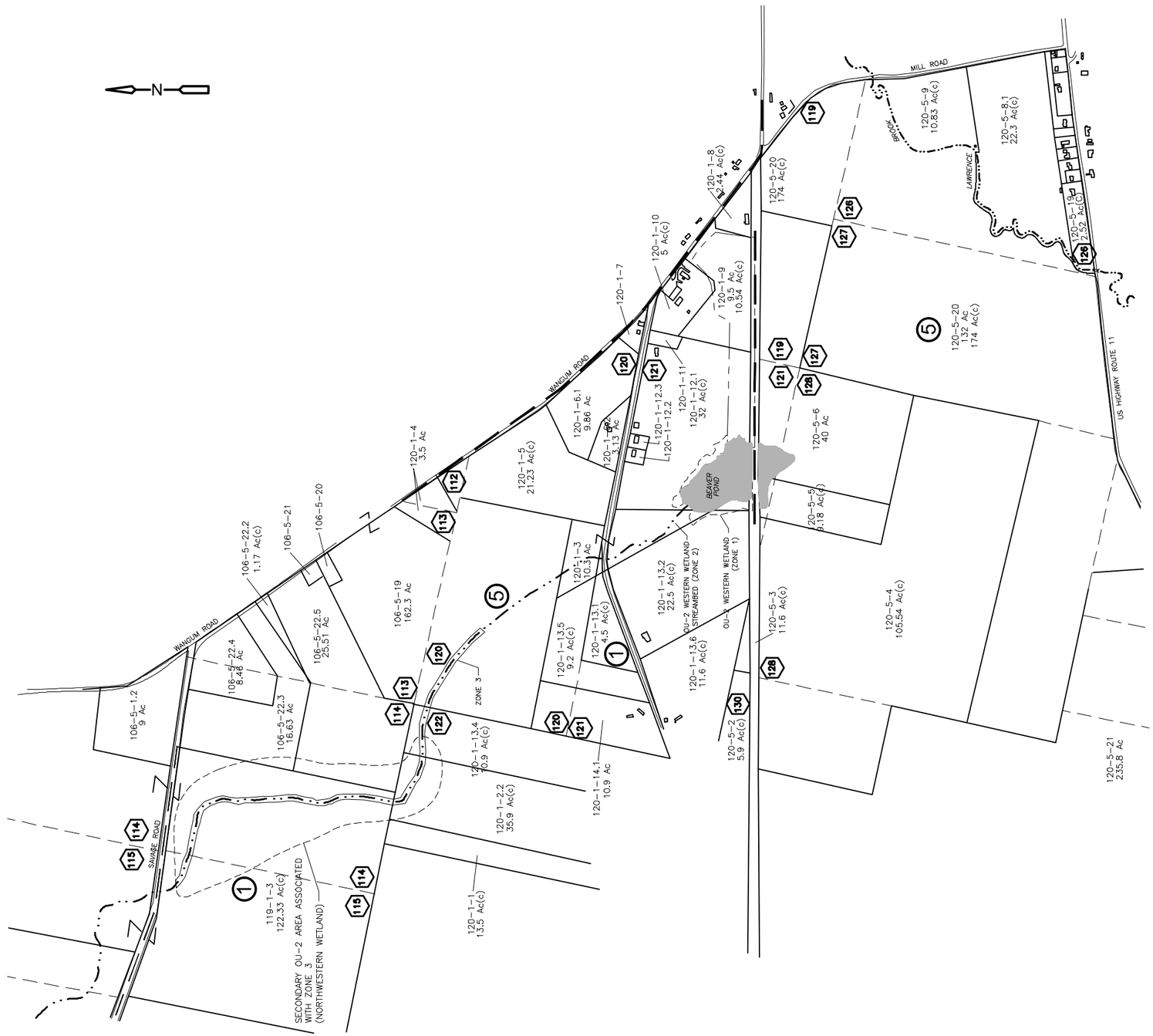

de maximis, inc.

1" = 300'

150 0 300

York Oil Superfund Site - Moira, New York

FIGURE 1-2
MONITORING WELL LOCATION PLAN




## NOTE

PROPERTY LINES ON THIS MAP ARE APPROXIMATED FROM TOWN OF MOIRA PROPERTY TAX MAPS (106, 119 AND 120). ZONES, NORTHWEST WETLANDS AND WATERLINES DERIVED FROM BLASLAND, BOUCK & LEE, INC., "CONTAINMENT PATHWAYS FEASIBILITY STUDY"; YORK OIL SUPERFUND SITE, MOIRA, NEW YORK REVISED DECEMBER 1997, AUTOCAD FIGURES 11 AND 12. THIS MAP SHALL BE USED FOR INFORMATION PURPOSES ONLY. FIELD SURVEY CHECKS ARE RECOMMENDED WHEREVER RESULTS APPEAR QUESTIONABLE.

## LEGEND

| | |
|---|---|
| 120-1-5 | SECTION-BLOCK-LOT NO. |
| 21.23 Ac(c) | AREA (CALCULATED) |
| 21.23 Ac | AREA (FROM DEED) |
| 120 | PATENT OR REALTY LOT NO. |
| 1 | BLOCK AREA NO. |
| | YORK OIL SITE BOUNDARY |
| | PROPERTY LINE |
| | PATENT OR REALTY LOT LINE |
| | BLOCK LIMIT LINE |
| | LAND HOOK |
| | WATER |
| | ROADS |
| | NORTHWESTERN WETLAND |

de maximis, inc.

NOT TO SCALE

York Oil Superfund Site - Moira, New York

FIGURE 2-1
TAX MAP BOUNDARIES WITHIN OU-1 AND OU-2

**TABLES**

| OU1 Wells | Purpose | Analytes | Frequency |
|---|---|---|---|
| YO-30SX | Background | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| YO-30DX | Background | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| YO-119 | Downgradient of Landfill | VOCs, 1,4-dioxane | Every 5 years (year prior to FYR) |
| **OU2 Wells** | **Purpose** | **Analytes** | **Frequency** |
| YO-58 | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-14X | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-111D | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-117S | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-117D | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO-12RX | Plume Monitoring | VOCs, 1,4-dioxane | Annual |
| YO- 12D | Plume Monitoring (downgradient sentinel) | VOCs, 1,4-dioxane | Annual |
| YO-14ALX | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-56D | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-101R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-102R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-113D | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-115R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |
| YO-125R | Plume Monitoring | VOCs, 1,4-dioxane | Bi-annual (every 2 years) |

**Table 3-1**
**Groundwater Sampling Schedule**

# APPENDIX A

## STANDARD OPERATING PROCEDURES

# STANDARD OPERATING PROCEDURE YO-001

# CHAIN OF CUSTODY, HANDLING, PACKAGING AND SHIPPING OF ENVIRONMENTAL SAMPLES

## 1. INTRODUCTION

### 1.1 Objective

The objective of this standard operating procedure (SOP) is to establish chain of custody, handling, packaging and shipping requirements and guidelines for environmental sample shipping. Proper chain of custody storage, handling, packaging and shipping is necessary to ensure the protection of the integrity of environmental samples shipped for analysis. For specific procedures to be used for polyfluoroalkyl substance (PFAS) samples, please refer to SOP YO-GW-006 *Groundwater Sampling of Monitoring Wells for Per- and Polyfluoroalkyl Substances*.

### 1.2 Equipment

- Coolers with return address of Site office written on inside lid
- Permanent marker or indelible pen
- Heavy-duty plastic bags
- Plastic zip-top bags, small and large
- Plastic electrical tape
- Fiber tape
- Duct tape
- Vermiculite and/or packing peanuts
- Bubble Wrap (optional)
- Ice
- Chain-of-Custody seals
- Draft Chain-of-Custody record or CLP custody records (if applicable)
- Draft Bill of Lading (if needed)

The term “Environmental Sample” refers to any sample that has less than reportable quantities of any hazardous constituents according to Department of Transportation (DOT) 49 CFR - Section 172.

## 2.0 SAMPLE HANDLING

Each sample container will be sealed in a separate plastic bag following collection. Samples will then be stored in an insulated cooler containing ice packs or ice sealed in a plastic bag. If samples are not immediately shipped to the laboratory, then they may be stored in a secure location and kept at the proper temperature. All samples shipped to a laboratory will be carefully checked against the chain-of-custody form (discussed below). Each cooler will be packed as it is being prepared for shipment in a manner that will prevent damage to sample containers during transit and in accordance with procedures presented in Section 4 below.

## 3.0 SAMPLE CUSTODY AND DOCUMENTATION

Chain-of-custody (COC) forms will be used to trace the possession and handling of all samples, from their collection, through analysis, until their final disposition. These forms will document the names of the relinquishing and receiving parties, the time and date of the transfer of custody, and the reason for the transfer of custody. One chain-of-custody form will accompany each cooler shipped to the laboratory. In the event that multiple coolers of samples are being sent to the same location, a unique, task specific, sample shipment group identifier and the number of coolers will be added to the top and special instructions portions of each chain-of-custody. The identifier will include the sample task (e.g., SW for surface water, SED for sediment), date (day, month and year), and cooler destination. The chain-of-custody form will be placed in a sealed plastic bag inside the cooler.

A custody seal will be placed on each cooler after packing and prior to shipment. For multiple cooler shipments, the sample shipment group identifier listed on the chain-of-custody will be written on the custody seal, as well as the cooler number designation (e.g., cooler 1 of 2, cooler 2 of 2). Shipping of samples to the laboratory will be accomplished by Federal Express, UPS or equivalent overnight service. Alternatively, samples for local laboratories, such as Alpha Analytical, given by the field team to a laboratory courier who takes custody of the coolers; the courier must sign the COC when they take custody of the cooler(s). The team leader will keep a copy of the COC that is signed by the laboratory courier. Samples will remain in the custody of the sampling team until custody is relinquished to the courier service that will transfer the samples to the laboratory. Each sample shipment will be tracked via the courier weigh bill (i.e. FedEx or UPS tracking number) to ensure that prompt delivery of the shipment to the laboratory has occurred.

Upon receipt by the laboratory sample custodian, the Sample Custodian will note on the form whether the custody seal is intact, the cooler temperature, the presence of air bubbles in any of the water samples submitted for VOC analysis, any damaged sample containers and/or discrepancies between the sample label and information on the COC, and sign and date the COC. A copy of the COC will then be transmitted to the Project Manager or their designate for their records. Sample receipts emailed by the laboratory to the Project Manager will be compared to the COC prepared by the field team to ensure that samples are accounted for and are assigned correctly by the laboratory for appropriate analyses.

### 3.1 Rush and Short Hold Time Samples

Prior to collection of samples for rush turn-around-times (TATs) or those with short hold times, the Project Manager should contact the laboratory and ensure that the laboratory has the capacity to receive and process samples on the desired expedited schedule (24-hr, 48-hr, or 72-hr). Samples that may require advanced planning with the laboratory may include samples submitted for expedited analysis to support decision making or analytes with short hold times. The laboratory may request that the rush TAT and/or short hold time samples are transported in separate rush air shipments or picked up by the courier immediately after collection. The personnel collecting these samples should coordinate with the project or field manager for specific instructions on the logistics.

## 4.0 PACKING PROCEDURES

### 4.1 Air Shipment

The following steps shall be followed when packing for shipment by air:

1. Select a sturdy cooler in good condition. Plug the drain valve from the inside of the cooler and secure the drain plug on the outside with fiber or duct tape.
2. Be sure the caps on all bottles are tight (will not leak); check to see that labels and are non-removable. Check that sample labels are filled out correctly with the site name, project number, a unique sample identification name or number, initials of the sample collector, time and date each sample was collected, analysis required, and sample preservative (if applicable).
3. Review and ensure that the COC records are completed properly.
4. Place all bottles in separate and appropriately sized plastic zip-top bags and close the bags. Up to three VOA vials may be packed in one bag. Due to their fragility, it is preferable that VOA bottles are placed in bubble wrap pouches typically provided by laboratories or wrapped in bubble wrap. It is preferable to place glass sample bottles and jars into the cooler vertically. Due to the strength properties of a glass container, there is much less chance for breakage when the container is packed vertically rather then horizontally.
5. Place two to four inches of packing peanuts or vermiculite into the bag in the cooler and then place the bottles in the bag with sufficient space to allow for the addition of more packing peanuts or vermiculite between the bottles. While packing material is necessary to absorb shock during shipping, the personnel must ensure that an ample supply of ice or other cooling material in the coolers, especially for samples that will be transported by carriers such as UPS or FedEx.

6. Put ice in large plastic zip-top bags (double bagging is preferred) and properly seal the bags. Place bags of ice on top of, or between, the samples. Fill remaining space between the bottles with packing peanuts or vermiculite.
7. Place the completed COC for the laboratory into a plastic zip-top bag, tape the bag to the inner side of the cooler's lid, and then close the cooler.
8. Fiber tape shall be wrapped around each end of the cooler and completed COC seals affixed to the top opposite sides of the cooler half on the fiber tape so that the cooler cannot be opened without breaking the seal. Wrap clear tape over custody seals.
9. Unless it is otherwise obvious, shipping containers can be marked with THIS END UP and arrow labels to indicate the proper upward position of the containers. A label containing the name and address of the shipper shall be placed on the outside of the container. Labels used in the shipment of hazardous materials (such as Cargo Only Aircraft, Flammable Solids, etc.) are not permitted to be on the outside of the container used to transport environmental samples and shall not be used.

### 4.2 Local Laboratory Courier

The following sample packing procedures will be used for samples designated for pickup by a local laboratory courier;

1. Follow steps 1 through 5 in Section 4.1 above;
2. Put ice in large plastic zip-top bags or place loose ice between and on top of samples that have been packed in zip-top bags. Fill remaining space between the bottles with ice.
3. Keep the COC form in a zip-top bag inside the cooler or affixed to the top of the cooler lid until the laboratory courier arrives.
4. Upon the courier's arrival, add the signature, date and time in appropriate sections of the COC form and present the COC to the laboratory courier for their signature.
5. Once the laboratory courier signs the COC, document the custody transfer by scanning, taking a hard copy, or a photograph of the COC for project records prior to couriers' departure. Put the signed COC into a zip-top plastic bag and place the COC into the cooler, then relinquish samples to the courier.

# STANDARD OPERATING PROCEDURE YO-002

# FIELD EQUIPMENT DECONTAMINATION

## 1.0 INTRODUCTION

This Standard Operating Procedure (SOP) was prepared to direct field personnel in decontamination of field equipment. For specific decontamination procedures for equipment that will be used for per - and polyfluoroalkyl substance (PFAS) sampling, please refer to SOP YO-GW-006 - *Groundwater Sampling of Monitoring wells for Per- and Polyfluoroalkyl Substances*.

### 1.1 Objective

The objective of equipment decontamination is to remove potential contaminants from a sampling device or item of field equipment prior to and between collection of samples for laboratory analysis, and to limit personnel exposure to residual contamination that may be present on used field equipment.

### 1.2 Equipment

The following equipment may be utilized when decontaminating equipment. Site-specific conditions may warrant the use or deletion of items from this list.

- Alconox or other non-phosphate concentrated laboratory grade soap specifically excluding those containing methanol and hexane;
- Deionized water;
- Pump sprayer;
- Two large plastic wash basins or buckets;
- Two coarse brushes;
- Paper towels or single-use rags;
- Small wire brush;
- Aluminum foil;
- Polyethylene sheeting; and
- Personal protective equipment (gloves, eyewear, apron, Tyvek suites, as needed).

## 2.0 PROCEDURES

### 2.1 General

The following procedures should be used for decontaminating field equipment. Procedures will vary with equipment used and potential contaminants present at the site.

### 2.2 Procedure for Aqueous and Non-Aqueous Sampling Equipment

Ground water sampling equipment, such as bladder pumps, will be cleaned using the following procedure.

1. Place wash basins (or buckets) in an established decontamination area that has a low permeability liner (e.g., polyethylene sheet) as secondary containment. The decontamination area must be of sufficient size to allow placement of the plastic wash basins in a line and space to allow air drying for equipment.
2. Fill the first wash basin with potable tap water. Add sufficient soap powder or solution to cause suds to form in the basin. Do not use an excessive amount of soap or rinsing the soap residue off the equipment will be difficult.
3. Wash the sampling equipment in the soap solution in the first basin, removing all residues. Use a brush as needed and be sure to wash inside surfaces of equipment as well as exterior surfaces. Allow excess soap to drain off the equipment when finished.
4. Spray and rinse the equipment with deionized water in a second basin.
5. Allow the equipment to completely air dry on clean polyethylene sheeting.
6. Rinse the equipment in the third basin, using deionized water.
7. Allow the equipment to completely air dry on clean polyethylene sheeting.
8. Reassemble equipment, if necessary. Reassembled equipment can wrapped in clean, unused aluminum foil, shiny side out for transport. Equipment used on the same day does not need foil wrapping.
9. Allow spent cleaning solutions in the trays to evaporate into the air. If evaporation is not possible, all spent cleaning solutions shall be disposed along with any other contaminated fluids generated during the field investigation.

Note that if temperature or humidity conditions preclude air drying equipment, equipment can be dried with paper towels or sufficient spares should be available so that no item of sampling equipment need be used more than once. Alternatively, the inability to air dry equipment completely prior to reuse should be noted in the field log.

## 2.3 Procedure for Oversized Equipment

Oversized equipment, such as submersible pumps, will be cleaned using the following procedure.

1. Fill two clean barrels with tap water.
2. Add enough concentrated soap to one barrel to form a thin layer of soap suds.
3. Immerse the pump in the soap containing barrel and start pump. Circulate the soap solution through the pump and feed discharge into a waste disposal drum. Use a brush to scrub the equipment if necessary, to remove debris.
4. Immerse the pump in the barrel filled with clean tap water and start pump. Circulate the water through the pump and feed discharge into a waste disposal drum. Run the pump until no soap residue is visible in the discharge.
5. Deionized water should then be run through the pump and used to rinse all submersible parts and hoses.
6. Record the decontamination procedure in the field logbook or appropriate field form.

## 2.4 Procedure for Measuring Equipment

Measuring equipment, such as pressure transducers or water level indicators, will be decontaminated with extra care due to the sensitive nature of this equipment, using the following procedure.

1. Fill two clean basins with tap water.
2. Add enough concentrated soap to one basin to form a thin layer of soap suds.
3. Immerse the device in the soap containing basin and gently agitate. Scrub device using a brush if it is soiled. Do not submerse any electrical connectors or take up reels, only that portion of the device in contact with potentially contaminated water.
4. Immerse the device in the basin containing the rinse water and gently agitate. Do not submerse any electrical connectors or take up reels, only that portion of the device in contact with contaminated water.
5. Spray rinse equipment with deionized water.
6. Allow the equipment to air dry.
7. Record the decontamination procedure in the field logbook or appropriate field form.

# STANDARD OPERATING PROCEDURE YO-GW-001

# SUBMERSIBLE PUMP OPERATION

## 1.0 INTRODUCTION

This standard operating procedure (SOP) was prepared to direct field personnel in the operation and limited troubleshooting of submersible pumps that may be used for purging monitoring wells and collecting liquid environmental samples. The safety procedures related to working with electric and pneumatic energy sources are provided in the Health and Safety Plan (HASP) and should be reviewed prior to field deployment.

### 1.1 Objective

The objective of submersible pump operation is to pump liquids from within a screened well to the ground surface for field screening and/or collection.

### 1.2 Equipment

The following equipment is needed for submersible pump operation:

Small Diameter Electric Submersible Pump

- Electric pump with power lead
- Tubing or hose for water discharge
- Small diameter cable, rope, or twine
- Pump controller (if needed, or a flow control valve)
- Portable generator or other power source (e.g., battery)
- Fuel to run generator

Portable Bladder Pump

- Bladder pump (a spare bladder is recommended)
- Pneumatic air tubing
- Water discharge tubing (may be bonded to air tubing)
- Small diameter cable, rope, or twine
- Pump controller with necessary air hose connectors and adapters
- air compressor or compressed gas cylinder (e.g. nitrogen) with regulator
- Portable generator, if necessary, for the air compressor.
- Fuel to run generator

Inertial Pump

- Tubing
- Check valve sized to tubing
- Surge block, appropriately sized to tubing and well (if used for well development)
- Pump actuator (e.g., Waterra Hydrolift) is optional
- Portable generator or battery, as needed for the pump actuator
- Fuel to run generator

## 2.0 PROCEDURES

### 2.1 General Submersible Pump Procedure

In general, a submersible pump setup consists of a pump connected to a power lead (e.g., electrical cable or pneumatic tubing) and tubing for carrying water to the ground surface. A power supply (e.g., generator or compressor) is often used to provide energy to operate the pump and a controller is used to regulate the flow rate of water from the pump. Because the submersible pump operates within the water column, prior to deployment, the pump and associated components that may contact the water column should be cleaned following the Field Equipment Decontamination procedures outlined in SOP YO-002.

### 2.2 Small Diameter Electric Submersible Pumps

Small diameter submersible pumps are generally used in 2-inch diameter monitoring wells or larger. There are several electric pump options for 2-inch and larger wells; some of these are capable of moving large volumes of water and overcoming significant head differentials such as when the water table is deeper below ground surface (e.g., more than 25-30 feet below the ground surface which is the practical limit for suction pumps). Submersible pumps are often powered by a generator and an electric controller. Many times a pump controller is used to adjust the flow rate of the pump although sometimes a single speed pump is used so a valve can be installed in the discharge piping to control flow. Examples of common small diameter electric submersible pumps include the Grundfos Redi-Flo2, Geotech GeoSub, and 12 volt pumps (e.g., Whale or various 'Monsoon' pumps manufactured by Proactive).

#### 2.2.1 Safety

- Inspect the electrical extension cord, as well as the lead to the pump, for frays, breaks, expose wiring, or other signs of damage.
- If there are concerns of an explosive atmosphere developing in well head space, then screen the wellhead space for vapors using a PID/FID prior to pump deployment.
- Avoid touching the steel well casing, controller housing, cabling, or other metals objects with the pump wires to prevent damaging the cables and to avoid electrical shock hazards.

- If a generator is needed, be sure that it is supplying the correct voltage for the controller and is located downwind of to the well. Do not add gasoline or oil to the generator while it is running and keep these fluids away from sampling apparatus.
- Review the HASP for additional safety precautions when using an electrical submersible pump.

### 2.2.2 Pre-Mobilization Procedures

- Check the oil and gasoline levels in the generator. The capacity for the portable Honda generator is 0.95 US Gallons (3.6 L). It is always preferable to start with a full tank of gasoline and avoid having to stop and add gasoline during well purging/sampling. Place the generator as far from the sampling location as practical to limit noise disturbance, exhaust fumes, presence of gasoline/oil, etc. Add gasoline and/or oil if necessary.
- Inspect the pump, tubing, rope, and electrical cord and connections for signs of damage. Replace or repair these items as needed.

### 2.2.3 Operation

- Place the cleaned/decontaminated pump, controller, tubing, and twine/rope on plastic sheeting next to the well and place the generator in a dry location downwind of the well. Do not connect the controller to the generator.
- Tie the twine/rope to the appropriate support eyelet on top of the pump, connect the tubing to the pump, and then lower the pump, power lead, and tubing into the well. Always support the weight of the pump and tubing with the twine/rope.
- Lower the pump until it is at the target sample depth and secure the twine/rope so that the pump is stable and hanging at the desired depth.
- If using a generator: start the generator, connect the pump to the controller, and then connect the power cord from the pump controller to the generator. If using a battery: connect the power lead from the pump to the electric controller or directly to the battery as appropriate for your setup.
- Start the pump at the lowest setting and then adjust the flow rate upward as needed using the electric controller or inline valve and monitor the drawdown in the well. If the water level drops more than desired, decrease the flow rate for the pump. Be careful to not run the pump dry as this will damage most electric pumps.

### 2.2.4 Troubleshooting

Mechanical equipment can pose challenges in the field. The table below provides some suggested troubleshooting for submersible pumps. When problems arise, field staff can also consult manufacturer's manuals and/or call the rental company for additional troubleshooting suggestions.

| Symptom | Potential Cause | Suggested Troubleshooting |
|---|---|---|
| Generator running, no pump output | Loose wiring connection. | Check all connection (power lead to controller and controller to generator). Adjust or repair as need. **Shut generator off before touching electrical connections.** |
| | Over voltage or under voltage on controller. | Adjust generator output/idle speed; allow generator more warm-up time. |
| | Pump out of water. | Lower pump into water column and adjust flowrate as needed. |
| | Power to pump is insufficient to overcome lift head to ground surface. | Increase power to pump on the controller. If drawdown occurs while pumping it will be necessary to occasionally increase the power to maintain a constant flow rate. |
| | Hose collapsed or kinked. | Un-kink hose. |
| | Hose/tubing disconnected from pump. | Pull pump from well and reconnect tubing. Use clean/decontaminated hose clamp if needed to secure tubing. |
| | Pump will not run or shuts down with thermal overload signal. Controller display indicates zero amps. | Ensure pump is set in the water column. Use cooling shroud in wells larger than 2-inch. |

## 2.3 Portable Bladder Pump

Portable bladder pumps are well suited for low-flow purging, and bladder pumps are available for wells with a casing diameter as small as ¾-inch. A bladder pump consists of a series of check valves connected to a plastic bladder. The pump is connected to water discharge line and pneumatic drive line. A compressor or pressurized gas cylinder (usually nitrogen) and controller are used to regulate the pump flow rate. When in operation, the controller supplies compressed gas to the pump which collapses the flexible bladder forcing water through a check valve and up the discharge line towards the ground surface. The controller then releases gas pressure, closing a check valve on the discharge line and allowing the bladder to expand thereby refilling the pump with groundwater. The controller then collapses the bladder again with compressed gas and the cycle repeats. One feature of a bladder pump is that flow occurs in squirts, not a steady and continuous flow. Examples of common bladder pumps include the QED SamplePro and the GeoTech portable bladder pump.

### 2.3.1 Safety

- Never blow compress air or gas directly onto expose skin.
- If using a compressed gas cylinder, ensure that it is securely fastened to a stable object when in use and during transportation.
- Be sure to regulate gas pressure.

- If using a generator or gas-powered air compressor, ensure that it is placed downwind from the well. Do not add gasoline or oil to the generator while it is running and keep these fluids away from sampling apparatus.
- Review the HASP for additional safety precautions when using a submersible bladder pump.

### 2.3.2 Pre-Mobilization Procedures

- If using a generator to power an air compressor, check the generator/compressor oil and gasoline levels. If using a compressed gas cylinder, check the pressure level to avoid having to refuel during purging or sampling. Add gasoline and/or oil if necessary.
- Inspect tubing and hoses for holes and kinks.

### 2.3.3 Operation

- Place the clean and decontaminated pump, tubing, twine/rope, controller, and air compressor next to the well on plastic sheeting. Place the generator/air compressor in a dry location downwind of the well.
- Tie the twine/rope to the appropriate support eyelet on top of the pump, connect the pneumatic drive tubing and water discharge tubing to the pump, and then lower the pump and tubing into the well. Always support the weight of the pump and tubing with the twine/rope.
- Lower the pump until it is at the target sample depth and secure the twine/rope so the pump is stable and hanging at the desired depth.
- Cut the tubing, if needed, to a convenient length and connect it to the controller. Ensure the controller is connected to the air compressor or compressed gas cylinder.
- If using a gas-powered air compressor, start the generator and turn on the compressor. Allow pressure in the compressor storage tank to rise. If using a compressed gas cylinder, attach the regulator securely to the gas cylinder head using a wrench and slowly open the regulator to supply the compressed air to the controller.
- With both the air compressor and compressed gas cylinder make sure there is enough pressure supplied to the controller to purge water to the ground surface, but not too much so as to exceed the controller inlet pressure maximum (see controller specific documentation for maximum inlet pressures). As a guide, the air line should be pressurized to about 1 pound per square inch (psi) for each foot the water level is below the ground surface.
- Turn the controller on and ensure the pressure cycle is long enough for the drive line to reach the target pressure identified above. The longer the length of tubing, the longer it will take for the tubing to pressurize. The fill time should initially be set to allow the air pressure to return to zero at the end of each cycle.

- If the pump does not discharge or is still discharging at the end of the pressure cycle, the discharge time can be increased. The fill time can be adjusted for maximum or desired flow.

### 2.3.4 Troubleshooting

Mechanical equipment can pose challenges in the field. The table below provides some suggested troubleshooting for bladder pumps. When problems arise, field staff can also consult manufacturer's manuals and/or call the rental company for additional troubleshooting suggestions.

| Symptom | Potential Cause | Suggested Troubleshooting |
|---|---|---|
| Air in sample line | Damaged bladder or O-rings or bladder shifted. | Inspect and replace. Decrease air pressure to pump. |
| No sample line output | Pump above water | Check and adjust pump level. reduce output to achieve stable drawdown. |
| | Loose pneumatic drive or water discharge tubing | Check tubing and push firmly on to connection points. |
| | Kinked pneumatic drive or water discharge tubing. | Check tubing and un-kink or replace. |
| | Inadequate air pressure | Increase discharge time or applied pressure. |
| | Silt in check valve | Surge pump in well or remove from well and clean. Consider further well development with alternate pump. |

## 2.4 Inertial Pump

An inertial pump consists of tubing with a check valve on the submerged end. Inertial pumps operate by manually (or mechanically with an actuator) cycling the tubing up and down in the water column. During the down cycle, the check valve opens and a portion of the tubing fills with water. During the up cycle, the check valve closes and lifts the water upward with the tubing. Inertial pumps are very useful for well development because they can remove solids and provide agitation (especially when a surge block is attached) and they are useful for very narrow diameter wells. However, inertial pumps are generally not a preferred sampling approach because they can cause high turbidity due to the up/down action. Thus, initial pumps are frequently used for groundwater sampling only when other pumps cannot be used. Examples of common inertial pumps are those made by Geoprobe and Waterra.

### 2.4.1 Safety

- If a battery or generator is being used to power the actuator (e.g. Waterra Hydrolift), follow electrical safety procedures noted above.
- Keep hands and loose clothing away from the moving parts of an electric actuator to avoid getting pinched or caught.

- If manually surging, wear gloves, use proper lifting techniques, and take breaks as need to avoid injury.
- Review the HASP for additional safety precautions when using an inertial pump.

### 2.4.2 Pre-Mobilization

- If using a generator to power the actuator, check the oil and gasoline level; if using a battery, ensure it is fully charged. Add gasoline and/or oil if necessary.
- If the well to be purged has a protective stick-up casing, ensure that the pump actuator has a way to be supported above the top of the well. The Waterra pump actuator is designed to be affixed to the side of the well protective casing.
- Inspect the top of the casing for sharp edges that could damage the tubing as it is raised and lowered in the well (e.g., steel casings). If necessary, protect the pump tubing or guard against the sharp edges.

### 2.4.3 Operation

- Attach a check valve to the bottom of the appropriately sized tubing by threading it on. For common initial pumps, the valve will cut shallow threads into the tubing.
- Lower the tubing, valve end first, into the well until the valve is at the sampling interval, and then cut the tubing to convenient length.
- Either by hand or by attaching the tubing to a mechanical actuator, move the tubing up and down in the water column to lift water to the surface.
- Adjust the rate of actuation to control the flow rate (if possible).

### 2.4.4 Troubleshooting

Initial pumps are simple devices, so they seldom have problems. Nevertheless, the motion needed for an inertial pump can cause pieces to come loose or they can be damaged in the well. The table below provides some troubleshooting ideas for these pumps.

| Symptom | Potential Cause | Suggested Troubleshooting |
|---|---|---|
| Actuator moving, no water discharge output | Silt in check valve | Vigorously surge tubing or remove and clean to allow ball check to seat properly in check valve. |
| | Tubing loose in actuator | Tighten actuator grip around tubing to prevent slipping. |

# STANDARD OPERATING PROCEDURE YO-GW-002

# CALIBRATION OF FIELD INSTRUMENTS

# MULTIPARAMETER (ORP, NTU, DO, ETC.) METERS

## 1.0 INTRODUCTION

### 1.1 Objective

The objective of collecting water quality data is to obtain physical/chemical parameters of aquifer being studied and collecting water quality parameters is frequently used during groundwater sampling to determine when a well has been adequately purged. The measurement methods may include deployment of down-hole multiparameter water meter/sondes (e.g. YSI 600 series, In-Situ AquaTROLL 600) in open boreholes or screened wells or monitoring field parameters for a sonde installed in a flow-through cell during low-flow groundwater purging. Obtaining accurate water quality data requires that the instrument (i.e., sonde) be calibrated. This Standard Operating Procedure (SOP) establishes procedures for calibrating a multiparameter water meter.

### 1.2 Equipment

- Water quality multiparameter meter/sonde (e.g., YSI 6-series) or low-flow sampling multimeters (e.g. YSI 556, Pro-Plus, or equivalent) with read-out instruments and cables;
- Maintenance kit with applicable o-rings, tools, brushes, lube, etc.;
- Calibration solutions;
- Cups sufficiently large for calibration fluids and the sonde;
- Flow-through cells;
- Paper towels;
- Trash bags for general trash; and
- Spare equipment batteries.

## 2.0 PROCEDURES

### 2.1 Calibration of Water Quality Sonde

Water quality sondes and multiparameter water meters are to be calibrated for each parameter at the beginning of each sample day and checked for accuracy at the end of each sample day.

### 2.1.1 Daily Calibration

Water quality instruments shall be used to monitor *in situ* turbidity levels (in NTU), temperature, dissolved oxygen (DO), pH, conductivity, and oxidation-reduction potential (ORP). Daily calibration shall be performed at the beginning of each workday. Calibration will be performed using calibration solutions and procedures prescribed by the manufacturer instructions. Calibration details will be recorded on the attached Field Calibration Form. The general method of calibration for each sensor is described below:

- Dissolved Oxygen

  a) Sondes - two-point calibration including zero DO solution and 100% saturation (in air) or

  b) Low-flow multiparameter instruments - a one-point calibration at 100% saturation (in air) followed by a check with a zero DO solution;

- Conductivity: single-point calibration (typically with a 1413 µS/cm or 1,000 µS/cm standard);
- Temperature: factory-calibrated (temperatures of all calibration standards should be recorded during calibration);
- pH: three -point calibration including pH values of 4.0, 7.0, and 10.0.;
- ORP: single-point calibration (Zobell or 100 mV solution); and
- Turbidity:

  a) Sondes - two-point calibration including standards using 0 NTU, 10.0 NTU, 20NTU, 12.7 NTU, 100.0 NTU, 800.0 NTU or 1000.0 NTU solutions.

  b) Multiparameter instruments used for low-flow sampling are not typically equipped with a turbidity sensor therefore a standalone Turbidity meter (e.g. LaMotte 2020we, HF Scientific MicoTPW, HACH 2100Q, or equivalent) is used. The turbidity meters typically require a two or three-point calibration including standards using 0 NTU, 0.2 NTU, 10.0 NTU, 20NTU, 100.0 NTU, 800.0 NTU or 1000.0 NTU solutions.

The instruments will be recalibrated as necessary (e.g., when field data are suspect, or calibration checks indicate incorrect operation) to ensure accurate measurements. All checks and recalibrations will be recorded on the applicable Field Calibration Form.

### 2.1.2 End-of-Day Check

At the end of each day, the instruments used for manual sampling should be checked against known standards to confirm that probes are reading correctly. This is done by submerging the probe in the calibration solutions used at the beginning of the day for calibration and recording the readings. If the reading is not within the accuracy limits of the probe compared to the calibration

value, the information should be recorded in the logbook and on the Field Log for the locations visited that day.

### 2.1.3 Decontamination

The sonde will be decontaminated between each sampling location. Decontamination shall be performed according to SOP YO-003. Personnel and PPE decontamination shall be performed in accordance with the HASP.

Water Quality Sonde Calibration Form

# In-Situ AquaTROLL 600

Inspector:_____ Date:_____

| | | | |
|---|---|---|---|
| In-Situ Troll S/N: | | | |
| Battery % Remaining | | Batteries Replaced? | Y / N |
| Internal Log Stopped/Downloaded and Sent to Amy Hoffmann? | Y / N | Internal Log Setup and Started? | Y / N |
| Task: | | | |

| ***Initial Check*** | | ***Standard*** | ***Reading Check*** | ***Acceptance Criteria*** | ***Pass / Fail*** | ***Recalibrated*** ***(See Below)*** |
|---|---|---|---|---|---|---|
| **pH** | S.U. | | | +/- 0.5 pH unit | P / F | Y / N |
| **ORP** | mV | FROM CALIBRATION SCREEN / CHART | | +/- 10 mV | P / F | Y / N |
| **Turbidity** | NTU | | | +/- 2 NTU | P / F | Y / N |
| **Sp. Conductivity** | µS/cm | 1,413 @ 25°C | | +/- 15% (Acceptable range: 1201.05-1624.95) | P / F | Y / N |
| **RDO** (Zero Solution) | mg/L | | | +/- 0.5 mg/L | P / F | Y / N |
| **Temperature** | °C | FROM THERMOMETER | | +/- 0.5 °C | P / F | Annually Only |

| ***Calibration:*** | *Sensor Range Value* | *Sensor Acceptance Criteria* | *Sensor Pass / Fail* | *Sensor Replaced or Solution Changed?* | *Sensor S/N:* |
|---|---|---|---|---|---|
| **pH** 4-7 | Slope 1: | –66 to –50 mV/pH | P / F | Y / N | |
| **pH** 7-10 | Slope 2: | | P / F | | |
| **pH** 4-7 | Offset 1: | +/- 30 mV | P / F | | |
| **pH** 7-10 | Offset 2: | +/- 30 mV | P / F | | |
| **ORP** mV | Offset: | +/- 30 mV | P / F | | |
| **Turbidity** NTU | Slope: | 0.7 to 1.3 | P / F | Y / N | |
| **Sp. Conductivity** µS/cm | Cell Constant: | 0.7 to 1.3 | P / F | Y / N | |
| **RDO (100% and 0% Sat.)** | Slope: | 0.7 to 1.3 | P / F | Y / N | |
| | Offset: | +/- 0.3 mg/L | P / F | | |

| ***Post Calibration Check*** | *Standard* | *Calibration Confirmation* | *Acceptance Criteria* | *Calibration Pass / Fail* |
|---|---|---|---|---|
| **pH** S.U | 1 | | +/- 0.1 pH unit | P / F |
| **ORP** mV | | | +/- 5mV | P / F |
| **Turbidity** NTU | | | +/- 2 NTU | P / F |
| **Sp. Conductivity** µS/cm | 1,413 @ 25°C | | +/- 10% (Acceptable range 1271.10—1554.30) | P / F |
| **RDO** (Zero Solution) | | | +/- 0.3 mg/L | P / F |

Notes

# STANDARD OPERATING PROCEDURE YO-GW-003

# WATER LEVEL MEASUREMENT PROCEDURES

## 1.0 INTRODUCTION

This Standard Operating Procedure (SOP) was prepared to direct field personnel in the methods for conducting water level measurements in monitoring wells during field investigations at hazardous and non-hazardous waste sites.

### 1.1 Objective

The objective of water level measurements is to gain accurate measurements (to within 0.01 ft) of the depth to groundwater from a reference point (e.g., mark on the top of a well casing). This procedure is used during groundwater sampling but may also be used during well installation. Data from water level measurements is commonly used for the preparation of groundwater elevation contour maps, purge volume calculations during groundwater sampling, slug tests, packer tests, and pump tests.

This SOP assumes that an electronic water level meter will be used. There are other (older) methods for obtaining water level measurements; if one of these less common methods is needed, then this SOP will be updated.

### 1.2 Equipment

The following list of equipment may be utilized during water level measurements. Site-specific conditions may warrant the use of additional or deletion of items from this list.

- Electronic water level indicators – graduated
- Water for decontamination
- Alconox, liquinox or other non-phosphate concentrated laboratory grade soap
- Spray bottles
- Site specific personal protective equipment (e.g., gloves, eyewear, tyvek suits)
- Air monitoring instruments as required (e.g., PID or FID as specified in HASP)
- Field forms (or Field logbook) (SOP NMI-008)
- Well keys
- Previous depth to water measurement data (if available)
- Oil/water interface probe (if necessary)

## 2.0 PROCEDURES

### 2.1 General

The following procedures should be followed during water level measurements. Procedures may vary depending on the equipment used and contaminants present at the site.

Site-specific conditions may warrant the use of stringent air monitoring and potentially more significant decontamination scenarios.

1. Record the condition of the well (protective casing, concrete collar, lock in place etc.) on the field form/field logbook.
2. Check that the water level tape has no obvious kinks or damage.
3. Put on latex or other sterile gloves. Stand upwind of the well; unlock and open the well. If a vented cap is present, conduct well head air monitoring from the vent. If a non-vented well cap is present, remove the cap and monitor air quality at the well head. Record all pertinent air monitoring results (sustained, dissipating, background, odor). Proceed to the nest steps if conditions at the wellhead are safe for field staff.
4. Identify the previous measuring point for the well which may be a marking or notch on the riser or casing (if present). Record this location in the field logbook or on the water level monitoring form.
5. Using a clean (i.e., decontaminated) water level indicator, turn on the meter, check the audible indicator using the test button if present, reel the electronic probe into the well riser (with the increments visible) slowly until the meter sounds. Grasp the tape and slowly raise and lower the probe to the depth where the meter just begins to sound. Check the depth to water on the tape from the measuring point for the well - make a mental note of the depth to within 0.01 feet. Slowly raise and lower the probe again and repeat the measurement to confirm the prior reading. Be careful when reading increments on the tape. It is easy to make a one-foot error in the measurement if the tape is read backwards.
6. Record the depth to water from the measuring point on the field form (or field logbook).
7. Remove the probe from the well using the reel, decontaminate the probe using SOP YO-GW-003, reseal the well and proceed to the next monitoring location.
8. Procedures utilized during water level measurements where free phase petroleum products are floating on the water table should be modified to include the use of an oil/water interface probe. When gauging free product depth and water depth, the procedures is similar to that described above except the meter will have two sounds – one for free product and another for water. The meter is lowered to the top of free product and raised up/down slightly to accurately measure the depth to the top of free

product. The meter is then lowered to the top of water and raised up/down to measure the depth to the top of water from the measuring point.

## 2.2 Decontamination

The water level indicator will be decontaminated between each monitoring location. Decontamination shall be performed according to YO-GW-003. Personnel and PPE decontamination shall be performed in accordance with the HASP, as needed.

# STANDARD OPERATING PROCEDURE YO-GW-004

# GROUNDWATER SAMPLING USING THE LOW-FLOW PROTOCOL

## 1.0 INTRODUCTION

This standard operating guideline provides instructions for groundwater sampling using the EPA low-flow/minimal drawdown well purging protocol. Included in this standard operating procedure are field forms for sampling, instructions and forms for meter calibration, and directions and documentation. When sampling for PFAS compounds, this SOP should be used in conjunction with YO-GW-006 – *Groundwater Sampling of Monitoring Wells and Analysis for Per- And Polyfluoroalkyl Substances*.

### 1.1 Equipment and Supplies

Pumps and probes may differ depending on the well diameter, groundwater constituents and depth to groundwater, but generally, sampling will require the following equipment:

- Peristaltic, bladder or Waterra pump capable of a flow rate between 50 and 500 ml/minute and appropriate power supply. The pump type will principally depend on the depth to water and well diameter. Bladder pumps are preferred; peristaltic pumps are acceptable only for wells where the depth to water is less than about 25 feet; Waterra pumps are only recommended for narrow diameter wells that cannot be sampled using a bladder or peristaltic pump. Prior to sampling for per-and polyfluoroalkyl substances (PFAS), please ensure that the pump and all other equipment and supplies as well as sampler clothing used are free of PFAS containing substances including polytetrafluoroethylene (PTFE, i.e. Teflon);
- Field probe and flow-through cell (e.g., YSI or In-Situ) for measuring pH, temperature, conductance (and/or specific conductance), dissolved oxygen and oxidation-reduction potential of groundwater;
- a turbidity meter;
- Calibration solutions for the field probes;
- Water level tape;
- Tubing, connections and tools as appropriate. PTFE (Teflon®) or PTFE-lined polyethylene tubing should not be used when sampling for PFAS; a suitable alternative, such as high-density polyethylene tubing should be used;
- Graduated cylinder and stopwatch;
- A three-way (T-valve);

- 5-gallon bucket and funnel for purge water;
- Field forms, notebook and PPE (as specified in the Health and Safety Plan);
- Decontamination supplies (e.g., DI water, Alconox soap, alcohol, paper towels);
- Sample containers and cooler (typically provided by the laboratory);
- Clean plastic sheeting, paper towels and miscellaneous supplies; and
- Photoionization Detector (PID) or Flame Ionization Detector (FID). If appropriate, to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

## 2.0 PROCEDURES

### 2.1 Pre-Mobilization Activities

- Obtain information (e.g., a table) with the construction, diameter, depth, material, screened interval, to extent available, and a map showing location for each monitoring well or multi-point sampler to be sampled.
- Obtain a listing of the parameters that will be measured in the field or laboratory as part of the sampling program including the required analytical method, sample volume, and holding time for each parameter. The parameters that will be measured in the field are the low flow stabilization parameters including temperature, pH, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity. These parameters will be recorded as required during low flow sampling, and immediately prior to collection of samples for laboratory analysis.
- In some cases, other parameters may be measured in the field using field test kits. Obtain the necessary test kits and supplies (e.g., deionized water).
- If dissolved metals will be analyzed, confirm that the laboratory will provide filters for field filtering of the groundwater samples.

### 2.2 Pre-Sampling Procedures

Several steps are required before sampling any of the wells. These steps ensure that instruments are functioning and properly calibrated, and that the necessary equipment has been supplied for efficient and accurate sampling.

#### 2.2.1 Inventory

Verify that the correct equipment is ready to be shipped to the field site and that it is clean (decontaminated). Inventory sample containers to verify that the laboratory has provided the correct number of containers of the proper size and contain preservative if required. It is recommended that sample containers are pre-labeled and bundled for each well (and depth at each well, and/or filtered versus non-filtered samples) to limit errors (such as forgetting to fill a bottle) during sample collection.

Verify that the appropriate personal protective equipment and ancillary supplies (e.g., paper towels, decontamination solution) are ready to be shipped to the field site. The appropriate protective equipment, as specified in the site-specific Health and Safety Plan, can be reviewed during a morning tailgate meeting. Contact the field supervisor or project manager immediately if there are discrepancies.

### 2.2.2 Calibration

Calibrate the field probes consistent with the manufacturer's specifications and the following at the start of each field day:

1. the pH probe should be calibrated using three points (pH = 4, 7, 10) using fresh calibration solutions;
2. the dissolved oxygen (DO) meter should be calibrated to moist air (100% saturation) and to zero DO using a saturated sodium bisulfite solution;
3. the redox potential (ORP) meter should be calibrated using Zobell 231 mV solution;
4. the specific conductance meter should be calibrated using a potassium chloride or equivalent solution (typically 1413 µS/cm); and
5. the turbidity meter should be calibrated using three points (typically 20, 100, 800 NTU), however exact calibration values may vary by manufacturer.

Record the calibration data on the field calibration record provided in this SOP. Periodic checks of the calibration should be performed during the field day, including a check at the end of the field day. Instruments will be recalibrated as necessary (e.g., when calibration checks indicate incorrect operation) to ensure accurate measurements, and all checks and recalibrations will be recorded on field calibration forms. Also check calibration if any readings are suspect.

Although, instruments typically do not require temperature sensor calibration, the accuracy of the sensor should be checked at least once per year. Rental companies should perform the temperature sensor calibration check and include it with the instrument documentation that it was performed. If the information is not included with the instrument, or the last check was over a year, then the accuracy should be checked against a thermometer traceable to National Institute of Standards and Technology (NIST).

Calibration form is provided in Attachment A.

## 2.3 <u>Well Purging and Sampling</u>

Sampling is performed using a five-step procedure that will be followed upon arrival at each well:

1. set-up;

2. purging;
3. measurement of field parameters and field testing;
4. sampling; and
5. clean-up.

Detailed procedures for each of these steps are provided in the following subsections. A monitoring well purge record form is provided in Attachment B.

### 2.3.1 Set-up

All necessary equipment for purging, sampling and sample storage will be brought to the well before the well is opened. Equipment will be placed on a clean plastic sheet near the well. General parameters describing the well and field condition (e.g., well ID, depth, weather, date and time) will be documented on a field data sheet.

The sampler will proceed with measuring the depth to the water surface, if possible (this may not be for the multiport wells) according to the SOP YO-GW-003. The tubing, field probe, and reservoir for purged water are then set up. A T-valve will be put in line between the pump and the flow-through cell and used to collect turbidity samples before the purged water enters the flow-through cell.

### 2.3.2 Purging (Low Flow Protocol)

Wells are purged using the low flow/minimum drawdown protocol as described by Puls and Barcelona (1996) and subsequent EPA low-flow protocols. The general procedural requirements for low-flow purging are as follows.

- Lower the pump slowly down the well positioning the pump intake at the middle of the well screen (unless another sampling depth is prescribed in the sampling plan).
- Minimize disturbance of the water column in the well by initiating pumping at a low rate (see below). Dedicated tubing (left in-place between sampling events) is also recommended to minimize disturbance to the water column before and during sampling.
- Begin pumping at a steady rate of 100 mL/min and measure the depth to water frequently (e.g., every minute for the first few minutes) to ensure that less than 0.3 ft of drawdown occurs. The pumping rate may be increased if drawdown is less than 0.3 ft, but the pumping rate should not exceed 500 mL/min. In some silty and/or clayey formations, drawdown may exceed 0.3 ft when pumping at 100 mL/min. If possible, decrease the pumping rate to the minimum pumping rate of the pump but not lower than the rate required to “turn over” at least one flow through cell volume between measurements (e.g. every five minutes). If the drawdown exceeds 0.3 ft, purging can continue as long as the drawdown stabilizes. If the drawdown exceeds 0.3 ft, the

volume required to be purged before sampling must be greater than the stabilized drawdown volume plus the volume in the tubing. The drawdown volume and the tubing volume can be calculated as follows:

- Stabilized Drawdown (ft) = Stable Pumping Depth to Water (ft) – Initial Depth to Water (ft)
- Stabilized Drawdown Volume = Stabilized Drawdown (ft) * Volume Per Foot for the Well (see table below)

| Diameter of Well (inches) | Volume per foot (L) | Volume per foot (Gal) |
|---|---|---|
| 1 | 0.154 | 0.041 |
| 2 | 0.618 | 0.163 |
| 3 | 1.389 | 0.367 |
| 4 | 2.470 | 0.653 |

- Tubing Volume = Tubing Length (ft) * Volume per foot for a given Tubing Diameter (see table below)

| Tubing Diameter (inches) | Volume per foot (L) | Volume per foot (Gal) |
|---|---|---|
| 0.25 | 0.010 | 0.003 |
| 0.5 | 0.039 | 0.010 |
| 0.75 | 0.087 | 0.023 |
| 1 | 0.154 | 0.041 |

- If the drawdown exceeds 0.3 feet and does not stabilize within two hours of purging, refer to sections below on *Variations from Low Flow Protocol* for alternatives to the low flow/minimum drawdown protocol.
- Field parameters and depth to water will be recorded on field data sheets a minimum of every 5 minutes while purging.
- Turbidity measurements will be collected by closing the valve to the flow-through cell and opening the valve to a separate output stream for filling turbidity vials.
- Measurements using the flow-through cell will be collected after closing the valve to the turbidity stream and opening the valve to the flow-through cell.
- Purging will continue until pH, temperature, specific conductance, ORP, DO concentration, and turbidity stabilize, which is defined as follows:
    - ±0.1 units for pH;
    - ±3% for specific conductance;
    - ±10 mV for ORP;

- ±3% for temperature;
- ±10% for turbidity (or less than 5 NTU); and
- ±10% dissolved oxygen (or less than 0.5 mg/L).

In the case that the above criteria for stabilization are not met before three well volumes have been pumped, then up to five well volumes can be pumped and then samples collected. If, at any time during this additional purging, the stabilization criteria are met for three consecutive data logging events, then samples can be collected.

### 2.3.3 Variations from Low Flow Protocol

Wells in low yield formations, such as poorly fractured bedrock or silt/clay soils, may not yield sufficient water for purging at 100 mL/min without more than 0.3 ft of drawdown. In these cases, a modified low flow method can be used. The field team should use an approach which balances practicality with sample quality such as collecting a sample after two hours of purging even if only some field parameters have stabilize or can evacuate all casing water and re-sample the well as soon as sufficient recharge has entered the well to fill necessary bottle ware. In either case, appropriate notes should be added to the field form indicating changes to the low-flow procedure. The choice of which approach will be made by the project team based on site conditions.

### 2.3.4 Sampling

Samples will be collected after field parameters have stabilized and been recorded. The pump rate and sample intake location should not be adjusted between purging and sampling with the exception that the pump rate can be increased after the SVOC samples are taken. Samples are to be obtained from the influent line (prior) to the three-way valve and flow-through cell (i.e., field parameters cannot be measured during sampling). The following sampling strategy is to be followed at each location.

*Sampling for VOC and Biodegradation Parameters*

Sample containers are to be filled in the order listed below and on the field data sheet using the following protocols:

1. PFAS/PFOA samples will be collected first. These parameters will be collected in containers supplied by the laboratory and collection procedures will follow recommendations from the laboratory. Container size, quantity, and preservative information is provided in the QAPP.

2. VOC samples will be collected second. Sample containers are to be completely filled so that a meniscus forms over the opening of the container. The container lid will be moistened with groundwater and screwed to the container body. The container is then turned upside down and inspected for air bubbles. If air bubbles exist in the container,

then it is "topped off" to eliminate bubbles. This procedure is repeated until there are no entrapped bubbles in the container. Filled samples are stored on ice at 4°C (±2°C).

3. SVOC (including 1,4-dioxane) samples will be collected third. Water will be dispensed into up to two 1000 ml amber glass bottles without a preservative, Sample containers will be filled to the neck of the glass jar and the lid will be screwed shut. Filled samples are stored on ice at 4°C (±2°C). Remediation General Permit (RGP) parameters (if sampled) or samples for geochemical parameters will be collected third. These parameters will be collected in containers supplied by the laboratory and collection procedures will follow recommendations from the laboratory. Container size, quantity, and preservative information is provided in the QAPP.

4. Total and Dissolved metals will be collected last. Groundwater will be placed into containers provided by the laboratory with the appropriate acid preservative. A 0.45 µm filter will be placed in line to fill sample containers that will be analyzed for dissolved metals. An approximately 100 mL of purge water should be run through the filter as a rinse before collecting samples. The sampler should make sure that no air bubbles remain in the filter prior to collecting the samples.

Note that some samples require a preservative, which will be dispensed to the container by the laboratory prior to bottles being shipped to the site. Care will be taken not to spill the preservative or overflow the container. Samples containing preservative cannot be emptied and refilled, so they must be collected without air bubbles on the first filling attempt or carefully topped off.

### 2.3.5 Observations During Sampling

Field sampling staff will identify and log any observations that may be considered *unusual* into a field notebook or on the field data sheet for each well. These observations include but are not limited to: excessive bubbling within the tubing or in the sample containers as they are filled; odors such as sulfide; excessive turbidity, solids, or formation of precipitates in the samples; color changes in the water; unusual sounds made by the equipment. In addition, sampling personnel will note the condition of the well upon arrival and inspection. If the well casing is damaged and there are anomalies in the calculated water level at the well, then the casing damage may indicate compromised sample quality.

### 2.3.6 Storage and Shipping

All samples will be immediately placed on ice (preferably double-bagged wet ice packs) to remain at 4°C (±2°C) prior to and during shipment to the laboratory. The sample containers will be stored in a cooler until further processing. The Chain of Custody forms for each sample suite will be sealed inside of a Ziploc® container (doubled if necessary) and placed in the cooler with the corresponding samples. Fragile material (glass or other breakable sample vials) may be

wrapped with bubble wrap or a similar material. Storage, packing, and shipping are provided in SOP YO-001 - Chain of Custody, Handling, Packing, and Shipping, while procedures for PFAS samples are provided in YO-GW-006.

## 2.4 Documentation

Field documentation includes completed calibration records, low flow sampling data sheets, daily field logs and other field notes deemed relevant. It is essential that field data sheets be filled out completely and legibly at each location, and that entries are consistent for each location and among different personnel. As referenced above, low-flow data and calibration forms are provided with this SOP. The attached field sheets may be modified to represent the specific parameters of interest for a given project, but should include the following information:

- Job, site, date and sampler;
- Well identification and description;
- Reference elevation and depth to water;
- Casing volume calculation;
- Depth of pump intake during purging and sampling;
- check list of items for pre-sampling well condition inspection;
- Equipment used (field probes, tubing, model and serial numbers);
- Purge rate, field parameters (temperature, conductivity, DO, ORP, pH, and, if specified, turbidity) and depth to water recorded every 5 minutes;
- Sampling parameters;
- Stabilized field parameters;
- Identification, time, container types, preservatives, and analytical methods for samples; and,
- Space for comments.

Sample documentation must include a Chain of Custody form (COC) which logs all samples collected and analyses to be performed. The COC must remain with the samples and it is recommended that the COC be complete as samples are collected and placed into the cooler. The COC must document each time the samples are relinquished (e.g., sample team to lab courier). Typically, the laboratory provides a blank COC and the field team completes the COC.

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Environmental Solutions

# MONITORING WELL DEVELOPMENT PURGING & SAMPLING RECORDS

| | |
|---|---|
| Well ID: | Well Diameter: |
| Project Name: | Total Depth: |
| Project Number: | Initial Depth to Water: |
| Date: | Intake Depth: |
| Recorded By: | Depth to Water after Purging: |
| Sample ID: | Method of Purging: |
| Duplicate ID: | Multi-Meter ID: |
| Weather: | Turbidity Meter ID: |

| Time | Depth to Water | Pumping Rate | Cumulative Volume | Temp | pH | Specific Conductance | D.O. | ORP | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | (ft btoc) | mL/min | L or gal | C | -- | us/cm | mg/L | mV | NTU | |
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| Samples Collected | Time Collected | Analysis |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

Notes: (well condition; nearby activities, odors, problems, deviations, etc. )

| Parameter | 3 Readings Within |
|---|---|
| pH | +/- 0.1 |
| Specific Cond | 3% |
| Dissolved O2 | 10% if greater than 0.5 mg/L Or under 0.5 mg/L |
| ORP | +/-10mV |
| Turbidity | 10% if greater than 5 NTU, Or under 5 NTU |
| Temperature | 3% |

| Well Casing Volume Per foot Of Depth | |
|---|---|
| Diameter (In) | Gallons/Foot |
| 1 | 0.041 |
| 1.5 | 0.092 |
| 2 | 0.163 |

# STANDARD OPERATING PROCEDURE YO-GW-005

## GROUNDWATER SAMPLING WITH HYDRASLEEVES™ INTRODUCTION

This Standard Operating Procedure (SOP) was prepared to direct field personnel in the methods for collecting groundwater samples using Hydrasleeve™ samplers. The Hydrasleeve™ sampler is a passive sampling device that does not require well purging. The objective of using a passive sampler is to minimize the generation of purge water and enable collecting groundwater samples in wells screened in low permeability formations which do not yield sufficient water for low-flow sampling. The Hydrasleeve™ sampler consists of five components: a suspension line, sample sleeve, a polyethylene check valve, a reusable stainless-steel weight clip, and a discharge tube. The size of the sample sleeve varies and can be selected based on the well diameter and required sample volume. The sample sleeve is designed to collect a sample directly from the well screen and fill as it is pulled up through the screened interval.

## 1.0 EQUIPMENT

The following equipment is needed for Hydrasleeve™ sampling.

- Latex gloves, eye protection and other PPE as required by the Health and Safety Plan (HASP);
- Well construction information, specifically the depth to the top and bottom of the well screen relative to the ground surface or top of well riser;
- Sample containers (e.g., 40 milliliter VOA vials, 1 liter amber glass jars, 1 liter plastic bottles, etc.) with preservative as required by the sampling plan;
- Hydrasleeve™ samplers and associated equipmentField activity forms; and,
- Chain-of-custody forms and sample cooler with ice packs.

## 2.0 PROCEDURE

The device must be placed and retrieved in a manner that will ensure that only water from the screened interval of the well is collected. Detailed deployment and collection procedures are provided below in the attached SOP from the manufacturer. Sampling containers should be filled in proper order (VOC, SVOCs etc.) follow sample collection procedures outlined in the Quality Assurance Project Plan (QAPP). Samples should be placed on ice immediately after bottles are filled.

## 3.0 DECONTAMINATION AND DISPOSAL

The Hydrasleeves™ are single-use sampling devices and therefore decontamination procedures do not apply to the sample sleeves. Re-usable stainless-steel weights should be decontaminated

using procedures detailed in SOP YO-003 prior to deployment at other monitoring wells. The sampling sleeves and PPE (e.g. latex gloves) should be accumulated in waste containers for proper disposal.

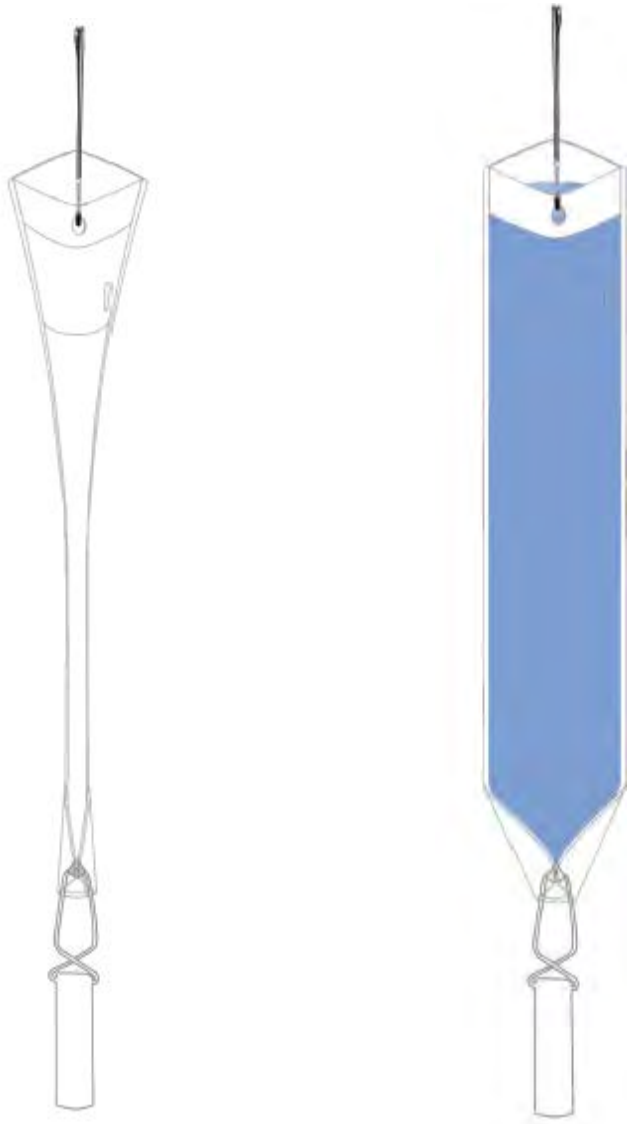
## 4.0 DOCUMENTATION

Field sampling activities will be documented in the appropriate field forms/field logbooks. The field staff should provide a consistent level of documentation among different personnel. The field staff will ensure that Chain of Custody forms are filled out completely and legibly and follow sample handling and shipping procedures detailed in SOP YO-001.

HYDRASleeve™

Simple by Design US Patent No. 6,481,300; No. 6,837,120 others pending

# Standard Operating Procedure: Sampling Groundwater with a HydraSleeve



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This guide should be used in addition to field manuals and instructions appropriate to the chosen sampling device (i.e., HydraSleeve, SpeedBag or Super/Skinny Sleeve and W3 HybridSleeve).

Find the appropriate field manual and instructions on the HydraSleeve website at http://www.hydrasleeve.com.

For more information about the HydraSleeve, or if you have questions, contact:
GeoInsight, P.O. Box 1266, Mesilla Park, NM 88047
800-996-2225, info@hydrasleeve.com.

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## Introduction

The HydraSleeve is classified as a no-purge (passive) grab sampling device, meaning that it is used to collect groundwater samples directly from the screened interval of a well without having to purge the well prior to sample collection. When it is used as described in this Standard Operating Procedure (SOP), the HydraSleeve causes no drawdown in the well (until the sample is withdrawn from the water column) and only minimal disturbance of the water column, because it has a very thin cross section and it displaces very little water (<100 ml) during deployment in the well. The HydraSleeve collects a sample from within the screen only. It excludes water from any other part of the water column in the well through the use of a self-sealing check valve at the top of the sampler. It is a single-use (disposable) sampler that is not intended for reuse, so there are no decontamination requirements for the sampler itself.

The use of no-purge sampling as a means of collecting representative groundwater samples depends on the natural movement of groundwater (under ambient hydraulic head) from the formation adjacent to the well screen through the screen. Robin and Gillham (1987) demonstrated the existence of a dynamic equilibrium between the water in a formation and the water in a well screen installed in that formation, which results in formation-quality water being available in the well screen for sampling at all times. No-purge sampling devices like the HydraSleeve collect this formation-quality water as the sample, under undisturbed (non-pumping) natural flow conditions. Samples collected in this manner generally provide more conservative (i.e., higher concentration) values than samples collected using well-volume purging, and values equivalent to samples collected using low-flow purging and sampling (Parsons, 2005).

## Applications of the HydraSleeve

The HydraSleeve can be used to collect representative samples of groundwater for all analytes (volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], common metals, trace metals, major cations and anions, dissolved gases, total dissolved solids, radionuclides, pesticides, PCBs, explosive compounds, and all other analytical parameters). Designs are available to collect samples from wells from 1” inside diameter and larger. The HydraSleeve can collect samples from wells of any yield, but it is especially well-suited to collecting samples from low-yield wells, where other sampling methods can’t be used reliably because their use results in dewatering of the well screen and alteration of sample chemistry (McAlary and Barker, 1987).

The HydraSleeve can collect samples from wells of any depth, and it can be used for single-event sampling or long-term groundwater monitoring programs. Because of its thin cross section and flexible construction, it can be used in narrow, constricted or damaged wells where rigid sampling devices may not fit. Using multiple HydraSleeves deployed in series along a single suspension line or tether, it is also possible to conduct in-well vertical profiling in wells in which contaminant concentrations are thought to be stratified.

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As with all groundwater sampling devices, HydraSleeves should not be used to collect groundwater samples from wells in which separate (non-aqueous) phase hydrocarbons (i.e., gasoline, diesel fuel or jet fuel) are present because of the possibility of incorporating some of the separate-phase hydrocarbon into the sample.

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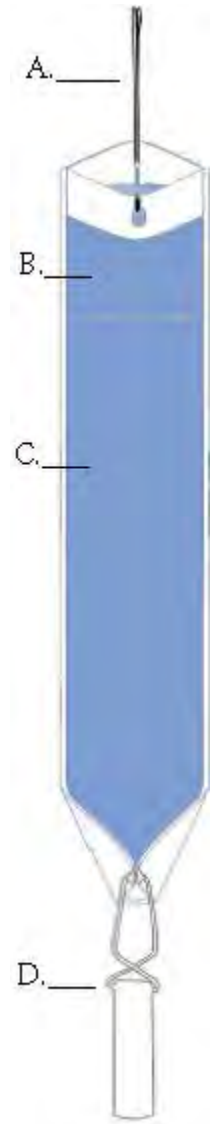
## Description of the HydraSleeve

The basic HydraSleeve (Figure 1) consists of the following components*:

- A suspension line or tether (A.), attached to the spring clip or directly to the top of the sleeve to deploy the device into and recover the device from the well. Tethers with depth indicators marked in 1-foot intervals are available from the manufacturer.
- A long, flexible, 4-mil thick lay-flat polyethylene sample sleeve (C.) sealed at the bottom (this is the sample chamber), which comes in different sizes, as discussed below with a self-sealing reed-type flexible polyethylene check valve built into the top of the sleeve (B.) to prevent water from entering or exiting the sampler except during sample acquisition.
- A reusable stainless-steel weight with clip (D.), which is attached to the bottom of the sleeve to carry it down the well to its intended depth in the water column. Bottom weights available from the manufacturer are 0.75" OD and are available in a variety of sizes. An optional top weight may be attached to the top of the HydraSleeve to carry it to depth and to compress it at the bottom of the well (not shown in Figure 1);
- A discharge tube that is used to puncture the HydraSleeve after it is recovered from the well so the sample can be decanted into sample bottles (not shown).
- Just above the self-sealing check valve at the top of the sleeve are two holes which provide attachment points for the spring clip and/or suspension line or tether. At the bottom of the sample sleeve are two holes which provide attachment points for the weight clip and weight.




*Other configurations such as top weighted assemblies, Super/SkinnySleeves, Speedbags, and W3 Hybrids are available.

**Note:** The sample sleeve and the discharge tube are designed for one-time use and are disposable. The spring clip, weight and weight clip may be reused after thorough cleaning. Suspension cord is generally disposed after one use although, if it is dedicated to the well, it may be reused at the discretion of the sampling personnel.

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## Selecting the HydraSleeve Size to Meet Site-Specific Sampling Objectives

It is important to understand that each HydraSleeve is able to collect a finite volume of sample because, after the HydraSleeve is deployed, you only get one chance to collect an undisturbed sample. Thus, the volume of sample required to meet your site-specific sampling and analytical requirements will dictate the size of HydraSleeve you need to meet these requirements.

### Table 1. Dimensions and Volumes of HydraSleeve Models.

| Diameter | Volume | Length | Lay-Flat Width | Filled Dia. |
|---|---|---|---|---|
| *2-Inch HydraSleeves* | | | | |
| Standard 600 mls HydraSleeve | ~600mls | 30” | 2.5” | 1.4” |
| Standard 1-liter HydraSleeve | ~1 Liter | 38” | 3” | 1.9” |
| Super/SkinnySleeve 1-liter | ~1 Liter | 38” | 2.5" | 1.5”* |
| Super/SkinnySleeve 1.5-liter | ~1.5 Liters | 52” | 2.5” | 1.5”* |
| Super/SkinnySleeve 2-liter | *~2Liters* | *66"* | *2.5"* | *1.5"** |
| *4-Inch HydraSleeves* | | | | |
| Standard 2.5 liter | ~2 Liters | 38” | 4” | 2.7” |

* outside diameter on the Heavy Duty Universal Super/SkinnySleeves is 1.5" however when using with schedule 40 hardware the O.D. of the assembly will be 1.9"

It's also recommended that you size the diameter of the HydraSleeve according to the diameter of the well (i.e. use 2-inch HydraSleeves in 2-inch wells). Using smaller sleeves in larger diameter wells (i.e. 2-inch HydraSleeves in 4-inch wells) will result in a longer fill rate and will require special retrieval instructions (explained later).

The volume of sample collected by the HydraSleeve varies with the diameter and length of the HydraSleeve. Dimensions and volumes of available HydraSleeve models are detailed in Table 1.

HydraSleeves can be custom-fabricated by GeoInsight in varying diameters and lengths to meet specific volume requirements. HydraSleeves can also be deployed in series (i.e., multiple HydraSleeves attached to one tether) to collect additional sample to meet specific volume requirements, as described below.

If you have questions regarding the availability of sufficient volume of sample to satisfy laboratory requirements for analysis, it is recommended that you contact the laboratory to discuss the minimum volumes needed for each suite of analytes. Laboratories often require only 10% to 25% of the volume they specify to complete analysis for specific suites of analytes, so they can often work with much smaller sample volumes that can easily be supplied using a HydraSleeve.

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# HydraSleeve Deployment

## Information Required Before Deploying a HydraSleeve

Before installing a HydraSleeve in any well, you will need to know the following:

- The inside diameter of the well
- The length of the well screen
- The water level in the well
- The position of the well screen in the well
- The total depth of the well

The inside diameter of the well is used to determine the appropriate HydraSleeve diameter for use in the well. The other information is used to determine the proper placement of the HydraSleeve in the well to collect a representative sample from the screen (see HydraSleeve Placement, below), and to determine the appropriate length of tether to attach to the HydraSleeve to deploy it at the appropriate position in the well.

Most of this information (with the exception of the water level) should be available from the well log; if not, it will have to be collected by some other means. The inside diameter of the well can be measured at the top of the well casing, and the total depth of the well can be measured by sounding the bottom of the well with a weighted tape. The position and length of the well screen may have to be determined using a down-hole camera if a well log is not available. The water level in the well can be measured using any commonly available water-level gauge.

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## HydraSleeve Placement

The HydraSleeve is designed to collect a sample directly from the well screen. It fills by pulling it up through the screen a distance equivalent to the length of the sampler when correctly sized to the well diameter. This upward motion causes the top check valve to open, which allows the device to fill. To optimize sample recovery, it is recommended that the HydraSleeve be placed in the well so that the bottom weight rests on the bottom of the well and the top of the HydraSleeve is as close to the bottom of the well screen as possible. This should allow the sampler to fill before the top of the device reaches the top of the screen as it is pulled up through the water column, and ensure that only water from the screen is collected as the sample. In short-screen wells, or wells with a short water column, it may be necessary to use a top-weight on the HydraSleeve to compress it in the bottom of the well so that, when it is recovered, it has room to fill before it reaches the top of the screen.

**Example**

2" ID PVC well, 50' total depth, 10' screen at the bottom of the well, with water level above the screen (the entire screen contains water).

***Correct Placement (figure 2):*** Using a standard HydraSleeve for a 2" well (2.5" flat width/1.5" filled OD x 30" long, 600 ml volume), deploy the sampler so the weight (a 5 oz., 2.5" long weight with a 2" long clip) rests at the bottom of the well. The top of the sleeve is thus set at ~34" above the bottom of the well. When the sampler is recovered, it will be pulled upward approximately 30" before it is filled; therefore, it is full (and the top check valve closes) at approximately 64" (5.3 feet) above the bottom of the well, which is well before the sampler reaches the top of the screen. In this example, only water from the screen is collected as a sample.

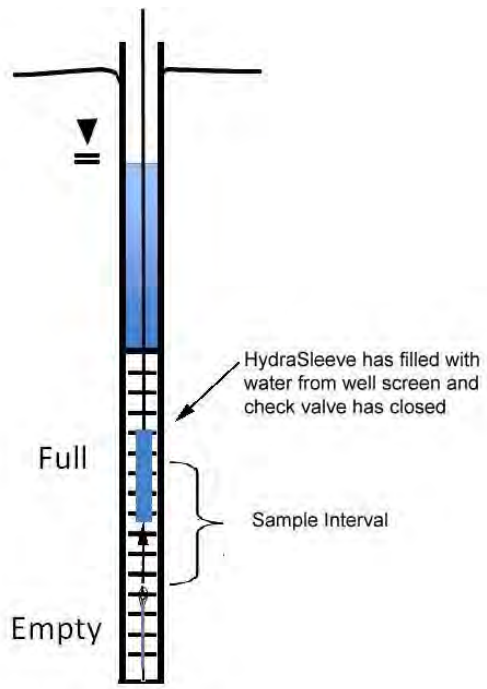


**Figure 2. Correct Placement of HydraSleeve.**

***Incorrect Placement (figure 3):*** If the well screen in this example was only 5' long, and the HydraSleeve was placed as above, it would not fill before the top of the device reached the top of the well screen, so the sample would include water from above the screen, which may not have the same chemistry.

***The solution?*** Deploy the HydraSleeve with a top weight, so that it is collapsed to within 6" of the bottom of the well. When the HydraSleeve is recovered, it will fill within 36" (3 feet) from the bottom of the well, or 2-feet before the sampler reaches the top of the screen, so it collects only water from the screen as the sample.

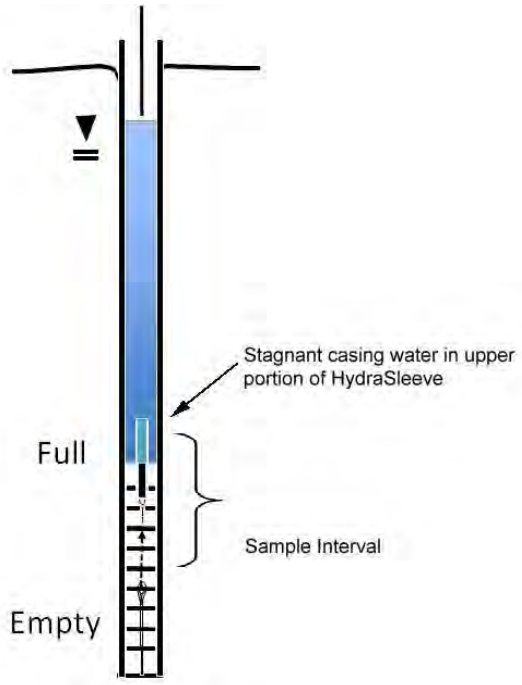


Figure 3. Incorrect placement of HydraSleeve.

This example illustrates one of many types of HydraSleeve placements. More complex placements are discussed in a later section.

*NOTE: Using smaller diameter HydraSleeves (2-inch) in larger diameter wells (4-inch) causes a slower fill rate. Special retrieval methods are necessary if this is your set up (shown later in this document).*

## Procedures for Sampling with the HydraSleeve

Collecting a groundwater sample with a HydraSleeve is usually a simple one-person operation.

**Note:** Before deploying the HydraSleeve in the well, collect the depth-to-water measurement that you will use to determine the preferred position of the HydraSleeve in the well. This measurement may also be used with measurements from other wells to create a groundwater contour map. If necessary, also measure the depth to the bottom of the well to verify actual well depth to confirm your decision on placement of the HydraSleeve in the water column.

Measure the correct amount of tether needed to suspend the HydraSleeve in the well so that the weight will rest on the bottom of the well (or at your preferred position in the well). Make sure to account for the need to leave a few feet of tether at the top of the well to allow recovery of the sleeve.

**Note:** Always wear sterile gloves when handling and discharging the HydraSleeve.

### I. Assembling the Basic HydraSleeve*

1. Remove the HydraSleeve from its packaging, unfold it, and hold it by its top.
2. Crimp the top of the HydraSleeve by folding the hard polyethylene reinforcing strips at the holes.
3. Attach the spring clip to the holes to ensure that the top will remain open until the sampler is retrieved.
4. Attach the tether to the spring clip by tying a knot in the tether.

**Note: Alternatively, if spring clips are not being utilized, attach the tether to one (NOT both) of the holes at the top of the Hydrasleeve by tying a knot in the tether.**

5. Fold the flaps with the two holes at the bottom of the HydraSleeve together to align the holes and slide the weight clip through the holes.
6. Attach a weight to the bottom of the weight clip to ensure that the HydraSleeve will descend to the bottom of the well.

*See Super/SkinnySleeve assembly manual and HydraSleeve Field Manual for other assembly instructions.

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## II. Deploying the HydraSleeve

1. Using the tether, carefully lower the HydraSleeve to the bottom of the well, or to your preferred depth in the water column

   During installation, hydrostatic pressure in the water column will keep the self-sealing check valve at the top of the HydraSleeve closed, and ensure that it retains its flat, empty profile for an indefinite period prior to recovery.

**Note:** Make sure that it is not pulled upward at any time during its descent. If the HydraSleeve is pulled upward at a rate greater than 0.5'/second at any time prior to recovery, the top check valve will open and water will enter the HydraSleeve prematurely.

2. Secure the tether at the top of the well by placing the well cap on the top of the well casing and over the tether.

**Note:** Alternatively, you can tie the tether to a hook on the bottom of the well cap (you will need to leave a few inches of slack in the line to avoid pulling the sampler up as the cap is removed at the next sampling event).

## III. Equilibrating the Well

The equilibration time is the time it takes for conditions in the water column (primarily flow dynamics and contaminant distribution) to restabilize after vertical mixing occurs (caused by installation of a sampling device in the well).

- Situation: The HydraSleeve is deployed for the first time or for only one time in a well

  The basic HydraSleeve is very thin in cross section and displaces very little water (<100 ml) during deployment so, unlike most other sampling devices, it does not disturb the water column to the point at which long equilibration times are necessary to ensure recovery of a representative sample.

  In some cases, like when useing the SpeedBags, the HydraSleeve can be recovered immediately (with no equilibration time) or within a few hours. In regulatory jurisdictions that impose specific requirements for equilibration times prior to recovery of no-purge sampling devices, these requirements should be followed.

  NOTE: If using top weights additional equilibration time is needed to allow the top weight time to compress the HydraSleeve into the bottom of the well.

- Situation: The HydraSleeve is being deployed for recovery during a future sampling event.

  In periodic (i.e., quarterly, semi-annual, or annual) sampling programs, the sampler for the current sampling event can be recovered and a new sampler (for the next sampling event) deployed immediately thereafter, so the new sampler remains in the well until the next sampling event.



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Thus, a long equilibration time is ensured and, at the next sampling event, the sampler can be recovered immediately. This means that separate mobilizations, to deploy and then to recover the sampler, are not required. HydraSleeves can be left in a well for an indefinite period of time without concern.

## IV. HydraSleeve Recovery and Sample Collection

1. Hold on to the tether while removing the well cap.
2. Secure the tether at the top of the well while maintaining tension on the tether (but without pulling the tether upwards)
3. Measure the water level in the well.
4. Use one of the following 3 retrieval methods. In all 3 scenarios, when the HydraSleeve is full, the top check valve will close. You should begin to feel the weight of the HydraSleeve on the tether and it will begin to displace water. The closed check valve prevents loss of sample and entry of water from zones above the well screen as the HydraSleeve is recovered.

   a. In one smooth motion, pull the tether up 30”-60" (the length of the sampler) at a rate of about 1 foot per second (or faster). The motion will open the top check valve and allow the HydraSleeve to fill (it should fill in about 1:1 ratio or the length of the HydraSleeve if the sleeve is sized to fit the well). This is analogous to coring the water column in the well from the bottom up.

   b. There are times it is recommended that the HydraSleeve be oscillated in the screen zone to ensure it is full before leaving the screen area. Pull up 1-3 feet, let the sleeve assembly drop back down and repeat 3-5 times before pulling the sleeve to the surface. The collection zone will be the oscillation zone. ***When in doubt use this retrieval method.***

   c. SpeedBags require check valve activation and oscillation during recovery: When retrieving the SpeedBag, pull up hard 1-2 feet to open the check valve; let the assembly drop back down to the starting point; REPEAT THIS PROCESS 4 TIMES; and then quickly recover the SpeedBag through the well sceen to the surface.

5. Continue pulling the tether upward until the HydraSleeve is at the top of the well.
6. Discard the small volume of water trapped in the Hydrasleeve above the check valve by pinching it off at the top under the stiffeners (above the check valve).

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## v. Sample Discharge

NOTE: Sample collection should be done immediately after the HydraSleeve has been brought to the surface to preserve sample integrity.

Be sure you have discarded the water sitting above the check valve – see step #6 above.

1. Remove the discharge tube from its sleeve.
2. Hold the HydraSleeve at the check valve
3. Puncture the HydraSleeve at least 3-4 inches below the reinforcement strips with the pointed end of the discharge tube. NOTE: For some contaminants (VOC's/sinkers) the best location for discharge is the middle to bottom of the sampler. This would be representative of the deeper portion of the well screen.
4. Discharge water from the HydraSleeve into your sample containers. Control the discharge from the HydraSleeve by either raising the bottom of the sleeve, by squeezing it like a tube of toothpaste, or both.
5. Continue filling sample containers until all are full.

## Measurement of Field Indicator Parameters

Field indicator parameter measurement is generally done during well purging and sampling to confirm when parameters are stable and sampling can begin. Because no-purge sampling does not require purging, field indicator parameter measurement is not necessary for the purpose of confirming when purging is complete.

If field indicator parameter measurement is required to meet a specific non-purging regulatory requirement, it can be done by taking measurements from water within a HydraSleeve that is not used for collecting a sample to submit for laboratory analysis (i.e., a second HydraSleeve installed in conjunction with the primary sample collection HydraSleeve [see Multiple Sampler Deployment below]).

## Alternate Deployment Strategies

### Deployment in Wells with Limited Water Columns

For wells in which only a limited water column needs to be sampled, the HydraSleeve can be deployed with an optional top weight in addition to a bottom weight. The top weight will collapse the HydraSleeve to a very short (approximately 6" to 24") length, depending on the length and volume of the sampler. This allows the HydraSleeve to fill in a water column only 3' to 10' in height (again) depending on the sampler size. Note the SuperSleeves accomplish the same thing but provide greater sample volume at a lower per sample cost.

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## Multiple Sampler Deployment

Multiple sampler deployment in a single well screen can accomplish two purposes:

1. It can collect additional sample volume to satisfy site or laboratory-specific sample volume requirements.
2. It can be used to collect samples from multiple intervals in the screen to allow identification of possible contaminant stratification.

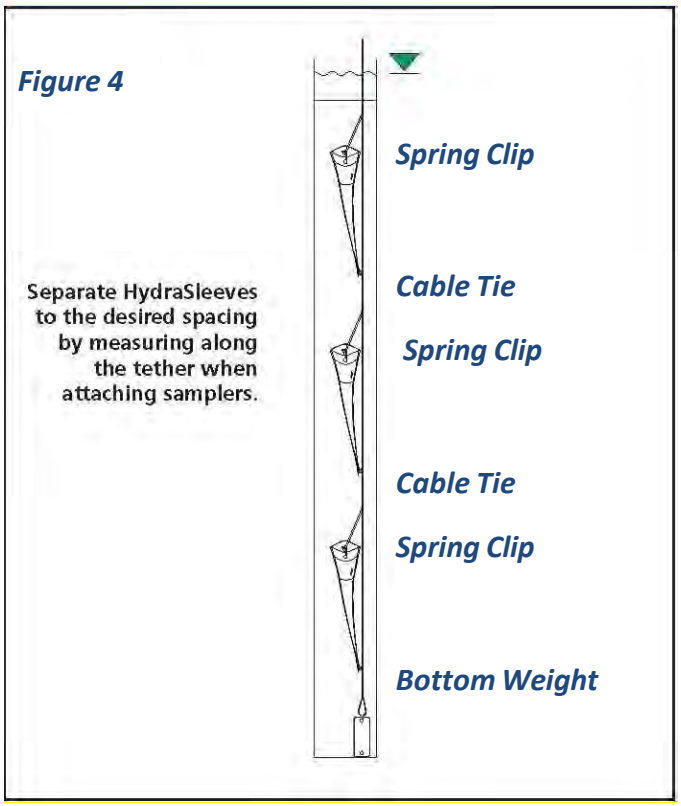


Figure 5. Multiple HydraSleeve deployment

If there is a need for only 2 samplers, they can be installed as follows. The first sampler can be attached to the tether as described above, a second attached to the bottom of the first using your desired length of tether between the two and the weight attached to the bottom of the second sampler (figure 6). This method can only be used with 2 samplers; 3 or more HydraSleeves in tandem need to be attached as described above.

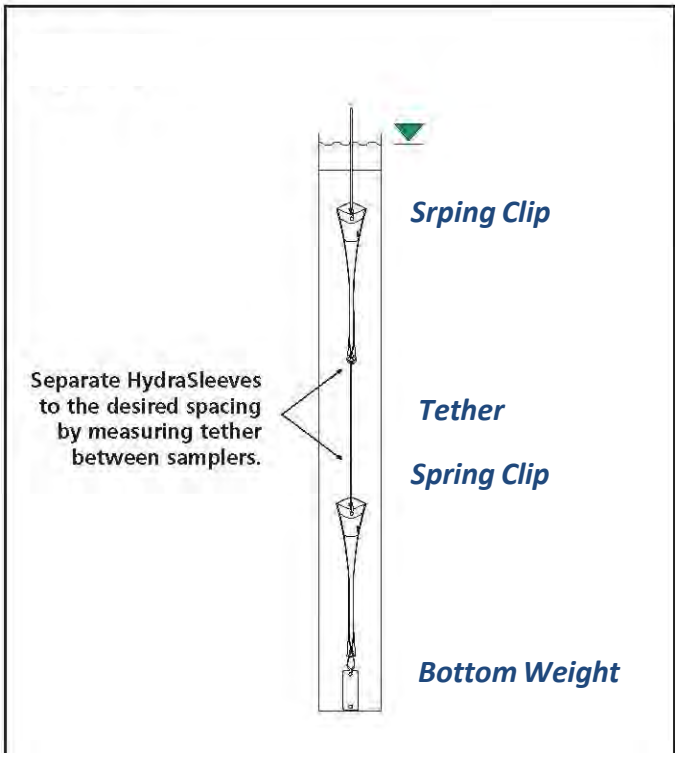


Figure 5. Alternative method for deploying multiple HydraSleeves.

In either case, when attaching multiple HydraSleeves in series, more weight will be required to hold the samplers in place in the well than would be required with a single sampler. Recovery of multiple samplers and collection of samples is done in the same manner as for single sampler deployments.

## Post-Sampling Activities

The recovered HydraSleeve and the sample discharge tubing should be disposed as per the solid waste management plan for the site. To prepare for the next sampling event, a new HydraSleeve can be deployed in the well (as described previously) and left in the well until the next sampling event, at which time it can be recovered.

The weight and weight clip can be reused on this sampler after they have been thoroughly cleaned as per the site equipment decontamination plan. The tether may be dedicated to the well and reused or discarded at the discretion of sampling personnel.

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## References

McAlary, T. A. and J. F. Barker, 1987, Volatilization Losses of Organics During groundwater Sampling From Low-Permeability Materials, groundwater Monitoring Review, Vol. 7, No. 4, pp. 63-68

Parsons, 2005, Results Report for the Demonstration of No-Purge groundwater Sampling Devices at Former McClellan Air Force Base, California; Contract F44650-99-D-0005, Delivery Order DKO1, U.S. Army Corps of Engineers (Omaha District), U.S. Air Force Center for Environmental Excellence, and U.S. Air Force Real Property Agency

Robin, M. J. L. and R. W. Gillham, 1987, Field Evaluation of Well Purging Procedures, groundwater Monitoring Review, Vol. 7, No. 4, pp. 85-93

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# STANDARD OPERATING PROCEDURE YO-GW-006

# GROUNDWATER SAMPLING OF MONITORING WELLS FOR PER- AND POLYFLUOROALKYL SUBSTANCES

## 1.0 INTRODUCTION

### 1.1 Purpose and Scope

This Standard Operating Procedures (SOP) was prepared to guide per- and polyfluoroalkyl substance (PFAS) sampling activities. This SOP describes recommended procedures to be used by field personnel when collecting groundwater samples from monitoring wells. Because PFAS are potentially present in a variety of materials that may come into contact with water samples, and because laboratory analytical method detection limits are low (low to sub nanogram per liter concentrations), conservative precautions are recommended to avoid sample cross-contamination and false positive results. The procedures in this SOP are consistent with best practices at the time of authoring.

### 1.2 Referenced Documents and SOPS

- YO-GW-004 Groundwater Sampling Using the Low-Flow Protocol
- NYSDEC, *Guidelines for Sampling and Analysis of PFAS – Under NYSDEC's Part 375 Remedial Programs*, Janury 2020

### 1.3 Definitions and Acronyms

#### 1.3.1 Definitions

| | |
|---|---|
| Bladder pump | A positive displacement pump that is acceptable for collection of all analytes and depths. Can be small enough to sample from wells as small as 3/4-inch in diameter. |
| Dedicated equipment | Equipment that is installed in or used in just one monitoring well for purging and sampling, and that remains in that well for the duration of the monitoring program or is used new and then discarded for each event and well. Dedicated equipment does not need to be decontaminated between sampling events. |
| Inertia pump | A riser tube fitted with a one-way foot valve. Best used on small diameter wells (2 inches or less). No depth restriction except for the weight of the water-filled tubing. |
| Peristaltic pump | A positive displacement pump that can be used to move fluids at a fixed rate. Peristaltic pumps are typically used if the depth to water is |

| | |
|---|---|
| | less than approximately 25 feet; ineffective for depths to water exceeding 33 feet. |
| PFAS-free water | Water that has been analyzed by an accredited laboratory (see Section 3.1) and determined to be below the method detection limit (i.e., non-detect) for the suite of PFAS to be analyzed for in environmental samples. Method detection limits (MDLs) used during analysis of PFAS-free water should be at or below the MDLs used for environmental samples. |
| Potable water | Water that meets state and federal drinking water requirements. Note this water may or may not have detectable PFAS concentrations. |
| Submersible pump | A positive-pressure pump that is acceptable for collection of all analytes. Achievable depths are limited by the power of the pump and length of wiring. Well must typically be at least 2 inches in diameter to fit these pumps. |

### 1.3.2 Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| CoC | chain of custody |
| DO | dissolved oxygen |
| DoD | Department of Defense |
| DOT | Department of Transportation |
| ETFE | ethylene tetrafluoroethylene |
| FEP | fluorinated ethylene propylene |
| HDPE | high-density polyethylene |
| IATA | International Air Transport Association |
| ICAO | International Civil Aviation Organization |
| LDPE | low-density polyethylene |
| MDL | method detection limit |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| ORP | oxidation-reduction potential |
| PFAS | per- and polyfluoroalkyl substances PFTE polytetrafluoroethylene |
| PPE | personal protective equipment |

| | |
|---|---|
| PVC | polyvinyl chloride |
| PVDF | polyvinylidene fluoride |
| QA | quality assurance |
| QC | quality control |
| QSM | quality systems manual |
| SOP | standard operating procedure |
| SOG | standard operating guidance |
| USGS | United States Geological Survey |

### 1.3.3 Equipment and Products

Sections 1.3.4 and 1.3.5 detail items that are safe to use versus not recommended for use on the job site to protect PFAS samples from potential cross-contamination. Science-based evidence is not currently available to support a determination of the realistic impact of these commonly used field items and materials on PFAS samples. In the absence of scientific-based sampling guidance, field staff, contractors, and analytical laboratories should try to avoid using items that may pose a risk for cross-contamination and false positive results and instead use acceptable alternatives identified in this section when feasible. If the field team needs to use products and equipment on site that are not recommended, additional quality assurance/quality control (QA/QC) samples may be collected to evaluate any potential impact on PFAS environmental samples. This information is also provided in an abbreviated format as a checklist for field staff to reference (Attachment A). The information provided herein is consistent with the NYSDEC field sampling guidelines for PFAS.

### 1.3.4 Field Equipment

Items that are safe to use on site when sampling for PFAS include the following:

- Sampling containers, screw caps and other equipment made from high-density polyethylene (HDPE)[1], polypropylene, silicone, acetate, or stainless steel;
- Sample preservatives (e.g., Trizma®);
- QA/QC samples (e.g., temperature and field blanks);
- Sample container labels;

[1] HDPE plastics are commonly identified by a recycling symbol with a number 2 inside it.

- Low-density polyethylene (LDPE)[2] materials not in direct contact with the sample (e.g., Ziploc® bags);
- Materials made of HDPE, silicone, acetate, or stainless steel;
- Masonite or aluminum clipboards;
- Ballpoint pens;
- Sampling forms, loose paper or field notebooks, chain-of-custody (COC) record, and sample container labels;
- Alconox®, Liquinox® and Luminox® detergents (Liquinox® is acceptable for PFAS sampling but shall not be used for decontamination of sampling equipment used for collection of media to be submitted for analysis of 1,4-dioxane);
- Paper towels;
- Trash bags;
- HDPE sheeting;
- Hard-shell coolers;
- Shipping and handling labels;
- Regular (wet) ice;
- Bubble wrap;
- Duct tape and packing tape;
- Large (e.g., 55-gallon) containers;
- Submersible pumps, bladder pumps, peristaltic pumps, and inertia pumps that do not have Teflon components;
- Dedicated Silicon and/or HDPE tubing;
- Analytical field meter (e.g., temperature, pH, conductivity, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity);
- Water level probe(s); and
- Paper towels made with virgin materials.

Items <u>to be avoided (i.e., not recommended)</u> when sampling for PFAS include the following:

- Glass sample containers, due to PFAS adherence to glass surfaces;

[2] LDPE plastics are commonly identified by a recycling symbol with a number 4 inside it.

- Water-resistant paper, notebooks, and labels (e.g., certain Rite in the Rain® products), due to use of PFAS in water-resistant inks and coatings;
- Sticky notes (e.g., certain Post-It® products), due to potential use of a paper coating product Zonyl™ or similar fluorotelomer compounds;
- Plastic clipboards, binders, and spiral hardcover notebooks;
- Pens with water-resistant ink;
- Felt pens and markers (e.g., certain Sharpie® products) – some PFAS SOPs (e.g., Michigan) specifically allow Fine or Ultra-Fine Point Sharpies® and TestAmerica Laboratories, Inc. routinely uses Sharpies® in the laboratory following unpublished analytical tests that reportedly showed no impact on PFAS sample results;
- Aluminum foil, as PFAS are sometimes used as a protective layer;
- Decon 90™ liquid detergent, which reportedly contain fluorosurfactants;
- Chemical (e.g., blue) ice packs, unless it is contained in a sealed bag. Blue ice has the potential to be contaminated from previous field sampling events;
- Materials containing polytetrafluoroethylene (PFTE) including Teflon™ and Hostaflon® (e.g., tubing, tape, plumbing paste, O-rings);
- Equipment with Viton™ components (i.e., fluoroelastomers);
- Stain- or water-resistant materials, as these are typically fluoropolymer-based;
- Material containing LDPE, particularly if used in direct contact with the sample (e.g., LDPE tubing, as PFAS can sorb to the porous tubing); and
- Material containing "fluoro" in the name – this includes, but is not limited to, fluorinated ethylene propylene (FEP), ethylene tetrafluoroethylene (ETFE), and polyvinylidene fluoride (PVDF).
- Paper towels and other paper products made from recycled materials

### 1.3.5 Clothing, Personal Protective Equipment (PPE), and Consumer Products

Items that are safe to use on site when sampling for PFAS include the following:

- Boots made of polyurethane, polyvinyl chloride (PVC), rubber, or untreated leather;
- Other field boots covered by PFAS-free (e.g., polypropylene) over-boots;
- Rain gear made of neoprene, polyurethane, PVC, wax-coated, vinyl, or rubber;
- Clothing made of synthetic (e.g., polyester) or natural (e.g., cotton) fibers;
- Safety glasses;
- Reflective safety vests;

- Hardhats;
- Disposable powder-free nitrile gloves;
- Uncoated HDPE suits (e.g., certain Tyvek® products); and
- Bottled water and hydration drinks.
- Sunscreens [3] and insect repellants[4] that have been tested and found to be PFAS-free.

Items to be avoided (i.e., not recommended) when sampling for PFAS include the following:

- Water- or stain-resistant boots and clothing (e.g., products containing GORE-TEX®);
- Clothing recently laundered with a fabric softener;
- Coated HDPE suits (e.g., certain Tyvek® products);
- Sunscreen and insect repellants containing fluorinated compounds as ingredients, such as polyfluoroalkyl phosphate esters;
- Latex gloves;
- Cosmetics, moisturizers, hand cream, and other related products containing fluorinated compounds as ingredients, such as polyfluoroalkyl phosphate esters;
- Food wrappers and packaging; and
- Food and drinks other than bottled water or hydration drinks.

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[3] Examples of PFAS-free sunscreens include Alba Organics Natural, Aubrey Organics, Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30, Banana Boat for Men Triple Defense Continuous Spray Sunscreen SPF 30, Banana Boat Sport Performance Coolzone Broad Spectrum SPF 30, Banana Boat Sport Performance Sunscreen Stick SPF 50, Coppertone Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50, Coppertone Sport High-Performance AccuSpray Sunscreen SPF 30, Coppertone Sunscreen Stick Kids SPF 55, Jason Natural Sun Block, Kiss my Face, L'Oréal Silky Sheer Face Lotion 50+, Meijer Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50, Meijer Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70, Neutrogena Beach Defense Water + Sun Barrier Lotion SPF 70, Neutrogena Beach Defense Water + Sun Barrier Spray Broad Spectrum SPF 30, Neutrogena Pure & Free Baby Sunscreen Broad Spectrum SPF 60+, Neutrogena Ultra-Sheer Dry-Touch Sunscreen Broad Spectrum SPF 30, Yes to Cucumbers, and sunscreens for infants. Products with fluorinated compounds as ingredients (e.g., polyfluoroalkyl phosphate esters) should not be worn during sampling.

[4] Examples of PFAS-free insect repellent include Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics, OFF! Deep Woods® spray for clothing and skin, Sawyer® do-it-yourself permethrin treatment for clothing, Insect Shield Insect® pretreated clothing, DEET products, and sunscreen/insect repellent combination product Avon Skin so Soft Bug Guard-SPF 30. Products with fluorinated compounds in their ingredients (e.g., polyfluoroalkyl phosphate esters) should not be worn during sampling.

Field staff should try to find acceptable alternatives to these items that still allow them to complete the field work safely and efficiently. For example, wearing long-sleeved clothing and a hard hat or sun hat may eliminate the need to use sunscreen in some climates. If an item cannot be easily avoided, additional consideration should be given to QA/QC samples to evaluate the potential impact of sample cross-contamination (e.g., field blanks).

## 2.0 FIELD PROCEDURES

### 2.1 Pre-Mobilization Activities

#### 2.1.1 Health and Safety Plan

Prior to each field event, the site health and safety plan should be reviewed and updated, as necessary. Health and safety plan requirements should be reviewed for consistency with this SOP and modified as appropriate to resolve any differences.

#### 2.1.2 Laboratory Coordination

Field personnel should communicate with the laboratory that will conduct PFAS analysis regarding the following items:

- Laboratory accreditation for PFAS analysis (see Section 3.1);
- Appropriate sample containers, labels, and preservatives (see Sections 2.2.3 and 2.2.4);
- Sample storage conditions and holding time (see Section 2.2.5); and
- The number and type of QA/QC samples (see Section 2.3).

Because there is no standard United States Environmental Protection Agency method for analyzing PFAS samples in media other than drinking water, commercial laboratories typically offer analysis for a suite of approximately 24 PFAS using a modified version of Method 537 or recently published Method 537.1. Laboratories may have developed their own variations. Project staff may consider the impact of differences in reported PFAS concentrations and the potential value of collecting and sending a split sample to a second commercial laboratory to assess variability in reported PFAS concentrations.

#### 2.1.3 Equipment Decontamination

Equipment should be decontaminated prior to mobilization to the site if it appears to be contaminated or if there is reason to believe that it is contaminated. Equipment decontamination should follow the steps outlined in Section 2.4.

## 2.2 Sampling

### 2.2.1 Pre-Sampling Activities

Prior to the sampling event, field staff can review information from previous groundwater monitoring events to inform their knowledge of well locations, field equipment, and field conditions. Field staff should also identify upgradient wells and downgradient wells relative to potential source area wells. Wells with the lowest anticipated PFAS concentrations should be sampled first.

At the beginning of each sampling day, field staff should prepare for sampling as follows:

1. Inspect field equipment to ensure that it is in good working order; and
2. Calibrate analytical field meter(s) according to the instrument manufacturers' specifications. Record calibration results on the appropriate form(s). Instruments that cannot be calibrated should not be used.

### 2.2.2 Sampling PPE

Gloves: Disposable powder-free nitrile gloves should be worn at all times during sample collection and handling of sampling equipment.

At a minimum, field personnel should put on a new pair of nitrile gloves after the following activities:

- Handling samples, including QA/QC samples and blanks;
- Handling sampling equipment; and
- Between each sampling location.

At a minimum, personnel should (1) thoroughly wash their hands with detergent (preferably Alconox® or Luminox®) and PFAS-free water. Liquinox® is also acceptable for PFAS sampling but shall not be used for decontamination while collecting media to be submitted for analysis of 1,4-dioxane); (2) thoroughly dry their hands with paper towels; and (3) put on a new pair of nitrile gloves after the following activities:

- Contact with a material potentially containing PFAS;
- Change in sampling locations;
- Breaks in work;
- Washroom breaks; and
- Exit and entry into the project site exclusion zone.

### 2.2.3 Sampling Equipment

Sample Containers: HDPE containers with screw caps are commonly used for sample collection. Different laboratories may supply sample containers of varying sizes. Sample container caps are typically unlined.

Preservatives: Field personnel should communicate with the laboratory to determine what, if any, sample preservatives will be used. Preservatives may include Trizma® or sodium thiosulfate to remove residual chlorine from chlorinated drinking water samples.

Pumps: A variety of pumps, including submersible pumps, bladder pumps, peristaltic pumps, or inertia pumps, may be used for groundwater sampling. The choice of sampling device should be based on site-specific considerations, including well diameter, depth to groundwater, and purge rates. Regardless of the type of pump, the pump components, fittings, O-rings, sampling tubing, and other sampling equipment should not include Teflon™ or other PFAS-containing materials if possible. Dedicated HDPE or silicon tubing is recommended for sampling each groundwater monitoring well.

Analytical Field Meter(s): Water quality parameters commonly evaluated during sampling of groundwater monitoring wells include temperature, pH, conductivity, ORP, DO, and turbidity. Analytical field meters to measure these parameters should be free of Teflon™ and other PFAS materials (e.g., tubing, O-rings) if possible.

Water Level Meter: A water level meter is typically used to monitor drawdown during groundwater purging prior to sampling. Water level meters should be decontaminated prior to and after each sampling location using PFAS-free water, as described in Section 2.4.

### 2.2.4 Sample Collection and Labeling

Container Rinsing: Sample containers should not to be rinsed prior to sampling.

Well Purging and Sample Collection: If known, wells with the lowest PFAS concentrations should be sampled first and wells with the highest PFAS concentrations sampled last. Well purging and sample collection should be conducted in accordance with SOP NMI-GW-010. Groundwater samples for PFAS analysis will be collected first, before samples for other analyses, to prevent cross contamination and PFAS samples will be maintained in a separate cooler from other types of groundwater samples to prevent cross contamination.

Labels: Some water-resistant inks may be potential sources of PFAS. PFAS-free container labels should be filled out using a ballpoint pen that does not have water-resistant ink, if possible. Field staff should try to avoid filling out container labels using felt pens and markers (e.g., certain Sharpie® products). Container labels should include the following information:

- A unique sample identifier;

- QA/QC sample type, if applicable;
- Sampling date and time (24-hour format);
- Sampler's name or initials; and
- Method of sample preservation.

Except for temperature blanks, all QC samples should be labeled and included on the COC record. Labeling of QC samples should follow the protocol described in the QAPP.

Wet Weather Considerations: Field sampling during wet weather (e.g., rainfall and snowfall) should be conducted wearing appropriate clothing that does not pose a risk for cross contamination if possible. Field personnel should try to avoid water-resistant clothing and boots. Rain gear made of polyurethane, PVC, vinyl, or rubber is an acceptable alternative. Samples and sample containers should not be opened prior to sample collection to avoid collecting precipitation. Should samples or sample containers become contaminated with precipitation, they should be discarded.

### 2.2.5 Sample Handling, Storage, and Shipment

Handling: Clean nitrile gloves should be worn when handling sample containers. Precautions should be taken to not drop or otherwise damage sample containers. Sample containers should not be placed in close proximity to a potential PFAS source.

Storage and Holding Times: Samples should be placed in a dedicated cooler and stored at a temperature between 0-4°C until transportation to the laboratory. Additional storage conditions and holding times should be determined by the laboratory. Measures should be taken to meet storage and holding time criteria (e.g., expedited shipping).

Shipment: Sample containers should be packed for shipment using the following steps:

1. Choose a cooler with structural integrity that will withstand shipment.
2. Secure and tape the drain plug with duct tape from the inside and outside.
3. Fill cooler at least one-third full with wet ice (try to avoid using chemical blue ice) double-bagged in sealed bags. Taping the ends of bags with duct tape will aid in waterproofing.
4. Check that the caps on all sample containers are tight and will not leak.
5. Check that the sample labels are intact, filled out, legible, and that the sample identifier exactly matches the COC record.
6. Seal each sample container in a sample bag to prevent melt water from getting into the sample or degrading the sample label.
7. Place sample containers into the cooler with their caps upright.

8. Fill excess space within the cooler with bubble wrap (try to avoid using paper, cardboard, or polystyrene foam).
9. Seal the entire cooler with duct tape, particularly the lid, to prevent leaks.

Ship samples as non-hazardous material unless the samples meet the established Department of Transportation (DOT) criteria for a "hazardous material" or the International Air Transport Association (IATA)/International Civil Aviation Organization (ICAO) for air definition of "dangerous goods". If the samples meet criteria for hazardous materials or dangerous goods, then DOT and IATA/ICAO regulations must be followed. Prior to shipping samples, field personnel should complete the appropriate air waybill or manifest. A copy of the air waybill or manifest should be kept for recordkeeping.

## 2.3 Sampling QA/QC

### 2.3.1 Field Duplicates

Field duplicates are samples collected in the same manner and at the same time and location as a primary sample. They should be collected from locations of known or suspected contamination. Field duplicates are used to assess field and analytical precision and sample heterogeneity. The number of required field duplicate samples should be determined as outlined in the QAPP.

### 2.3.2 Matrix Spike and Matrix Spike Duplicate Samples

Matrix spike and matrix spike duplicate (MS/MSD) samples are aliquots of environmental samples that are spiked with a known concentration of PFAS by the laboratory. MS/MSD samples are used to assess interferences caused by the sample matrix. MS/MSD samples are not needed if the analytical laboratory is using an isotopic dilution method but are technically required to meet Department of Defense (DoD) accreditation requirements, if this accreditation is required by the project. If necessary, MS/MSD samples are to be collected in the same manner and at the same time and location as a primary sample (i.e., additional sample volume). It is preferred that this location have little to no PFAS contamination. Samples should have the same matrix to ensure a valid result; if the samples do not appear visually similar (e.g., discoloration, suspended solids), choose another location for collection of MS/MSD samples. The number of required MS/MSD samples should be determined based on discussions with the laboratory and as outlined in the QAPP. MS/MSD samples should be labeled with the same sample name and time as the primary sample and denoted as MS/MSD samples on the COC and sample label.

### 2.3.3 Blanks

Blanks should be shipped and handled in the same manner as environmental samples. Field blanks should be labeled as such on sample bottles and on the COC. The number and type of blanks should be determined by discussions with the laboratory.

Equipment Blanks: Equipment blanks are used to assess sources of field and laboratory contamination. Equipment blanks are prepared by pouring PFAS-free water over or through decontaminated reusable field sampling equipment and collecting the rinsate in a sample container. The number of required equipment blank samples should be determined as outlined in the QAPP.

Field Blanks: Field blanks are used to assess ambient contamination within the field and laboratory. Field blanks should be prepared by filling a sample container with PFAS-free water in the field in the same manner as environmental samples. Field blanks are an effective way of assessing potential cross-contamination as a result of sample handling. The number of required field blank samples should be determined as outlined in the QAPP.

Temperature Blanks: Temperature blanks are used to assess the temperature of samples during shipping. Temperature blanks should be provided by the laboratory and prepared by filling a sample container with PFAS-free water prior to shipment of the sample containers. The blank should be kept in the cooler during sampling and shipment to the laboratory. Once the cooler returns to the laboratory, the temperature of the blank should be measured to ensure that recommended sample storage criteria are met.

## 2.4 Decontamination

Decontamination should occur prior to leaving the sampling area or at a central decontamination location and at the end of each workday. Additionally, sampling equipment exposed to PFAS contaminated water should be decontaminated between sample locations.

Alconox® and Luminox ® detergents are acceptable for decontamination purposes. Liquinox® is acceptable for PFAS sampling but shall not be used for decontamination of sampling equipment used for collection of media to be submitted for analysis of 1,4-dioxane. Use of Decon 90 should be avoided. Decontamination wastes must be properly contained and disposed of in accordance with applicable local, state and federal regulations.

### 2.4.1 Field Equipment Decontamination

All non-disposable sampling equipment that is in contact with groundwater (e.g., field probes) must be cleaned prior to and between uses at each groundwater sampling location according to the following procedures:

1. Remove any gross (e.g., soil) contamination from sampling equipment.
2. If heavy petroleum residuals are encountered during sampling, use methanol or another appropriate solvent to remove any residues from sampling equipment.
3. Wash water-resistant equipment thoroughly and vigorously with potable water containing detergent (Alconox® or Luminox®) using a bristle brush or similar utensil to remove any remaining residual contamination. Liquinox® is acceptable for PFAS

sampling but shall not be used for decontamination of sampling equipment used for collection of media to be submitted for analysis of 1,4-dioxane.

4. Rinse equipment thoroughly with potable water (1st rinse).
5. Rinse equipment thoroughly with PFAS-free water (2nd rinse).
6. For field instruments, rinse again with PFAS-free water (3rd rinse).
7. Dry wet equipment with a paper towel or leave the equipment to air dry in a location away from dust or fugitive contaminants. All equipment should be dry before reuse.

Cleaning and decontamination of the equipment should be accomplished in stages and in such a way that the contamination does not discharge into the environment. Dedicated or disposable sampling equipment should be considered to minimize the need for decontamination.

### 2.4.2 Personnel and PPE Decontamination

A decontamination area for personnel and portable equipment may be specified in the health and safety plan. The area may include basins or tubs to capture decontamination wastes, which can be transferred to larger containers as necessary. Decontamination following groundwater monitoring well sampling should follow these steps:

1. Gross (e.g., soil) contamination should be scraped and wiped from boots, safety glasses, hardhats, reflective vests, and other reusable PPE. Once gross contamination has been removed, gloves should be removed by rolling off the hands in such a way to avoid exposing skin to PFAS-contaminated materials.

2. A new pair of gloves should be put on and reusable PPE should be decontaminated using PFAS-free water mixed with detergent (preferably Alconox® or Luminox®) and brushes, or similar means. Liquinox® is acceptable for PFAS sampling but shall not be used for decontamination when collecting media to be submitted for analysis of 1,4-dioxane. After debris is removed, reusable PPE should be rinsed with PFAS-free water.

3. Hands and any exposed body parts should be washed thoroughly using detergent (preferably Alconox® or Luminox®) and PFAS-free water. Liquinox® is acceptable for PFAS sampling but shall not be used for decontamination when collecting media to be submitted for analysis of 1,4-dioxane. Hands should be dried with paper towels.

## 2.5 Food and Drink

Food and drink should not be brought within the exclusion zone. Food that is kept in the staging area should preferably be contained in HDPE or stainless-steel containers.

## 3.0 LABORATORY PROCEDURES

### 3.1 Accreditations

All samples for PFAS will be analyzed by an approved laboratory for this Site and is accredited pursuant to the National Environmental Laboratory Accreditation Program (NELAP), and Clean Water Act and is RCRA certified for the category of parameters analyzed. Consistent with NYSDEC policy, the samples for PFAS compounds will be performed using a modified USEPA Method 537 Version 1.1. with isotope dilution.

## 4.0 DOCUMENTATION

### 4.1 Chain of Custody

Chain of custody procedures described in the current QAPP will be followed during PFAS sample collection and handling.

**Attachment A. Daily Sampling Checklist**

Date: _____

Site Name: _____

Weather (temperature/precipitation): _____

Please check all boxes that apply and describe any exceptions in the notes section below along with QA/QC methods used to assess potential sample cross-contamination as a result.

Field Clothing and PPE:

- No water- or stain-resistant boots or clothing (e.g., GORE-TEX®)
- Field boots (or overboots) are made of polyurethane, PVC, rubber, or untreated leather Rain gear are made of polyurethane, PVC, vinyl, wax-coated or rubber
- Clothing has not been recently laundered with a fabric softener No coated HDPE suits (e.g., coated Tyvek® suits)
- Field crew has not used cosmetics, moisturizers, or other related products today
- Field crew has not used sunscreen or insect repellants today, other than products approved as PFAS-free

Field Equipment:

- Sample containers and equipment in direct contact with the sample are made of HDPE, polypropylene, silicone, acetate or stainless steel, not LDPE or glass
- Sample caps are made of HDPE or polypropylene and are not lined with Teflon™ No materials containing Teflon™, Viton™, or fluoropolymers
- No materials containing LDPE in direct contact with the sample (e.g., LDPE tubing, Ziploc® bags)
- No plastic clipboards, binders, or spiral hard cover notebooks No waterproof field books
- No waterproof or felt pens or markers (e.g., certain Sharpie® products) No chemical (blue) ice, unless it is contained in a sealed bag
- No aluminum foil
- No sticky notes (e.g., certain Post-It® products) Decontamination:

Reusable field equipment (e.g., dip sampler) decontaminated prior to reuse

- "PFAS-free" water is on-site for decontamination of field equipment Alconox®, Liquinox® or Luminox® used as decontamination detergent
- Food and Drink:
- No food or drink on-site, except within staging area
- Food in staging area is contained in HDPE or stainless steel container

Notes:

_____

_____

_____

_____

_____

Field Team Leader Name (Print): _____

Field Team Leader Signature: _____ Date/Time: _____

# STANDARD OPERATING PROCEDURE YO-GW-007

# WELL ABANDONMENT

## 1.0 INTRODUCTION

This Standard Operating Procedure (SOP) provides instructions to decommission and abandon monitoring wells. The methods provided in this SOP are designed to prevent contaminant migration from the ground surface to the water table or between separate aquifer systems.

### 1.1 Equipment

Abandonment of drilled wells requires the services of a state-licensed drilling subcontractor (Driller). The Driller will provide the equipment needed for well abandonment. A field geologist/engineer will oversee and document the well abandonment. The field engineer/geologist should have appropriate personal protective equipment, a camera, a depth to water meter, a calculator, field logbook, and appropriate instructions and documentation (e.g., Field Plan, maps, Health and Safety Plan, and SOPs) upon arriving at the Site. The field geologist/engineer will identify the well proposed for abandonment and verify that it is the correct well by measuring the total depth of the well and comparing this measurement to well construction records. A depth to water measurement will also be taken and recorded prior to commencing with abandonment activities.

## 2.0 PROCEDURES

The EPA preferred method of well abandonment requires the following steps:

1. Remove well casing and screen;
2. Clean out borehole;
3. Backfill the cleaned bore hole with cement, bentonite grout, neat cement, or concrete; and
4. Notify appropriate state agency.

### 2.1 Removal of well screen and casing (for Well 1 to 4-inch in Diameter)

The driller will remove the protective standpipe taking caution to minimize damage to the well riser. The driller will then attempt to pull the well riser and screen intact from the borehole. If the riser and screen cannot be pulled out of the borehole, a tremie pipe will be lowered to the bottom of the screen and a volume of cement bentonite grout equal to the well screen and riser will be pumped in. The driller will excavate around and cut the well riser approximately 3 feet below the ground surface. If the grout settles after placement, then additional grout will be poured into the well to bring the grout up to the top.

If required by the regulatory agencies or remedial investigation contractor, the driller will then over-drill the original borehole using a hollow-stem auger to remove any remaining well materials. The resulting borehole shall then be backfilled using a cement and/or bentonite grout placed using a tremie pipe. The tremie pipe shall initially extend to the base of the well and be raised as the borehole is filled, keeping the end of the tremie pipe 1 to 3 feet above the top of grout. Grout shall be allowed to rest for 24 hours after which time additional grout shall be added if needed to fill the borehole. The ground surface at the borehole should be restored to the condition of its surroundings by adding clean fill, grass seed, cold patch or concrete. If the well is located in a heavily trafficked area, a design may be needed for the patch covering the former well location.

## 2.2 Removal of well screen and casing (Well >6-inch Diameter or Old Corroded Wells)

A hollow stem auger may not be practical for the removal of a well that is larger than 6-inch diameter. In such cases, a solid stem auger or tapered well assembly may be able to extract the casing and screen from the borehole.

Old wells with corroded casing and/or surrounded by thickly grouted annular space will typically break or twist within a borehole. If the well is in poor condition and unable to remove without potentially leaving pieces of the broken well or creating voids, the casing and screen can be left in the borehole. For these wells, the borehole may be tremie grouted using cement-bentonite grout. The casing can then be cut even with the ground surface of up to 3 feet below the ground surface. The resulting void from the cut well can then be filled with concrete to two feet below ground surface. The top two feet can then be restored by placing fill, topsoil and grass; or by placing fill and pavement.

*de maximis, inc.*

# YORK OIL MONTHLY INSPECTION REPORT

Weather: _____ °F

Date: _____

Time: _____

Report No: _____

| AREA TO INSPECT | CONDITIONS OBSERVED | | |
|---|---|---|---|
| | Sat | Unsat | N/A |
| **Gates/Office/Buildings Secure:** | ☐ | ☐ | ☐ |
| **Fencing:** | ☐ | ☐ | ☐ |
| **Wells Secure:** | ☐ | ☐ | ☐ |
| **Cover Area:** | ☐ | ☐ | ☐ |
| **Access Road:** | ☐ | ☐ | ☐ |
| **Swayles/Drainage:** | ☐ | ☐ | ☐ |
| **Animal Activity:** | ☐ | ☐ | ☐ |
| **General Site Observations:** | | | |

Comment: _____

_____

*Inspector:* _____