

NYSEG

Site Management Plan

**Binghamton Court Street Former Manufactured Gas Plant
Site, Operable Unit No. 1 & No. 2
Broome County, Binghamton, New York
NYSDEC Site No. 7-04-031**

July 2026

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Certification Statement

I Mark O. Gravelding certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).



Date: July 10, 2026

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Acronyms and Abbreviations

Arcadis	Arcadis of New York, Inc.
BBL	Blasland, Bouck, & Lee, Inc.
bss	below sediment surface
BTEX	benzene, toluene, ethylbenzene, xylenes
cfs	cubic feet per second
COC	Constituent of Concern
CP	Commissioner Policy
DER-10	Division of Environmental Remediation "Technical Guidance for Site Investigation and Remediation
DNAPL	dense non-aqueous phase liquid
EC	Engineering Control
ECL	Environmental Conservation Law
EWP	Excavation Work Plan
FSP	Field Sampling Plan
GCAMP	Generic Community Air Monitoring Plan
HASP	Health and Safety Plan
HDPE	high-density polyethylene
IC	Institutional Control
IRM	Interim Remedial Measure
LNAPL	light non-aqueous phase liquid
mg/kg	milligram per kilogram
MGP	manufactured gas plant
NAPL	non-aqueous phase liquid
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSEG	New York State Electric & Gas Corporation
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PVC	polyvinyl chloride

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PDI	Pre-design Investigation
PE	Professional Engineer
PrPAH	priority pollutant polycyclic aromatic hydrocarbon
PRR	Periodic Review Report
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RSO	Remedial System Optimization
SMP	Site Management Plan
SRI	Supplemental Remedial Investigation
SVI	Soil Vapor Intrusion
SVOC	semi-volatile organic compound
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compound

Executive Summary

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan (SMP):

Site Identification:

Binghamton Court Street Former Manufactured Gas Plant Site
Operable Unit No. 1 & No. 2
271 Court Street, Binghamton, New York
New York State Department of Environmental Conservation
(NYSDEC) Site No. 7-04-031

Institutional Controls:	1. The New York State Electric & Gas Corporation (NYSEG)-owned, portion of Operable Unit-1 (OU-1) may be used for commercial and industrial use;
	2. The area of the Site known as OU-2 may be used as Class A waters.
	3. All Engineering Controls (ECs) must be operated and maintained as specified in this SMP.
	4. All ECs must be inspected at a frequency and in a manner defined in the SMP.
	5. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP.
	6. Data and information pertinent to site management must be reported to the NYSDEC at the frequency and in a manner defined in this SMP.
	7. All future activities that will disturb remaining impacted material must be conducted in accordance with this SMP.
	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	9. Maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.
	10. Access to the Site (including OU-2) must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.

Institutional Controls (cont'd):	11. The potential for vapor intrusion must be evaluated (or vapor intrusion mitigation measures installed) for any new buildings developed in the area within the Institutional Controls (IC) boundaries, and any potential impacts that are identified must be monitored or mitigated.
Engineering Controls:	1. Cover system
	2. Passive non-aqueous phase liquid (NAPL) Barrier Wall
	3. Storm Sewer
Inspections:	Frequency
1. Site-wide Inspection/Cover inspection	Annually
Monitoring:	
1. Groundwater Level and NAPL Gauging	Annually
2. Groundwater Sampling	Once every five years (starting in 2020)
3. River Sheen Monitoring	Quarterly first two years (2021 & 2022), semi-annually following two years (2023 & 2024), and annually for next six years 2025 through 2030)
4. Soil Vapor Intrusion Evaluation for New Building	As needed
Reporting:	
1. Groundwater Sampling Letter Report	Once every five years (starting in 2020, to be included with the Periodic Review Report [PRR])
2. NAPL Monitoring Letter Report	Annually
3. River Sheen Monitoring Report	Annually (if any sheen observed, NYSDEC will be immediately notified).
4. Periodic Review Report	Every five years (starting in 2025)

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

1 Introduction

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for New York State Electric & Gas Corporation's (NYSEG) Binghamton Court Street Former Manufactured Gas Plant (MGP) Site located in Binghamton, New York (hereinafter referred to as the "Site"; Figure 1). This SMP addresses both Operable Units (OUs) associated with this Site: OU-1 refers to the on-Site (upland) former MGP area located at 271 Court Street, and OU-2 refers to the off-Site sediment impacts and surface water in the Susquehanna River adjacent to OU-1 (Figure 2). The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program, Site No. 7-04-031, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

NYSEG entered into an Order on Consent (Index# D7-001-96-03) on November 8, 1996 (NYSDEC 1996), and a Modified Consent Order (Index # A7-0379-9811) on January 4, 1999 (NYSDEC 2016) with the NYSDCE to remediate the Site. The Site location is shown on Figure 1, and the layout of the site is shown on Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some impacted media were left at this Site, which are hereafter referred to as "remaining impacts". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining impacts to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDCE and recorded with the Broome County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining impacts at the Site and off-Site until the Environmental Easement is extinguished in accordance with the Environmental Conservation Law (ECL) Article 71, Title 36. This plan has been approved by the NYSDCE, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDCE.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion; and
- Failure to comply with this SMP is also a violation of ECL, Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) Part 375 and the Order on Consent (Index # D7-001-96-03; Site No. 7-04-031) and Modified Consent Order (Index # A7-0379-9811, Site No. 7-04-031) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDCE or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in Table 1.1 (in Section 1.3) of this SMP.

This SMP was prepared by Arcadis of New York, Inc. (Arcadis), on behalf of NYSEG, in accordance with the requirements of the NYSDCE's Division of Environmental Remediation "Technical Guidance for Site Investigation and Remediation" (DER-10), dated May 2010 (NYSDEC 2010a), and the guidelines provided by the NYSDCE. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easements for the Site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut down of a remedial system, post-remedial removal of impacted sediment or soil, or other significant change to the site conditions. All approved alterations must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations. For Example, any changes to as-built drawings must be stamped by a New York State Professional Engineer. In accordance with the Environmental Easement for the Site, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner and/or NYSEG to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent, Modified Consent Order, 6 NYCRR Part 375 and/or ECL.
2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP). If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above-mentioned 60-day advance notice is also required.
4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

8. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Order on Consent and Modified Consent Order and all approved work plans and reports, including this SMP.
9. Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1.1 includes contact information for the above notifications, as well as a complete site contacts list. The information on this table will be updated as necessary to provide accurate contact information.

Table 1.1 – Notifications

Name ¹	Contact Information	Required Notifications ²
Ms. Levia Terrell NYSEG Remediation Project Manager	18 Link Drive Binghamton, NY 13904 T: 607.423.1652 lterrell@nyseg.com mailto:	All Notifications
Mr. Justin Starr NYSDEC Division of Environmental Remediation	625 Broadway Albany, NY 12233 T: 518.402.9797 justin.starr@dec.ny.gov	All Notifications
Mr. Joshua Cook NYSDEC Regional Hazardous Waste Engineer	5786 Widewaters Pkwy Syracuse, NY 13214-1867 T: 315.426.7524 joshua.cook@dec.ny.gov	All Notifications
Mr. Anthony Peretta New York State Department of Health (NYSDOH)	Empire State Plaza Corning Tower, Room 1787 Albany, NY 12237 T: 518.402.7860 anthony.peretta@helath.ny.gov	Notifications 4, 6, and 7
Mr. Joe Bistrovich Arcadis Project Manager	110 West Fayette Street Suite 300 Syracuse, NY 13202 T: 315.671.9697 joe.bistrovich@arcadis.com	All Notifications

Notes:

1. Notifications are subject to change and will be updated as necessary.
2. Numbers in this column reference the numbered bullets in the notification list in this section.

2 Summary of Previous Investigations and Remedial Actions

This section summarizes background information relevant to the development of this SMP, including site location and description, physical setting, investigation and remedial history, remedial goals, and a summary of remaining site-related impacts.

2.1 Site Location and Description

The Site is located in Binghamton, Broome County, New York. OU-1 is identified as Section 160.27 Block 1 and Lot 23 and Section 160.28 Block 1 Lot 27 on the City of Binghamton Tax Map. OU-1 also includes the section of Court Street immediately south of these lots (NYSEG-owned property). OU-1 is an approximately 4.3-acre area and is bounded by Norfolk Southern Railroad to the north, the Susquehanna River to the south, a private property (295 Court Street) to the east, and Brandywine Avenue to the west (see Figure 2 – Site Plan).

OU-2 includes off-site sediment impacts within the Susquehanna River and is located immediately south and downgradient of OU-1. OU-2 is bordered to the north by Court Street (separated by a flood wall) and to the west by the Tompkins Street Bridge, which is a continuation of Brandywine Avenue. The Chenango River joins the Susquehanna River approximately 1.5 miles downstream of OU-2, and the Rock Bottom Dam is approximately 0.8 mile downstream of OU-2.

The boundaries of the Site are more fully described in the Environmental Easement included in Appendix A. The owner(s) of the OU-1 parcel(s) listed above at the time of issuance of this SMP is NYSEG (details below). Note that OU-2 is not described in the Environmental Easement because it is entirely a New York State Class A water body and is not considered land for which a boundary survey can be performed.

Site Owner:

NYSEG
18 Link Drive
Binghamton, New York 13094

2.2 Physical Setting

An overview of the physical setting for the Site is presented below, including a description of the land use, and site geology and hydrogeology.

2.2.1 Land Use

The Site consists of a vacant storage yard with the exception of a single-story brick building and a gas distribution and control building. OU-1 is zoned heavy industrial and is currently used for storage of electrical and gas distribution equipment and materials. OU-2 consists of the off-site sediment and surface water impacts in the Susquehanna River adjacent to OU-1. As a Class A water body, OU-2 has best usage as a water supply for drinking and culinary or food processing purposes; for primary and secondary recreation; and for fishing. Class A waters are suitable for fish, shellfish, and wildlife propagation and survival.

The properties adjoining the Site and, in the neighborhood, surrounding the Site primarily include residential, commercial, and industrial properties. The properties immediately north, east, and west of the Site include commercial and industrial properties. To the south of OU-2, across the Susquehanna River, there are a mix of commercial and residential properties as well as the City of Binghamton Water Treatment Plant.

2.2.2 Geology

Investigation activities completed to date have identified five principal geologic units at the Site (in descending order). Underlying OU-1 are:

- Fill – The fill layer consists of an assortment of man-made structures and is approximately 5 to 10 feet thick.
- Alluvial silt and clay – Massive, with a blocky texture and little or no organic matter. This deposit is largely saturated but poorly permeable. It is discontinuous and is approximately 5 to 15 feet below grade and 5 to 10 feet thick.

Underlying OU-2 and the alluvial silt and clay deposit of OU-1 are:

- Outwash sand and gravel: Fine to coarse sand and fine to coarse gravel, with occasional lenses of fine sand and silt (averaging 30 feet thick). The OU-2 subsurface consists primarily of outwash sands and gravels from the sediment surface to the top of till that ranges from loose to very dense. This unit is present in OU-1 and OU-2.
- Till: Dense silt and clay matrix containing embedded sand and gravel, rounded to angular, multiple rock types. The till is approximately 45 to 50 feet below grade and approximately 50 feet thick in OU-1. The till is approximately 30 to 35 feet below the sediment surface in OU-2.
- Bedrock: Dark gray shale, slightly weathered, horizontal bedding. The bedrock layer is approximately 100 feet below grade in OU-1 and approximately 70 to 80 feet below the sediment surface in OU-2.

Geologic cross sections were presented in the Final Remedial Investigation (RI) Report (Blasland, Bouck, & Lee, Inc. [BBL], 2002) as Figures 6 through 8 (cross section locations are shown on Figure 1 and 3 of the Final RI Report Figures) (Appendix B). Site specific boring logs were provided in the RI Report.

2.2.3 Hydrogeology

Several detailed studies of the hydrogeology of the valley-fill aquifer in the region have been completed by Randall (1977 and 1978), Holecek, et al. (1982), and MacNish and Randall (1982). Ku, et al. (1975) studied stream flow in the region and its effect upon groundwater recharge. Randall (1986) and Wolcott and Coon (2001) developed finite-difference aquifer models for the region. Based on these studies, it is known that groundwater in the sediments overlying bedrock in the Susquehanna River Valley near Binghamton is derived principally from infiltration of precipitation falling on the land and infiltration of water through the beds of tributary streams (Ku, et al., 1975). Most of the rain and snowmelt in areas of the valley where sand and gravel occur at the surface infiltrates the soil, while only a small percentage of rain or snowmelt infiltrates the top foot or two of soils on the surrounding hills bordering the valley (Ku, et al., 1975; MacNish and Randall, 1983).

Tributary streams, an important source of recharge in the valleys of the region, typically originate in uplands and lose considerable amounts of water as they flow across stratified drift of the valley floor. A small, steady flow of groundwater likely moves through the bedrock and till from upland areas toward the river valley and into the sediments.

As soon as infiltrating water reaches the water table, it begins to move toward areas of discharge. In the Susquehanna River Valley near Binghamton, the major discharge areas are the Susquehanna and Chenango Rivers. The majority of groundwater flow in the valley is interpreted to occur through stratified-drift (sand and gravel) aquifers, due to their relatively high hydraulic conductivity, large thickness, and considerable areal extent. Lesser amounts of groundwater move through silt and clay deposits, till, and bedrock.

In the area of OU-1, the water table is located 8 to 10 feet below ground surface. Where the silt unit exists, the majority of shallow groundwater in OU-1 moves radially away from the groundwater mound located near the center of OU-1. Where the silt unit is absent and consistent with regional flow patterns, shallow groundwater can preferentially drain down into the sand and gravel unit. Within the sand and gravel, and from the bedrock through the till, the gradient is generally upward, suggesting that groundwater in OU-1 discharges to the Susquehanna River.

Susquehanna River water depths within OU-2 range from approximately 1 foot to 11 feet, based on soundings or borings completed during previous investigation activities. The United States Geological Survey (USGS) River Gauge 015030000 at Conklin, New York is the closest upstream river gauge, approximately 8.4 miles from OU-2. The maximum discharge measured at this station was 76,800 cubic feet per second (cfs) and the maximum gauge height was 25.02 feet on June 28, 2006, during a 100+-year flood. The minimum discharge measured at this station was 85 cfs, on October 14, 1964, and the minimum gauge height was 1.30 feet. Gauge heights and discharge rates recorded at the USGS River Gauge 015030000 at Conklin, New York for select major flooding and high flow events are provided in Table 2.1 below.

Table 2.1 – Susquehanna River at Conklin, New York High Flow Events

Date	Gauge Height	Flow (cfs)
June 28, 2006	25.02	76,800
March 28, 2007	12.64	25,100
March 9, 2008	14.26	30,700
March 11, 2009	12.33	24,100
January 25, 2010	13.39	27,600
September 8, 2011*	23.94	72,000
January 28, 2012	9.08	15,000
June 29, 2013	11.15	20,300
May 17, 2014	12.36	24,300
April 10, 2015	12.97	26,300

* Discharge influenced by hurricane

A water table [contour map](#) is provided as [Figure 3](#) and a sand and gravel potentiometric surface map is provided as [Figure 4](#). [Groundwater elevation data](#) from the April 2025 monitoring event is provided in [Table 1](#). [Groundwater monitoring well construction logs](#) are provided in [Appendix C](#).

2.3 Investigation and Remedial History

The following narrative provides an operation, investigation, and remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8 - References.

2.3.1 Site History and Ownership

The Binghamton Gas & Electric Company began MGP operations around 1888 at what is now 293 Court Street (the eastern portion of OU-1). Plant ownership passed to Binghamton Gas Works by 1898, and operations expanded westward, to what is now 279 Court Street, to fill the entire footprint of OU-1 until it ceased operation around 1939. The Site consisted of four gas holders, seven oil tanks, a tar-separating well, a machine shop, and a governor house (Final RI Report, Figure 2 [Appendix B]).

Gas production records from 1940 to 1950 list the source of gas at the Site as “natural gas.” By about 1969, all aboveground structures associated with the MGP were dismantled. Columbia Gas of New York and its predecessors owned the property until 1991, though in 1961 they sold the eastern portion of the 293 Court Street parcel to a private party. When NYSEG purchased Columbia Gas of New York in 1991, it assumed ownership of the Court Street Property and responsibility for management of issues related to the former MGP. On September 10, 1999, NYSEG purchased the eastern portion of the 293 Court Street property back from the private party.

2.3.2 Site Investigation History

NYSEG has commissioned the following environmental investigations at the Site:

- Site Prioritization Investigation. In 1991, Engineering-Science, Inc. completed this investigation to determine whether the Site posed an imminent threat to human health and/or the environment. The investigation included collection of; seven surface-soil samples, six from the Site and one “background” sample from an off-Site location; and three surface-water and three sediment samples from the Susquehanna River. The surface-water and sediment samples were collected from locations upstream, adjacent to, and downstream of the Site. Each sample was analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganics including cyanide. The surface soil samples were found to contain polycyclic aromatic hydrocarbons (PAHs), a subset of SVOCs often associated with MGP Sites, at concentrations as high as approximately 40.2 ppm. River surface water was found to contain no Site-related constituents above applicable criteria; however, river sediment was found to contain significant concentrations of both VOCs and SVOCs that were potentially derived from the Site. Based on the investigation results NYSEG determined that additional work was warranted. Site Prioritization Investigation results were presented in a report titled Prioritization of Former Manufactured Gas Plant Site, Binghamton Court Street Site (Engineering-Science, Inc. 1993).
- Task II RI. Between 1993 and 1994, BBL completed this investigation to further define the nature and extent of site-related impacts. This investigation involved excavating test pits, drilling soil borings, installing shallow and deep monitoring wells, installing a piezometer, and collecting soil, groundwater, surface water, and sediment samples. The Task II investigation found that:
 - Non-aqueous phase liquid (NAPL)-affected soil pervaded the former MGP operations area of the Site at depths from several feet below grade to the top of till, approximately 50 feet below grade with the most likely sources of site related impacts being the former oil-storage tanks (light non-aqueous phase liquid

[LNAPL]), former gas holder Nos. 1 through 3 (primarily dense non-aqueous phase liquid [DNAPL]), and tar-separating well (primarily DNAPL).

- Site groundwater from the water table to the top of the till, contained Site-related constituents at concentrations exceeding NYSDEC's Division of Water, Technical and Operations Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (NYSDEC 1998). Deeper groundwater also contained chlorinated VOCs at concentrations that often exceeded the Ambient Water Quality Standards. These compounds were attributed to an upgradient source.
- An active storm sewer that crosses the western portion of the Site (Figure 2) contained traces of NAPL; however, sediments in the pipe did not contain NAPL and PAH levels in pipe sediments both upstream and downstream of the Site were comparable.
- Sediments near the 66-inch storm sewer and 24-inch pipe outfalls (Figure 2) contained MGP-related impacts.
- Susquehanna River water quality was not adversely impacted by Site-related constituents.

Investigation results are documented in the Task II RI Report (BBL 1996).

- Final RI. Between 1997 and 2002, BBL conducted an RI that consisted of the following three phases of investigation:
 - The Phase I Supplemental Remedial Investigation (SRI), conducted in 1997, included subsurface investigation using soil borings and monitoring wells to better delineate the extent of MGP-impacts above the water table. Boring locations were chosen based on a review of previous investigations, to provide data in areas not thoroughly investigated during the Task II RI. Additionally, test borings were drilled between OU-1 and the river as a continuation of the Task II RI, these borings better delineated the horizontal and vertical extent of NAPL in this area by drilling to the top of till at locations downgradient of the known extent of NAPL.
 - Offsite Properties Investigation, conducted in 1998, included the subsurface investigation at two properties immediately east of the site, 293 and 295 Court Street, using soil borings and monitoring wells to determine whether soils or groundwater had been impacted by the site. The study found that:
 - Total petroleum hydrocarbon (TPH) analysis of soil samples collected from the 293 Court Street property matched the NAPL signature associated with the site, indicating that soil and/or groundwater impacts originated from the former MGP site.
 - TPH analysis of soil samples from the 295 Court Street property indicated that PAHs detected in soils were not related to the former MGP site.
 - The Phase II SRI, conducted in 2001 and 2002 delineated the extent of site-related impacts in OU-1 and OU-2 through test pit excavation, soil borings, installation of groundwater monitoring wells (including bedrock wells), and collection of surface water and sediment samples. The RI sufficiently characterized the nature and extent of impacts at OU-1 with results indicating that NAPL, primarily coal tar DNAPL, was observed in subsurface soils and was present in both unsaturated and saturated soils of the OU-1 portion of the Site. The RI results were presented in the Final RI Report (BBL 2002).
- Sediment Assessment. In 2013, Arcadis conducted a sediment assessment in the Susquehanna River to reassess the quality of sediments adjacent to the site and evaluate potential changes in presence and distribution of MGP-impacted sediments related to two significant high-flow events occurring in 2006 and 2011 and other significant high-flow events occurring from 2002 to 2012. Sediment probing and sampling was

conducted from 100 feet upstream of the 24-inch outfall pipe to 150 feet downstream of the Tompkins Street Bridge. The 2013 sediment assessment findings indicated that the distribution of impacts observed in surficial sediments adjacent to and downstream of OU-2 varied from the distribution of impacts documented in the Final RI Report (BBL 2002). Of the six general areas assessed in 2013, observations and analytical sampling indicated that four of the areas did not warrant further evaluation. As a result, it was determined that two general areas required remedial consideration and further evaluation. Sediment assessment results are presented in the Sediment Assessment Report (Arcadis 2013).

- Pre-Design Investigation. Arcadis conducted a Pre-Design Investigation (PDI) in 2014 to further characterize the two sediment areas identified for further evaluation from the 2013 sediment assessment, named Area 1 and Area 2 (Figure 5). The investigation sufficiently characterized the nature and extent of Site-related impacts to the two sediment areas in OU-2 for remedial decision making. PDI results are presented in the PDI Letter Report (Arcadis 2015).

2.3.3 Remedial History

An overview of the Interim Remedial Measures (IRMs) conducted to address environmental impacts identified at the Site is presented below.

2.3.3.1 Gas Holder Foundation IRM

Concurrently with the RI, NYSEG conducted an IRM from 2000 to 2001. This IRM involved removal of buried source material, including the No. 3 gas holder foundation, a tar separating well adjacent to the holder, and numerous buried pipes found to contain DNAPL (see Figure 7). Approximately 9,100 tons of MGP impacted soil and debris and were transported off-site for disposal and 64,900 gallons of impacted water were taken off-site for treatment/disposal. This work was completed in August 2001 and is documented in the IRM Final Engineering Report (NYSEG 2002).

2.3.3.2 Storm Drain Liner IRM

An IRM was conducted from July to November 2003 to clean and line the 66-inch storm sewer that transects the NYSEG property (OU-1) (Figure 2). The IRM was performed to address NAPL that was observed infiltrating the storm sewer. The liner system consisted of a 12-inch wide by 1-inch-thick sheet of polyvinyl chloride (PVC) that was spirally wrapped around the interior of the storm sewer. The continuous PVC joint was sealed with a snap-together PVC gasket and the annular space between the liner and storm sewer pipe/culvert was grouted to hold the liner in place. Storm drain liner IRM details are presented in the Storm Sewer Interim Remedial Measure Documentation Report (Arcadis 2005).

2.3.3.3 No. 2 Gas Holder Foundation IRM

An IRM was conducted from September 2004 to January 2005 to remove the No. 2 gas holder foundation, associated piping, and source material found to contain DNAPL impacts (see Figure 7). Impacted soil was removed to a depth of 10 feet below grade, resulting in the off-Site disposal of approximately 9,900 tons of MGP impacted soil, debris, and concrete and approximately 318,500 gallons of impacted water were taken off-site for treatment/disposal. The excavation was backfilled with clean fill meeting the commercial use criteria (which allows for industrial use) specified in 6 NYCRR Part 375-6.7(d). The completed work for this IRM is documented in the IRM Final Engineering Report (NYSEG 2006).

2.3.3.4 NAPL Barrier Wall IRM

An IRM was conducted from July through December 2006 to install a passive NAPL barrier wall and recovery wells along the western and southern OU-1 property boundaries to prevent off-Site migration of NAPL and to recover NAPL to the extent practicable. The passive NAPL barrier was constructed from the ground surface and keyed into the till unit to intercept and collect mobile DNAPL and LNAPL, if present in recovery wells. The NAPL barrier wall/jet grout panels, were installed to an approximate elevation of 795 feet (North American Vertical Datum of 1988). Installation of the barrier wall effectively cut off the migration pathways along the historic outfall pipes and their associated bedding materials. Details of the NAPL Barrier Wall IRM are presented in the NAPL Barrier Wall IRM Engineering Certification Report (Arcadis 2008).

Following installation one preliminary round of NAPL monitoring was conducted in January 2007 with formal NAPL monitoring at OU-1 beginning in April 2007. To date, measurable quantities of NAPL have not accumulated in any of the recovery wells. Only odors, sheens and trace amounts (i.e., blebs) of tar-like material have been observed. Due to lack of accumulated NAPL observed and the number of locations gauged, the monitoring/gauging frequency has been reduced since 2007. The current monitoring/gauging program is described in Sections 3.3.4.2 and 4.4.2.

2.3.3.5 66-inch Storm Sewer Replacement

Due to leakage and seal failures of the PVC lined storm sewer that allowed infiltration of NAPL into the storm sewer, the 66-inch diameter reinforced concrete pipe storm sewer that transected NYSEG's property was replaced with a new 63-inch outside diameter, Dimension Ratio 32.5 non-structural high-density polyethylene (HDPE) pipe from October 2011 to March 2012. Approximately 4,690 tons of impacted soils were excavated to accommodate storm sewer replacement and transported off-site for treatment via low temperature thermal desorption and disposal and approximately 1,740 tons of non-impacted soils and 480 tons of construction and demolition debris were transported offsite and disposed at the Broome County Landfill. 66-inch storm sewer replacement details are presented in Storm Sewer Replacement Construction Completion Report (Arcadis 2012).

2.3.3.6 OU-2 IRM

An IRM was conducted within the OU-2 portion of the site (i.e., Susquehanna River) from September 2018 to November 2019 to remove impacted sediments from two areas of the Susquehanna River (see Figure 5). Sediment removal depths ranged from approximately 1 to 5 feet below sediment surface and were completed in accordance with the Interim Remedial Measure Design Report (Arcadis 2017).

Horizontal and vertical sediment removal limits for Areas 1 and 2 within OU-2 were based on the removal of sediments containing priority pollutant polycyclic aromatic hydrocarbon (PrPAH) concentrations greater than 4 milligrams per kilogram (mg/kg) (Area 1) or field observations indicating no evidence of NAPL (i.e., no blebs, coating, staining, or sheens) (Area 2), based on results of the 2013 and 2014 investigations. Sediment removal depths at Area 1 ranged from 1-foot below sediment surface (bss) to 5-feet bss with approximately 681 cubic yards of impacted sediment removed. Removal depths at Area 2 were to 1-foot bss and removed approximately 95 cubic yards of impacted sediment. OU-2 IRM activities are documented in the Interim Remedial Measure Final Engineering Report for Binghamton Court Street Former Manufactured Gas Plant Site (GEI Consultants Inc. 2023).

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for OU-1 as listed in the Record of Decision (ROD) dated March 2013 (NYSDEC 2013), consist of eliminating or reducing, to the extent practicable, the following:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Pursuant to the Order on Consent between the NYSDEC and NYSEG, NYSEG is also responsible for remediating actual and potential significant adverse impacts on the bed and banks of the Susquehanna River (OU-2) located across from, and downgradient of, the OU-1 portion of the Site that area associated with hazardous substances and petroleum that originated from the OU-1 portion of the Site (NYSDEC 1996).

Following completion of the OU-2 IRM in November 2019, the NYSDEC issued the Decision Document for the NYSEG – Binghamton Court St. MGP Operable Unit Number 02 in June 2021 (NYSDEC 2021). Based on investigation results and completed IRMs, the Department selected No Further Action with Monitoring as the remedy for the Site. The NYSDEC believes that, based on the remedial measures already implemented, this remedy is protective of human health and the environment and satisfies the remediation objectives outlined below – specifically, Sediment RAOs include:

Sediment

RAOs for Public Health Protection

- Prevent direct contact with contaminated sediments.
- Prevent surface water contamination which may result in fish advisories.

RAOs for Environmental Protection

- Prevent releases of contaminant(s) from sediments that would result in surface water levels in excess of (ambient water quality criteria).
- Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain.
- Restore sediments to pre-release/background conditions to the extent feasible.

2.5 Remaining Impacts

MGP byproducts, typically coal tar NAPL and purifier waste, often account for most of the impacts at former MGP Sites. Principal components of coal tar that are routinely analyzed for at MGP Sites are benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, which are VOCs, and PAHs, which are SVOCs. The principal toxic chemical associated with purifier waste is cyanide. Purifier waste has not been identified at the Site.

MGP impacted soils were addressed during implementation of the IRMs. The extent of impacts remaining at the Site following the completion of the IRMs is presented in the following subsections.

2.5.1 NAPL Distribution (OU-1)

As described in Section 2.3.3, potential DNAPL source areas have been removed (i.e., No. 2 and No. 3 gas holders, tar separating well, and former MGP pipes containing NAPL). However, based on its nature, DNAPL has migrated from source areas (above the water table) downward (below the water table), through fractures and bedding planes in the silt and clay unit, and into the sand and gravel unit. The till unit appears to be confining with respect to the downward migration of NAPL. Additionally, DNAPL has spread laterally in the direction of groundwater flow (i.e., generally southward). Based on the heterogeneous nature of the Site geology, NAPL is distributed irregularly throughout OU-1 and has migrated below the silt and clay unit at several isolated locations throughout OU-1. The probable extent of NAPL remaining in OU-1 is shown on Figure 6.

Much of the DNAPL remaining in OU-1 appears to be residual NAPL (i.e., NAPL in quantities below residual saturation that is immobile and trapped in soil pore spaces). Results of the periodic NAPL monitoring currently conducted in OU-1 further demonstrates this fact, as no recoverable NAPL has been identified in the passive NAPL barrier wall recovery wells from the beginning of NAPL monitoring through the most recent monitoring event as of the submittal of this SMP.

Additionally, as shown on Figure 6, petroleum NAPL was observed east and northeast of the NYSEG property. The petroleum NAPL is located approximately 15 to 22 feet below ground surface, below the silt and clay unit near the top of the sand and gravel unit. As indicated in the Final RI Report (Arcadis 2002), petroleum impacts likely originate north of the former MGP, where a scrap yard and oil refinery were previously located.

2.5.2 Soil (OU-1)

Surface soil analytical results indicate that surface and near-surface soil samples did not contain BTEX compounds or PAHs at concentrations greater than Site-specific screening value of 10 mg/kg total BTEX and 500 mg/kg total PAHs (i.e., screening values identified in Technical and Administrative Guidance Memorandum 4046 (NYSDEC 1994), routinely used at former MGP Sites in New York State to evaluate the extent of soil containing MGP-related impacts).

Subsurface soils containing visual impacts are assumed to contain MGP-related constituents of concern (i.e., BTEX and PAHs) at concentrations above the applicable guidance values. Total BTEX and total PAH concentrations detected in subsurface soil samples (i.e., collected at depths greater than 2 feet below grade) are shown on Figure 7. In general, the areal extent of subsurface soil above the water table that contains elevated concentrations of total BTEX and total PAHs is located in the northern portion of OU-1 in areas associated with several oil tanks (Nos. 1, 2, and 6), former No. 2 gas holder (deeper than 10 feet below grade), and the retorts. As indicated in Section 2.3.3, the No. 2 and No. 3 gas holders, the tar separating well structure, as well as impacted

soil within the structures, have been removed. The analytical results shown on Figure 7 reflect current conditions following IRM activities.

Below the water table, the extent of subsurface soil containing elevated concentrations of total BTEX and total PAHs strongly correlates to the NAPL distribution observed in OU-1, with the greatest concentrations of total BTEX and total PAHs generally located in the immediate vicinity of former gas holders, tar separating wells, and oil tanks. Additionally, as shown on Figure 6, soil samples collected from the 295 Court Street property and upgradient of OU-1, contain petroleum-related impacts. Surface and subsurface soil analytical summary tables are presented in the Final RI Report (Arcadis 2002).

2.5.3 Groundwater (OU-1)

Historical groundwater sampling results indicate that the extent of groundwater containing MGP-related impacts strongly correlated with the distribution of visually impacted material (i.e., NAPL). Comprehensive groundwater analytical summary tables are presented in the Final RI Report (Arcadis 2002).

Analytical results for the most recent groundwater samples (collected in 2025) and documented in the 2025 Periodic Review Report (PRR) (Arcadis 2025) were compared to the Class GA groundwater quality standards and guidance values presented in the NYSDEC's TOGS 1.1.1, Ambient Water Quality Standards and Groundwater Effluent Limitations (NYSDEC 1998). Groundwater sample results indicate the following:

- Piezometer PZ03-01D: Benzene and acenaphthene concentrations were greater than their respective Class GA groundwater quality standard or guidance value. This piezometer is screened across NAPL-containing material. Therefore, the presence of constituents of concern (COCs) in this groundwater sample is expected.
- Piezometer PZ93-1: Ethylbenzene, toluene, xylenes, acenaphthene, fluorene, naphthalene, and phenanthrene concentrations were greater than their respective Class GA groundwater quality standard or guidance value. This piezometer is screened within the fill unit; therefore, the presence of COCs in this groundwater sample is expected.
- Cyanide was not detected at concentrations exceeding its Class GA groundwater quality standard in any of the samples analyzed in 2025.
- Monitoring Wells: Groundwater samples collected from the remaining monitoring wells included in the monitoring well network (MW93-05D, MW97-14S, MW97-14D, MW01-17S, MW01-17D, and MW97-7S) contained constituent concentrations below the applicable Class GA groundwater quality standards and guidance values.

Recent groundwater sample results and the inferred location of groundwater impacts above NYSDEC Class GA Standards and Guidance Values are shown on Figure 8.

Additionally, as discussed in the Final RI Report (Arcadis 2002), chlorinated VOCs (i.e., 1,1,1-trichloroethane and 1,1-dichloroethane) were detected at concentrations greater than NYSDEC Class GA standards and guidance values in groundwater samples collected from monitoring wells screened within the sand and gravel unit. These VOCs were shown to be present in groundwater flowing onto the Site and are not related to former Site activities.

2.5.4 Sediment (OU-2)

Sediment removal areas and boring locations are shown on Figure 5, potential remaining sediment impacts are discussed below:

- Boring P (Area 1) lies just outside the sediment remediation limits and slightly exceeds the PrPAH removal criteria of 4 mg/kg. Samples in boring P were found to have black staining, faint MGP-like odors, and trace sheens. At the surface, the PrPAH concentration for boring P was 0.89 mg/kg. At the 1- to 2-foot interval and 4- to 5-foot interval PrPAH concentration exceeded the 4 mg/kg removal criteria with concentrations of 4.66 mg/kg and 12.5 mg/kg, respectively. Borings within the immediate vicinity of boring P were not found to have MGP-related impacts suggesting that remaining impacts observed at boring P are isolated and non-contiguous.
- Boring SS-3-12 (Area 1), conducted in 1997 lies just outside the sediment removal limits, had a fluorene concentration of 2.3 mg/kg, exceeding the Benthic Aquatic Life Acute Toxicity Criterion (NYSDEC 1999). A 2014 sample from boring O which is located adjacent to and superseding location SS-3-12, did not contain MGP impacts.
- Boring locations H (Area 1) and A (Area 2) had faint MGP-like odors from 24 to 27.4 feet bss and 20 to 22 feet bss, respectively and Boring location F (Area 2) had NAPL-coated sand and gravel observed from 28.4 to 29.5 feet bss (interval immediately above the till). The faint MGP-like odors were encountered approximately 15 feet below the base of the river and the interval with NAPL coating lies more than 25 feet below the base of the river. Based on the depths of these impacts, they were considered non-contiguous with the shallow sediment impacts observed and therefore were not included in the areas for remedial consideration.
- The northern remedial boundaries (i.e., shore side) of Areas 1 and 2 were determined by establishing a three-foot offset from existing infrastructure in consideration of constructability, health and safety, and protection of existing infrastructure. This buffer was included along the Court Street flood wall, the abutment of the former bridge for Tompkins Street, the pump house and adjacent concrete spillway, and riprap supporting the slope at Tompkins Street Bridge. Concentrations at SS-3 (Area 1), SS-9 and SS-10 (Area 2) are likely the most representative of impacts that might remain in the three-foot buffer zone at shallow depths. These samples were analyzed for VOCs, SVOCs, select metals, total solids, and total organic carbon, the results are provided in Table 2.

In summary, remaining sediment impacts may be present within the 3-foot buffer zones adjacent to existing infrastructure, deeper than the final excavation depths, and beyond the approved excavation area limits. While a total volume of any potentially remaining impacts may not be explicitly known, remaining impacts are expected to be minor and occur at isolated, non-contiguous locations.

3 Institutional and Engineering Control Plan

3.1 General

Since remaining impacts exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as implementation of the EWP (as provided in Appendix D) for the proper handling of remaining impacts that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the ROD to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining impacts; and (3) limit the use and development of the Site to commercial or industrial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easements. The IC boundaries are shown on the Figure Titled "Parcels of Land Known as 279 and 293 Court Street" in Appendix A. These ICs are:

- The NYSEG-owned parcels may be used for commercial and industrial use, subject to local zoning laws.
- All ECs must be operated and maintained as specified in this SMP.
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the properties is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the Broome County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP.
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP.
- All future activities that will disturb remaining impacted/solidified material must be conducted in accordance with this SMP.

- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
- The potential for vapor intrusion must be evaluated for any new buildings developed in the area within the IC boundaries noted on the Environmental Easement in Appendix A, and any potential impacts that are identified must be monitored or mitigated.
- Vegetable gardens and farming on the Site are prohibited.
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.

3.3 Engineering Controls

An overview of the ECs established for the Site is presented in the following subsections.

3.3.1 Cover

Exposure to remaining impacts at the site is prevented by an existing soil cover system placed over the Site. The cover system is comprised of a minimum of 12-inches of clean gravel which meets the requirements for commercial (and industrial) use specified in 6 NYCRR Part 375-6.7(d) (NYSDEC 2006) or asphalt pavement. Figure 2 shows the approximate extents of the cover system materials, there are no applicable demarcation layers. The EWP provided in Appendix D outlines the procedures required to be implemented in the event the cover system is breached, penetrated, temporarily removed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and NYSDOH's Generic Community Air Monitoring Plan (GCAMP) prepared for the Site and provided in Appendices E and F, respectively. Any disturbance of the cover system must be overseen by a qualified environmental professional as defined in 6 NYCRR Part 375, a Professional Engineer who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

3.3.2 Passive NAPL Barrier Wall

As discussed in Section 2.3.3, a passive NAPL barrier wall was constructed to mitigate potential migration of NAPL beyond the downgradient edge of NYSEG's property and recover NAPL, to the extent practicable. The major components of the NAPL barrier consist of the following:

- Gravel-filled collection trench;
- Jet-grouted low-permeability panels;

- DNAPL collection system; and
- LNAPL collection system.

The location of the passive NAPL barrier wall and associated NAPL recovery wells are shown on Figure 2. Construction of the passive NAPL barrier wall was completed in December 2006 and NAPL monitoring at the associated recovery wells (and additional wells in OU-1) began in April 2007. Annual monitoring was conducted from 2007 through 2017, and from 2020 to present. Monitoring/gauging activities completed each year are summarized in an annual NAPL Monitoring Report letter or PRR submitted to NYSDEC. No recoverable quantities of NAPL have been identified in any recovery since monitoring began in 2007. Monitoring frequencies for future events are further discussed in Sections 3.3.4.2 and 4.4.2.

3.3.3 Storm Sewer

As discussed in Section 2.3.3, the existing storm sewer that transected the western portion of OU-1 was replaced to provide a water- and NAPL-tight storm sewer system across OU-1 that prevents infiltration of potentially impacted groundwater and NAPL into the City of Binghamton storm sewer (and subsequently to the Susquehanna River). New storm sewer components include new 63-inch external diameter non-structural HDPE pipe and four new HDPE manholes. Storm sewer replacement activities were completed in March 2012. Due to the zero-leakage design of the new storm sewer line, the new sewer line does not need to be periodically inspected. No active systems are associated with the storm sewer replacement.

3.3.4 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by the NYSDEC, confirmation samples of applicable environmental media are required before terminating any remedial actions at the Site. Confirmation samples require Category B deliverables and a Data Usability Summary Report.

As discussed below, the NYSDEC may approve termination of a groundwater monitoring program. When a remedial party receives this approval, the remedial party will decommission all Site-related monitoring, injection and recovery wells as per the NYSDEC guidance entitled “Commissioner Policy-43 (CP-43): Groundwater Monitoring Well Decommissioning Policy” (NYSDEC CP-43 policy [NYSDEC 2009]).

The remedial party will also conduct any needed restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees and wetlands, and will comply with NYSDEC and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the Site.

3.3.4.1 Cover (or Cap)

The existing cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.4.2 Passive NAPL Barrier Wall

The passive NAPL barrier wall is a permanent control. Gauging of the recovery wells installed within the wall will be conducted at defined, regular intervals in accordance with this SMP. In the event that NAPL is not observed in any wells for five consecutive events, NYSEG may provide the NYSDEC with a proposal to extend the monitoring interval. In the event that monitoring continues beyond five years, the need for continued monitoring will be regularly reevaluated. If, after several gauging events at this extended sampling interval, NAPL remains undetected and the results of an evaluation deem NAPL monitoring unnecessary, then NYSEG may propose to the NYSDEC that monitoring be discontinued. Monitoring will continue until written permission to discontinue is granted by the NYSDEC.

4 Monitoring and Sampling Plan

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for OU-1 are included in the Field Sampling Plan (FSP), and Quality Assurance Project Plan (QAPP) provided in Appendices H and I, respectively.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils).
- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly groundwater standards and Part 375 soil cleanup objectives for soil.
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

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

- Sampling locations, protocol and frequency.
- Information on all designed monitoring systems.
- Analytical sampling program requirements.
- Inspection and maintenance requirements for monitoring wells.
- Monitoring well decommissioning procedures.
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7 of this SMP.

4.2 Site-Wide Inspection

Site-wide inspections will be performed at OU-1 a minimum of once per year. These periodic inspections must be conducted when the ground surface is visible (i.e., no snow cover). Site-wide inspections will be performed by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix G – Site Inspection Form. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage.
- An evaluation of the condition and continued effectiveness of ECs.
- General site conditions at the time of the inspection.
- Whether stormwater management systems, such as basins and outfalls, are working as designed.

- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection.
- Confirm that site records are up to date.

Inspections of all installed remedial components will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed.
- If these controls continue to be protective of human health and the environment.
- Compliance with requirements of this SMP and the Environmental Easements.
- Achievement of remedial performance criteria.
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7 of this SMP.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at OU-1, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of OU-1 will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at OU-1 by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public. The remedial party will submit follow-up status reports to the NYSDEC within 45 days of the event on actions taken to respond to any emergency event requiring ongoing responsive action, describing and documenting actions taken to restore the effectiveness of the ECs.

4.3 River Sheen Monitoring

Periodic visual monitoring of the river surface will be completed to assess the presence of MGP-related sheens, due to the minor/residually impacted sediment that potentially remains within OU-2 within the excavation buffer zones adjacent to existing infrastructure, deeper than the final excavation depths, and/or beyond the approved excavation area limits. Sheen observation monitoring will be conducted from a fixed location at the northeast corner of the Tompkins Street Bridge (Figure 5) for a consistent duration (30 minutes).

If sheens are observed during any of the monitoring events, the observer will make additional observations from additional locations as necessary to determine the potential source of the sheens. The observer will first move to a location upstream of the remedial area to determine if sheens are also present in the upstream area. If sheens are also present upstream of the remedial area, the sheens will be noted as unrelated to the MGP remedial area. If sheens are not present upstream of the remedial area, the observer will then move to additional observation location(s) within the remedial area (river conditions permitting). The observer will attempt to quantify the frequency and magnitude of sheens appearing on the water surface (e.g., "a sheen blossom of approximately one square foot appeared on the water surface every three minutes"). The NYSDEC spill hotline will be immediately notified if any Site-related sheens are observed.

Visual sheen monitoring was conducted quarterly in 2021 and 2022, semi-annually in 2023 and 2024, and annually in 2025. To date no sheens have been observed. Sheen monitoring is currently conducted annually until

2030. Sheen monitoring results to date are documented in the Annual Monitoring Reports (Arcadis 2021, 2022, 2024a) or PRR (Arcadis 2024b, 2025). If sheens related to the MGP remedial area are observed during annual monitoring, observations will continue annually until six consecutive observation periods are completed without a sheen observation.

Future sheen monitoring results will be included in Annual Monitoring Reports or PRR, as applicable. At the completion of the 10-year monitoring period in 2030, if no sheens are observed the need for continued sheen monitoring will be evaluated by NYSDEC.

4.4 Post-Remediation Media Monitoring and Sampling

Samples shall be collected from the groundwater monitoring wells on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in Table 4.1 – Post Remediation Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Table 4.1 – Post Remediation Sampling Requirements and Schedule

Sampling Location	Analytical Parameters		NAPL Recovery	NAPL and Water Level Monitoring	Schedule
	BTEX (USEPA Method 8260)	PAHs (USEPA Method 8270)			
MW93-5D, MW97-7S, MW97-14D, MW97-14S, MW01-17D, MW01-17S, PZ93-1, PZ03-01D	X	X			Once every 5 years (starting in 2020)
NAPL Recovery Wells (RW-1 through RW-22), NMW-1, NMW-2			X	X	Annually
MW93-5D, MW-93-6D, MW97-7S, MW97-14D, MW97-14S, MW01-17D, MW01-17S, PZ93-1, PZ03-01D, PZ03-09A, PZ03-09D				X	Annually

Detailed sample collection and analytical procedures and protocols are provided in the FSP (Appendix H) and QAPP (Appendix I).

4.4.1 Groundwater Monitoring and Sampling

As required by the ROD, groundwater monitoring will be conducted to assess the performance and effectiveness of the remedy. NAPLs inadvertently released during former MGP operations have been in place for decades. While the removal of impacted materials and NAPL has reduced the time potentially required to achieve the groundwater RAOs presented in the ROD, some residual NAPL remains in Site soils. This residual NAPL will continue to slowly dissolve for many years; therefore, groundwater RAOs may not be achieved in the foreseeable future. A network of monitoring wells has been installed to monitor upgradient, side-gradient, downgradient, and on-site groundwater conditions. The network of wells has been designed to achieve the following objectives:

1. Confirm that groundwater-flow patterns characterized during the RI have not changed appreciably.
2. Document the quality of groundwater entering OU-1 from the sand and gravel unit.
3. Document that the MGP-related dissolved phase plume remains stable or is shrinking.

Periodic water level gauging and groundwater sampling, as described in the following subsections, will be completed to meet these objectives. [Monitoring well construction details are included in Table 3.](#)

4.4.1.1 Water Level Gauging

To meet Objective #1, synoptic rounds of water levels will be measured periodically at both shallow (water-table) and deep (sand and gravel) monitoring wells and piezometers. Water-level monitoring will be performed in conjunction with NAPL gauging (discussed in Section 4.4.2) and groundwater sampling (discussed in Section 4.4.1.2). Well locations gauged for water levels will be the same wells gauged for NAPL, including the NAPL recovery wells installed in the passive NAPL barrier wall. As such, groundwater levels will be measured whenever NAPL gauging is conducted, or groundwater samples are collected. In the event that NAPL gauging is discontinued (with NYSDEC permission), groundwater levels will be gauged during each groundwater sampling event (or annually if groundwater sampling is discontinued).

Following the completion of the water level gauging, potentiometric surface maps (i.e., for shallow and deep units) will be prepared and included in annual site management reports (see Section 7.1).

4.4.1.2 Groundwater Sampling

To meet Objectives #2 and #3, groundwater samples will be periodically collected from the monitoring wells listed in Table 4.1. Based on recent groundwater data, the extent of impacted groundwater is stable. Therefore, [groundwater sampling will be performed once every five years to assess the performance of the remedy.](#) Any [modification to the frequency or sampling requirements](#) presented in this SMP [will require approval from the NYSDEC project manager.](#) Monitoring will continue until written permission to discontinue is granted by the NYSDEC. [This SMP will be modified to reflect changes in the groundwater sampling plan once approved by the NYSDEC.](#)

[Well construction details including well identification number, as well as the purpose, location, depths, diameter and screened intervals of the wells and piezometers to be sampled are presented in Table 3. As part of the groundwater monitoring, two upgradient wells, four side-gradient wells, and four downgradient wells are sampled to evaluate the effectiveness of the remedial system. The remedial party will measure depth to the water table for each monitoring well in the network before sampling.](#) Monitoring well construction logs are included in Appendix C.

Groundwater samples will be collected using low-flow purging and sampling techniques in accordance with the FSP (Appendix H). The groundwater samples will be submitted to a NYSDOH-certified laboratory for analysis of the parameters listed in Table 4.1. Analytical parameters to be analyzed along with the detection limits and minimum reporting limits to be achieved by the Environmental Laboratory Approval Program-certified laboratory are included in the QAPP (Appendix I). Analytical results will be reported using NYSDEC Analytical Services Protocol (ASP) Category B data deliverables and will be validated in accordance with United States Environmental Protection Agency (USEPA) National Functional Guidelines.

4.4.1.3 Monitoring Well Repairs, Replacement, and Decommissioning

If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent PRR. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC's CP-43 Policy (NYSDEC 2009). Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

Deliverables for the groundwater monitoring program are specified in Section 7 – Reporting Requirements.

4.4.2 NAPL Gauging

NAPL gauging will be performed to monitor the amount of NAPL that enters the passive NAPL barrier wall and will be performed in conjunction with water-level gauging. NAPL monitoring wells are listed in Table 4.1 and shown on Figures 3 and 4.

If a recoverable quantity of NAPL is identified in any well, the NAPL will be removed by manual bailing or pumping with a portable pump at a frequency that is sufficient to maintain the level of NAPL to within the well sump (i.e., the NAPL gauging schedule may be modified based on the observed NAPL accumulation rate). To date, no recoverable NAPL has accumulated in any of the passive NAPL barrier wall recovery wells, only odors, sheens, and trace amounts (i.e., blebs) of tar-like material have been observed. If no recoverable quantities of NAPL are observed during a five-year period, NYSEG would request to conduct NAPL monitoring less frequently or cease NAPL monitoring altogether.

4.4.3 Soil Vapor Intrusion Sampling

Prior to the construction of any enclosed structures located over areas that contain remaining impacts and where the potential for soil vapor intrusion (SVI) has been identified, an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system may include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the NYSDOH's October 2006 (or most recent) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006) and the FSP (Appendix H). Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next PRR, as applicable.

4.4.4 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in the FSP (Appendix H). Other observations (e.g., groundwater monitoring well integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the FSP.

5 Operation and Maintenance Plan

5.1 General

The Site remedy does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

Automated NAPL recovery systems could be installed in the future (if warranted based on the rate of NAPL recovery).

In the event that new building(s) are constructed at OU-1, based on the results of SVI sampling as described in Section 4.4.3, vapor mitigation measures (e.g., vapor barrier and sub-slab depressurization system piping) may be installed.

This SMP will be updated to include an Operation and Maintenance Plan for any active remedial systems that are installed.

6 Periodic Assessment/Evaluations

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a current vulnerability assessment that evaluates the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding. This section also identifies vulnerability assessment updates that will be conducted for the site in Periodic Review Reports.

The OU-1 Site serves as a vacant/storage lot for NYSEG and does not contain vulnerable assets. The engineering controls at OU-1 are passive and are not vulnerable to changing or extreme weather conditions. Storm water management is not anticipated to be a concern because OU-1 is graded for positive drainage. Based on the Federal Emergency Management Agency National Flood Insurance Program Map Number 3600380002C, dated June 1, 1977, OU-1 is located between limits of 100-year flood and 500-year flood. Additionally, OU-1 is protected from flooding by the flood wall located south of Court Street. OU-2 is located within the 100-year flood limits.

Remaining impacted materials at OU-1 are below the soil cover system which is anticipated to withstand foreseeable rain, snow, and flooding and protect against long term direct contact exposures. Based on the thickness and integrity of the soil cover system, impacted materials are not anticipated to be released from OU-1 during extreme weather events, including flooding.

Impacted Susquehanna River sediments were removed and backfilled with clean material. Any remaining impacts are expected to be minor and occur at isolated, noncontiguous locations (i.e., deep sediments). In the event that a severe flood results in scouring of the riverbed, remaining impacts in shallow sediments, which are already less than the PrPAH removal criteria of 4 mg/kg may be displaced. However, scouring is not likely to expose or release deeper sediment contamination.

If conditions at the Site change, NYSEG with NYSDEC consultation will evaluate the need to develop a vulnerability assessment. Potential future vulnerability assessments will be provided as part of the PRR.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation (NYSDEC 2010b) requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR.

Site maintenance activities (i.e., groundwater monitoring, NAPL monitoring, and site inspection) will be performed in such a way to minimize energy usage, waste generation, and water consumption. If feasible, these activities

will be performed during the same mobilization and with local staff carpooling to minimize fuel usage and emissions generated from traveling to the Site. Measures to minimize the generation of wastewater will be reported in the PRR.

6.2.1 Timing of Green Remediation Evaluations

For potential future major remedial system components (e.g., construction of a sub-slab depressurization system for a future building), green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the NYSDEC project manager feels appropriate, (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.3 Remedial System Optimization

If a remedial system is put into use at this Site in the future, An RSO study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the ROD.
- The management and operation of the remedial system is exceeding the estimated costs.
- The remedial system is not performing as expected or as designed.
- Previously unidentified source material may be suspected.
- Plume shift has potentially occurred.
- Site conditions change due to development, change of use, change in groundwater use, etc.
- There is an anticipated transfer of the site management to another remedial party or agency.
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principles are to be considered when performing the RSO.

7 Reporting Requirements

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate inspection form provided in Appendix G. This form is subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 7.1 and summarized in the Annual Monitoring Report or PRR, as applicable.

Table 7.1 – Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Surface water sheen observation/monitoring	Annually (to be included with PRR every fifth year). Immediate notification of NYSDEC spill hotline if sheen is noted.
Site-wide inspections and NAPL Monitoring Letter Report	Annually (to be included with PRR every fifth year)
Groundwater Sampling Letter Report	Every 5 years (to be included with PRR)
PRR (Including Groundwater Monitoring Results)	Every 5 years (starting in 2025), or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period.
- Name, company, and position of person(s) conducting monitoring/inspection activities.
- Description of the activities performed.
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet).
- Type of samples collected (e.g., groundwater, NAPL, sub-slab vapor, indoor air, outdoor air).
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation).
- Sampling results in comparison to appropriate standards/criteria.
- A figure illustrating sample type and sampling locations.
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format).

- Any observations, conclusions, or recommendations.
- A determination as to whether remaining impacts have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event.
- Name, company, and position of person(s) conducting maintenance activities.
- Description of maintenance activities performed.
- Any modifications to the system.
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet).
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

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

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link <http://www.dec.ny.gov/chemical/62440.html>.

7.2 Periodic Review Report

A PRR will be submitted to the NYSDEC project manager beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR shall be submitted every fifth years to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager.

Although OU-1 is subdivided into separate parcels, a single Periodic Review Report will be prepared that addresses the OU-1 properties described in the Environmental Easements (Appendix A), as well as the in-river portion of OU-2 (i.e., Susquehanna River sediments). The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.

- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables of constituents of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables will include a presentation of past data as part of an evaluation of constituents' concentration trends, including but not limited to:
 - Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
 - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
 - Operations & Maintenance data summary tables;
 - A current plume map for sites with remaining groundwater contamination; and
 - A groundwater elevation contour map for each gauging event.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
- A site evaluation, which includes the following:
 - The compliance of the remedy with the requirements of the ROD.
 - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications.
 - Any new conclusions or observations regarding remaining impacts based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored.
 - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan.
 - An update to the climate change vulnerability assessment if site or external conditions have changed since the previous assessment, and recommendations to address vulnerabilities.
 - A summary of the Green Remediation evaluation, including a quantitative and qualitative overview of a site's environmental impacts and recommendations to improve the remedy's environmental footprint. The PRR will include the completed Summary of Green Remediation Metrics form provided in Appendix J.
 - An evaluation of trends in constituent levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the ROD.
 - The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional as defined in 6 NYCRR Part 375 or Professional Engineer licensed to practice and registered in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

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

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

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [insert name of Professional Engineer], of [business address], am certifying as NYSEG's designated site representative [I have been authorized and designated by all owners/remedial parties to sign this certification] for the site."

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial System Optimization Report

If an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A general outline for the RSO report is provided in Appendix K. The RSO report will document the research/investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

8 References

- Arcadis. 2005. Storm Sewer Interim Remedial Measure Documentation Report. Prepared for New York State Electric & Gas Corporation, Court Street Former Manufactured Gas Plant Site, Binghamton, New York. May.
- Arcadis. 2008. NAPL Barrier Wall Interim Remedial Measure Engineering Certification Report. Prepared for New York State Electric & Gas Corporation. Binghamton, New York. June.
- Arcadis. 2012. 66-Inch Storm Sewer Replacement Construction Completion Report. Prepared for New York State Electric & Gas Corporation, Court Street Former Manufactured Gas Plant Site, Binghamton, New York. September.
- Arcadis. 2013. Binghamton Court Street Former MGP Site, Susquehanna River, Sediment Assessment Report. Prepared for New York State Electric & Gas Corporation. August 19.
- Arcadis. 2015. Binghamton Court Street Former MGP Site, Susquehanna River Sediments, Pre-Design Investigation Letter Report. Prepared for New York State Electric & Gas Corporation. May 14.
- Arcadis. 2017. Interim Remedial Measure Design Report, Court Street Manufactured Gas Plant Site, Operable Unit 2, Binghamton, New York, Site No. 7-04-031. Prepared for New York State Electric & Gas Corporation. May.
- Arcadis. 2021. 2021 Post-Construction Monitoring Report, Binghamton Court Street Former Manufactured Gas Plant Site, NYSDEC Site No. 7-04-031, Binghamton, New York. January 19.
- Arcadis. 2022. 2022 Post-Construction Monitoring Report, Binghamton Court Street Former Manufactured Gas Plant Site, NYSDEC Site No. 7-04-031, Binghamton, New York. December 22.
- Arcadis. 2024a. 2023 Post-Construction Monitoring Report, Binghamton Court Street Former Manufactured Gas Plant Site, NYSDEC Site No. 7-04-031, Binghamton, New York. January 18.
- Arcadis. 2024b. Periodic Review Report, Court Street Former Manufactured Gas Plant Site, Binghamton, New York, NYSDEC Site No.: 7-04-031. October.
- Arcadis. 2025. Periodic Review Report, Court Street Former Manufactured Gas Plant Site, Binghamton, New York, NYSDEC Site No.: 7-04-031. October.
- Blasland, Bouck, and Lee, Inc. (BBL). 1996. Task II Remedial Investigation Report, Former Manufactured Gas Plant Site, Court Street, Binghamton, New York. Prepared for New York State Electric & Gas Corporation. June.
- BBL. 2002. Final Remedial Investigation report, Court Street Site, Binghamton, New York. Prepared for New York State Electric & Gas Corporation. December.
- Engineering - Science, Inc. 1993. Prioritization of Former Manufactured Gas Plant Site, Binghamton – Court Street Site. Prepared for New York State Electric & Gas Corporation. Binghamton, New York. August.
- GEI Consultants Inc. 2023. Interim Remedial Measure Final Engineering Report for Binghamton Court Street Former Manufactured Gas Plant Site. Prepared for New York State Electric & Gas Corporation. Binghamton, New York. May.

- Holecek, T.J., Randall, A.D., and others. 1982. Geohydrology of the Valley-Fill Aquifer in the Endicott-Johnson City Area, Broome County, New York. U.S. Geological Survey Open-File Report 82-268, 5 sheets, 24,000 scale.
- Ku, H.F.H., A.D. Randall, and R.D. MacNish. 1975. Streamflow in the New York Part of the Susquehanna River Basin. New York State Department of Environmental Conservation Bulletin 71, 130 p.
- MacNish, R.D. and Randall, A. D. 1982. Stratified-Drift Aquifers in the Susquehanna River Basin, New York. New York State Department of Environmental Conservation Bulletin 75, 68 p.
- NYSDEC. 1994. New York State Department of Environmental Conservation. Technical and Administrative Guidance Memorandum #4046. January 24.
- NYSDEC. 1996. Order on Consent, Index #D7-001-96-03. New York State Electric & Gas Corporation, Binghamton Court Street Former MGP Site. November 8.
- NYSDEC. 1998. [Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Division of Water Technical and Operational Guidance Series \(TOGS\) 1.1.1. June \(January 1999 Errata, April 2000, June 2004, February 2023, addendum\).](#)
- NYSDEC. 1999. Technical Guidance for Screening of Contaminated Sediments. New York State Department of Environmental Conservation, Division of Fish, Wildlife, and Marine Resources, Bureau of Habitat. January 25.
- NYSDEC. 2006. Title 6 of the New York Codes, Rules, and Regulations ([NYCRR](#)) [Part 375, Environmental Remediation Programs. December 14.](#)
- NYSDEC. 2009. New York State Department of Environmental Conservation. CP-43: Groundwater Monitoring Well Decommissioning Policy. November 3.
- NYSDEC. 2010a. [DER-10](#) New York State Department of Environmental Conservation. [DER-10/Technical Guidance for Site Investigation and Remediation.](#) May 3.
- NYSDEC. 2010b. New York State Department of Environmental Conservation. DER-31/Green remediation. August 11.
- NYSDEC. 2013. Record of Decision NYSEG – Binghamton Court St. MGP, Operable Unit Number 01: Former MGP Area, Site Number 7-04-031. Albany, New York. March.
- NYSDEC. 2016. Modified Order on Consent, Index # A7-0379-9811. New York State Electric & Gas Corporation, Binghamton Court Street Former MGP Site. January 4.
- NYSDEC. 2021. Decision Document. NYSEG – Binghamton Court St. MGP, Operable Unit Number 02: Susquehanna River Sediment, Site Number 7-04-031. Albany, New York. June.
- NYSDOH. 2006. New York State Department of Health. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October.
- NYSEG. 2002. Interim Remedial Measures Final Engineering Report, Binghamton Court Street Former Manufactured Gas Plant Site, City of Binghamton, Broome County, New York. July.
- NYSEG. 2006. Interim Remedial Measures Final Engineering Report for Gas Holder Foundation No. 2 Associated with Binghamton Court Street Former Manufactured Gas Plant Site, City of Binghamton, Broome County, New York. September.

- Randall, A.D., 1977. The Clinton Street-Ballpark Aquifer in Binghamton and Johnson City, New York. New York State Department of Environmental Conservation Bulletin 73, 87 p.
- Randall, A.D., 1978, A Contribution to the Pleistocene Stratigraphy of the Susquehanna River Basin. New York State Education Department, Empire State Geogram, v. 14, no. 2, pp. 2-15.
- Randall, A.D., 1986. Aquifer Model of the Susquehanna River Valley in Southwestern Broome County, New York, U.S. Geological Survey Water-Resources Investigation Report 85-4099, vi, 38 p.
- Wolcott, S.W., and Coon, W.F. 2001. Simulation of a Valley-Fill Aquifer System to Delineate Flow Paths, Contributing Areas, and Travel-Time to Wellfields in Southwestern Broome County, New York. U.S. Geological Survey Water-Resources Investigations Report 2001-4171 (version 2.0), vi, 25 p. Prepared in cooperation with the U.S. EPA and New York State Department of Environmental Conservation.

Tables

Table 1
Groundwater Elevation Data - April 2025
Site Management Plan - Binghamton Court Street Former MGP
Binghamton, New York

Monitoring Well ID	Top of Inner Casing (TIC) Elevation (feet AMSL)	Constructed Well Depth (feet bgs)	Depth to Water (feet below TIC)	Depth to Bottom (feet below TIC)	Groundwater Elevation (feet AMSL)
Barrier Wall Recovery Wells					
RW-1	841.76	54.20	9.62	51.11	832.14
RW-2	841.97	52.30	9.83	51.58	832.14
RW-3	842.01	16.75	9.84	15.86	832.17
RW-4	842.99	17.10	10.86	15.39	832.13
RW-5	842.97	48.60	10.83	48.57	832.14
RW-6	843.57	49.10	11.25	48.28	832.32
RW-7	843.58	18.79	11.27	17.77	832.31
RW-8	843.49	18.10	11.19	17.25	832.30
RW-9	843.53	52.95	11.24	51.74	832.29
RW-10	843.08	16.60	10.78	15.76	832.30
RW-11	843.92	49.70	11.65	39.57	832.27
RW-12	844.78	47.96	12.55	47.72	832.23
RW-13	844.78	18.70	12.54	17.86	832.24
RW-14	845.8	17.60	13.58	17.03	832.22
RW-15	845.77	49.20	13.53	48.82	832.24
RW-16	848.38	49.91	16.16	48.53	832.22
RW-17	848.34	24.50	16.12	24.45	832.22
RW-18	845.85	41.98	13.57	41.84	832.28
RW-19	845.87	19.11	13.66	19.13	832.21
RW-20	841.76	15.45	9.54	13.13	832.22
RW-21	841.99	16.00	9.63	15.68	832.36
RW-22	841.97	52.20	9.60	50.80	832.37
NAPL Recovery Wells					
NMW-1	849.94	43.45	17.69	40.48	832.25
NMW-2	846.12	43.50	14.07	40.48	832.05
Upgradient and Side-Gradient Wells					
PZ93-1	848.00	8.50	10.04	12.18	837.96
MW93-06D	845.98	65.00	13.49	67.18	832.49
MW93-05D	847.16	56.90	14.52	59.14	832.64
MW97-14D	844.88	40.00	11.89	37.76	832.99
MW97-14S	844.87	20.00	11.93	18.82	832.94
MW01-17D	860.79	59.20	28.37	58.71	832.42
MW01-17S	860.86	37.00	28.63	32.33	832.23
Sentinel Wells					
MW97-07S	848.97	28.50	16.99	25.78	831.98
MW-01-03-R	846.56	108.00	13.52	111.12	833.04
PZ03-01D	847.61	47.00	15.36	46.69	832.25
PZ03-09A	850.86	16.00	19.06	22.37	831.80
PZ03-09D	850.81	55.50	18.72	47.09	832.09
Surface Water Elevation					
MP-1 (Tompkins St. Bridge)	858.19	--	26.32	--	831.87

Acronyms and Abbreviations:

amsl = above mean sea level
bgs = below ground surface
DNAPL = Dense Non-Aqueous Phase Liquid
NA = not available
NM = not measured
TIC = top of inner casing

Notes:

1. Elevations referenced to the NAVD 88 Datum.
2. Not included as part of the monitoring well network.
2. NAPL gauging and water level data collected by Arcadis on 4/22/2025.
3. Measurement taken from surveyed point on bridge.

Table 2
Remaining Sediment Analytical Results
Site Management Plan - Binghamton Court Street Former MGP
Binghamton, New York

Location ID: Sample Designation: (Depth)		SS-3 BSTCSS9303G (0 - 1 ft)	SS-9 BTSCSS9309G (0 - 0.7 ft)	SS-10 BTSCSS9310G (0 - 0.7 ft)
Date Collected:	Units	6/16/1993	6/16/1993	6/16/1993
Volatile Organics				
1,1,1-Trichloroethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,1,2,2-Tetrachloroethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,1,2-Trichloroethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,1-Dichloroethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,1-Dichloroethene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,2-Dichloroethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,2-Dichloroethene total	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
1,2-Dichloropropane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
2-Butanone	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
2-Hexanone	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
4-Methyl-2-Pentanone	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
Acetone	ppm	0.051 N	0.021 N	0.12 ND [0.13 ND]
Benzene	ppm	0.018 N	0.007 U	0.037 UD [0.037 UD]
Bromodichloromethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Bromoform	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Bromomethane	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
Carbon Disulfide	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Carbon Tetrachloride	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Chlorobenzene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Chloroethane	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
Chloroform	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Chloromethane	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
Dibromochloromethane	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Ethylbenzene	ppm	0.27 N	0.007 U	0.068 ND [0.097 ND]
Methylene Chloride	ppm	0.008 U	0.007 U	0.037 UD [0.025 JD]
Styrene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Tetrachloroethene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Toluene	ppm	0.006 J	0.007 U	0.037 UD [0.037 UD]
Trichloroethene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Vinyl Acetate	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
Vinyl Chloride	ppm	0.017 U	0.013 U	0.075 UD [0.075 UD]
Xylene (total)	ppm	0.099 N	0.007 U	0.071 ND [0.11 ND]
cis-1,3-Dichloropropene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
trans-1,3-Dichloropropene	ppm	0.008 U	0.007 U	0.037 UD [0.037 UD]
Total Volatiles Detected	ppm	0.444	0.021	0.259 [0.362]
Total Volatile TICs Detected	ppm	1.097	0.0	22.738 [18.703]
Semi-Volatile Organics				
1,2,4-Trichlorobenzene	ppm	11 UD	0.44 U	0.50 [0.48 U]
1,2-Dichlorobenzene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
1,3-Dichlorobenzene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
1,4-Dichlorobenzene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2,2'-oxybis(1-Chloropropane)	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2,4,5-Trichlorophenol	ppm	28 UD	1.1 U	1.2 U [1.2 U]
2,4,6-Trichlorophenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2,4-Dichlorophenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2,4-Dimethylphenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2,4-Dinitrophenol	ppm	28 UD	1.1 U	1.2 U [1.2 U]
2,4-Dinitrotoluene	ppm	11 UD	0.44 U	0.5 U [0.48 U]

Table 2
Remaining Sediment Analytical Results
Site Management Plan - Binghamton Court Street Former MGP
Binghamton, New York

Location ID: Sample Designation: (Depth)		SS-3 BSTCSS9303G (0 - 1 ft)	SS-9 BTSCSS9309G (0 - 0.7 ft)	SS-10 BTSCSS9310G (0 - 0.7 ft)
Date Collected:	Units	6/16/1993	6/16/1993	6/16/1993
Semi-Volatile Organics (Con't)				
2,6-Dinitrotoluene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2-Chloronaphthalene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2-Chlorophenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2-Methylnaphthalene	ppm	55 ND	0.25 J	0.65 N [0.63 N]
2-Methylphenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
2-Nitroaniline	ppm	28 UD	1.1 U	1.2 U [1.2 U]
2-Nitrophenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
3,3'-Dichlorobenzidine	ppm	11 UD	0.44 U	0.5 U [0.48 U]
3-Nitroaniline	ppm	28 UD	1.1 U	1.2 U [1.2 U]
4,6-Dinitro-2-methylphenol	ppm	28 UD	1.1 U	1.2 U [1.2 U]
4-Bromophenyl-phenylether	ppm	11 UD	0.44 U	0.5 U [0.48 U]
4-Chloro-3-methylphenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
4-Chloroaniline	ppm	11 UD	0.44 U	0.5 U [0.48 U]
4-Chlorophenyl-phenylether	ppm	11 UD	0.44 U	0.5 U [0.48 U]
4-Methylphenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
4-Nitroaniline	ppm	28 UD	1.1 U	1.2 U [1.2 U]
4-Nitrophenol	ppm	28 UD	1.1 U	1.2 U [1.2 U]
Acenaphthene	ppm	250 NDE	0.9 N	2.2 N [2.3 N]
Acenaphthylene	ppm	16 ND	0.24 J	1.6 N [1.5 N]
Anthracene	ppm	110 ND	0.5 N	1 N [1.1 N]
Benzo(a)anthracene	ppm	70 ND	1 N	1.4 N [1.4 N]
Benzo(a)pyrene	ppm	87 ND	1 N	1.9 N [1.9 N]
Benzo(b)fluoranthene	ppm	65 ND	1.2 N	1.7 N [1.6 N]
Benzo(g,h,i)perylene	ppm	32 ND	0.57 N	2.1 N [2 N]
Benzo(k)fluoranthene	ppm	22 ND	0.35 J	0.41 J [0.37 J]
Benzoic Acid	ppm	28 UD	1.1 U	1.2 U [1.2 U]
Benzyl Alcohol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Butylbenzylphthalate	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Chrysene	ppm	62 ND	0.98 N	1.3 N [1.2 N]
Di-n-butylphthalate	ppm	11 UD	0.063 J	0.5 U [0.48 U]
Di-n-octylphthalate	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Dibenzo(a,b)anthracene	ppm	5.8 JD	0.13 J	0.5 U [0.48 U]
Dibenzofuran	ppm	11 UD	0.22 J	0.095 J [0.97 J]
Diethylphthalate	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Dimethylphthalate	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Fluoranthene	ppm	170 ND	2 N	2.4 N [2.2 N]
Fluorene	ppm	110 ND	0.58 N	0.9 N [0.93 N]
Hexachlorobenzene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Hexachlorobutadiene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Hexachlorocyclopentadiene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Hexachloroethane	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Indeno(1,2,3-cd)pyrene	ppm	26 ND	0.56 N	1.5 N [1.5 N]
Isophorone	ppm	11 UD	0.44 U	0.5 U [0.48 U]
N-Nitroso-di-n-propylamine	ppm	11 UD	0.44 U	0.5 U [0.48 U]
N-Nitrosodiphenylamine	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Naphthalene	ppm	120 ND	0.63 N	1.4 N [1.3 N]
Nitrobenzene	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Pentachlorophenol	ppm	28 UD	1.1 U	1.2 U [1.2 U]

Table 2
Remaining Sediment Analytical Results
Site Management Plan - Binghamton Court Street Former MGP
Binghamton, New York

Location ID: Sample Designation: (Depth)		SS-3 BSTCSS9303G (0 - 1 ft)	SS-9 BTSCSS9309G (0 - 0.7 ft)	SS-10 BTSCSS9310G (0 - 0.7 ft)
Date Collected:	Units	6/16/1993	6/16/1993	6/16/1993
Semi-Volatile Organics (Con't)				
Phenanthrene	ppm	270 NDE	1.8 N	2.2 N [2.2 N]
Phenol	ppm	11 UD	0.44 U	0.5 U [0.48 U]
Pyrene	ppm	240 NDE	2.2 N	3.9 N [3.9 N]
bis(2-Chloroethoxy)methane	ppm	11 UD	0.44 U	0.5 U [0.48 U]
bis(2-Chloroethyl)ether	ppm	11 UD	0.44 U	0.5 U [0.48 U]
bis(2-Ethylhexyl)phthalate	ppm	11 UD	0.094 J	0.2 J [0.14 J]
Total Semivolatiles Detected	ppm	1,710.8	15.267	26.855 [26.267]
Total Semivolatile TICs Detected	ppm	321	20.77	35.23 [37.01]
Inorganics				
Aluminum	ppm	11,800 N	7,810 N	7,330 N [9,150 N]
Antimony	ppm	0.51 U	0.39 U	0.39 U [0.38 U]
Arsenic	ppm	3.2 N	4.1 N	3.2 N [4.3 N]
Barium	ppm	85.4 N	49.9 N	34.7 N [40.3 N]
Cadmium	ppm	0.68 U	0.53 U	0.52 U [0.51 U]
Chromium	ppm	15.2 N	12.2 N	10.4 N [12.3 N]
Copper	ppm	37.1 N	245 N	32.1 N [35.1 N]
Iron	ppm	19,800 N	16,800 N	13,900 N [18,900 N]
Lead	ppm	42.1 N	35 N	34.6 N [56.4 N]
Manganese	ppm	400 N	222 N	153 N [161 N]
Mercury	ppm	0.43 N	0.07 U	0.06 U [0.11 J]
Nickel	ppm	20.9 N	16.8 N	14.2 N [18.1 N]
Selenium	ppm	0.34 U	0.28 U	0.25 U [0.25 U]
Silver	ppm	1U	0.79 U	0.79 U [0.76 U]
Vanadium	ppm	13.9 N	11 N	9.8 N [10.6 N]
Zinc	ppm	92.2N	73.4 N	90.4 N [93 N]
Cyanide	ppm	3.9 U	2.7 U	2.8 U [3.2 U]
Amenable Cyanide	ppm	NA	NA	NA
Miscellaneous				
Total Solids	ppm	57.3 N	71.2 N	74.8 N [75.9 N]
Total Organic Carbon	ppm	29,023 N	7,414 N	25,970 N [22,917 N]

Acronyms and Abbreviations:

D - Indicates sample was diluted to quantify the concentration.

J - Detected at an estimated concentration below the minimum quantitation limit.

NA = not analyzed

N - Detected concentration

TIC - Tentatively Identified Compound

U - Undetected. The value listed is the detection limit. The detection limit for organic compounds is the quantitation limit. The inorganic detection limit is the instrument detection limit.

Notes:

1. Data obtained from Appendix F-5 of the Task 2 Remedial Investigation Report (BBL 1996).

2. Analytical results are presented in parts per million (ppm), which is equivalent to milligrams per kilogram (mg/kg).

Table 3
Monitoring Well Construction Details
Site Management Plan - Binghamton Court Street Former MGP
Binghamton, New York

Monitoring Well ID	Date Installed	Constructed Well Depth (ft bgs)	Northing ¹	Easting ¹	Geologic Unit Screened	Well Diameter (in.)	Casing Type	Screen Size (in.)	Screen Length (ft)	Sump Length (ft)	Ground Surface Elevation (ft AMSL) ²	Measuring Point Elevation (ft AMSL) ²	Screened Interval Elevation ³ (ft AMSL)	
													Top	Bottom
Barrier Wall Recovery Wells														
RW-1	11/2006	53.40	766956.1577	1006838.7566	S/G	8	ST	0.09	10	NA	NA	841.76	798.60	788.60
RW-2	11/2006	52.70	766930.0815	1006740.2651	S/G	8	ST	0.09	10	NA	NA	841.97	799.50	789.50
RW-3	11/2006	16.20	766929.6071	1006739.0007	F/A	8	ST	0.09	10	NA	NA	842.01	835.80	825.80
RW-4	11/2006	16.20	766911.2782	1006677.5677	F/A	8	ST	0.09	10	NA	NA	842.99	836.50	826.50
RW-5	11/2006	48.80	766910.8590	1006677.1421	S/G	8	ST	0.09	10	NA	NA	842.97	803.70	793.70
RW-6	11/2006	48.90	766897.9077	1006632.3487	S/G	8	ST	0.09	10	NA	NA	843.57	804.70	794.70
RW-7	11/2006	18.20	766897.6575	1006632.1389	F/A	8	ST	0.09	10	NA	NA	843.58	835.50	825.50
RW-8	11/2006	18.20	766838.3826	1006443.4103	F/A	8	ST	0.09	10	NA	NA	843.49	835.00	825.00
RW-9	11/2006	53.10	766838.7794	1006444.0108	S/G	8	ST	0.09	10	NA	NA	843.53	800.50	790.50
RW-10	11/2006	16.60	766814.8472	1006413.5582	F/A	8	ST	0.09	10	NA	NA	843.08	837.50	827.50
RW-11	11/2006	49.50	766813.9575	1006413.1127	S/G	8	ST	0.09	10	NA	NA	843.92	804.40	794.40
RW-12	11/2006	48.10	766793.9803	1006361.2360	S/G	8	ST	0.09	10	NA	NA	844.78	806.70	796.70
RW-13	11/2006	18.70	766793.2402	1006360.6213	F/A	8	ST	0.09	10	NA	NA	844.78	836.20	826.20
RW-14	11/2006	17.50	766794.2368	1006315.2974	F/A	8	ST	0.09	10	NA	NA	845.80	837.90	827.90
RW-15	11/2006	49.10	766794.9521	1006314.7922	S/G	8	ST	0.09	10	NA	NA	845.77	806.30	796.30
RW-16	11/2006	49.80	766798.1171	1006286.2103	S/G	8	ST	0.09	10	NA	NA	848.38	808.70	798.70
RW-17	11/2006	23.20	766798.7106	1006286.1272	F/A	8	ST	0.09	10	NA	NA	848.34	835.40	825.40
RW-18	11/2006	42.10	766917.9423	1006245.5884	S/G	8	ST	0.09	10	NA	NA	845.85	813.60	803.60
RW-19	11/2006	19.10	766917.1431	1006246.3233	F/A	8	ST	0.09	10	NA	NA	845.87	836.90	826.90
RW-20	11/2006	15.50	766954.8631	1006835.0006	F/A	8	ST	0.09	10	NA	NA	841.76	837.20	827.20
RW-21	11/2006	16.20	766936.1258	1006754.7723	F/A	8	ST	0.09	10	NA	NA	841.99	836.30	826.30
RW-22	11/2006	52.30	766932.9539	1006750.3989	S/G	8	ST	0.09	10	NA	NA	841.97	799.70	789.70
NAPL Recovery Wells														
NMW-1	1/18/2004	44.00	766685.5745	1006314.7751	S/G	2	PVC	0.01	10	2	849.65	849.94	817.65	807.65
NMW-2	1/17/2004	44.00	766693.1212	1006368.9369	S/G	2	PVC	0.01	5	2	846.69	846.12	809.69	804.69

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Monitoring Well ID	Date Installed	Constructed Well Depth (ft bgs)	Northing ¹	Easting ¹	Geologic Unit Screened	Well Diameter (in.)	Casing Type	Screen Size (in.)	Screen Length (ft)	Sump Length (ft)	Ground Surface Elevation (ft AMSL) ²	Measuring Point Elevation (ft AMSL) ²	Screened Interval Elevation ³ (ft AMSL)	
													Top	Bottom
Upgradient and Side-Gradient Wells														
PZ93-1	6/9/1993	8.50	767154.0082	1006517.8778	F/A	2	PVC	0.01	5	NA	844.80	848.00	841.30	836.30
MW93-05D	6/3/1993	56.92	767167.2804	1006454.6309	S/G	2	SS	0.01	10	NA	844.90	847.16	798.50	788.50
MW93-06D	6/8/1993	59.85	767143.8461	1006226.9824	S/G	2	SS	0.01	10	NA	844.10	845.98	794.30	784.30
MW97-14D	12/11/1997	40.00	767166.7309	1006894.7335	S/G	2	PVC	0.01	5	0.1	845.91	844.88	811.01	806.01
MW97-14S	12/11/1997	20.00	767166.8920	1006898.6883	F/A	2	PVC	0.01	10	0.1	845.85	844.87	835.95	825.95
MW01-17D	9/18/2001	59.50	767044.2100	1006086.4780	S/G	2	PVC	0.01	5	NA	861.16	860.79	806.66	801.66
MW01-17S	9/19/2001	37.00	767035.1206	1006087.5270	F/A	2	PVC	0.01	10	NA	861.65	860.86	834.65	824.65
Sentinel Wells														
MW97-7S	9/25/1997	26.20	766681.5437	1006337.7855	F/A	2	PVC	0.01	10	0.2	849.63	848.97	833.63	823.63
PZ03-01D	1/5/2004	47.00	766670.6341	1006357.1998	S/G	1	PVC	0.01	2	0.5	848.10	847.61	803.10	801.10
PZ03-09A	1/23/2003	23.00	766629.2479	1006330.8182	F/A	2	PVC	0.01	10	0.5	851.19	850.86	838.19	828.19
PZ03-09D	1/23/2003	48.00	766629.2565	1006330.8442	S/G	1	PVC	0.01	2	0.5	851.19	850.81	805.19	803.19
Surface Water Elevation														
OU1-MP-1 ⁴	--	--	766517.3707	1006364.7755	--	--	--	--	--	--	--	858.19	--	--

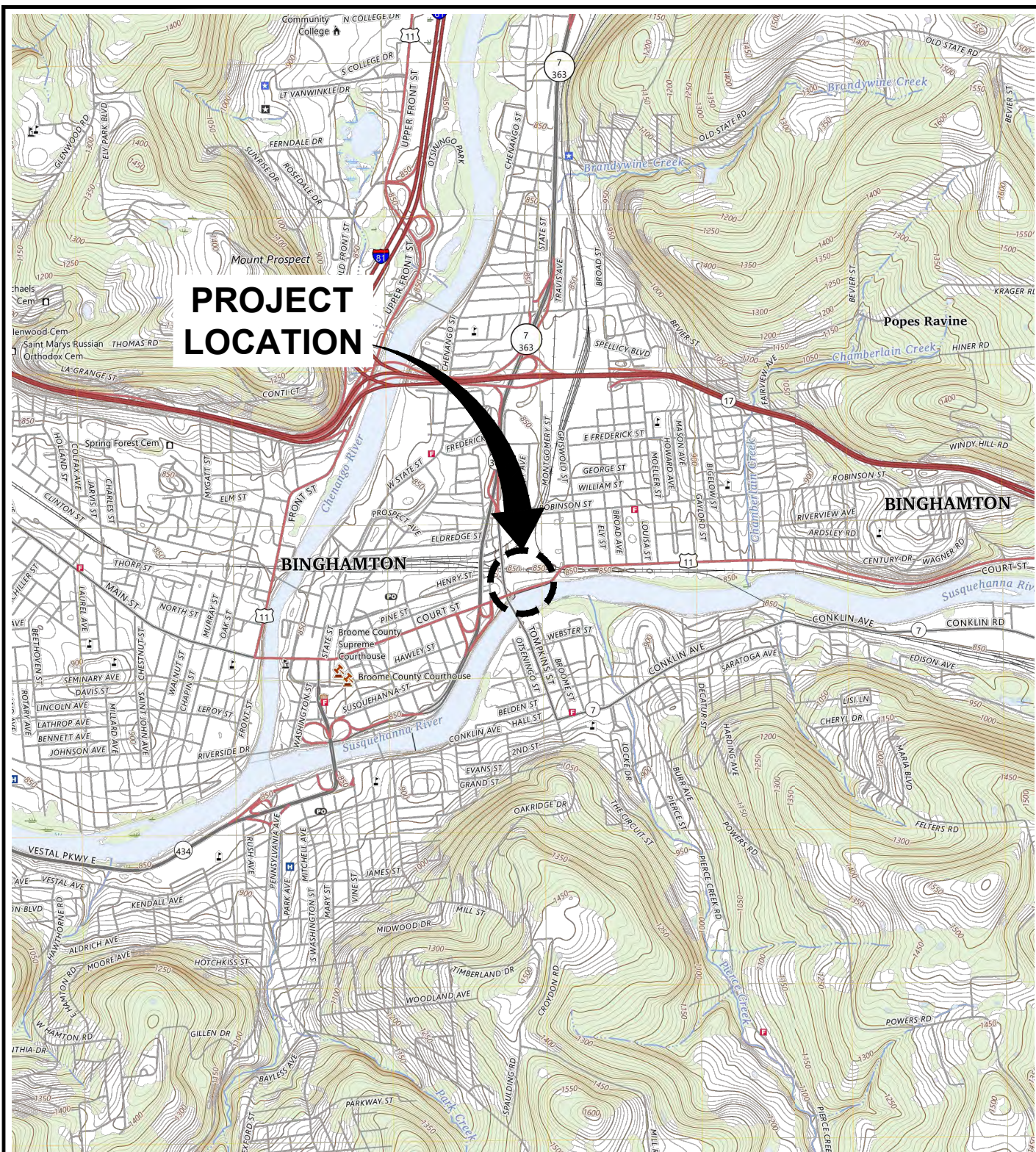
Acronyms and Abbreviations:

AMSL = above mean sea level
bgs = below ground surface
F/A = fill/alluvium (i.e., overburden)
S/G = sand/gravel
ft = feet
in. = inch
NA = not available
PVC = polyvinyl chloride
SS = stainless steel
ST = steel
-- = not applicable

Notes:

1. Horizontal coordinates referenced to the North American Datum of 1983 (NAD83), New York State Plane, Central Zone FIPS 3102.
2. Elevations are shown in feet above mean sea level (AMSL) referenced to the North American Vertical Datum of 1988 (NAVD88).
3. Recovery well screened intervals are estimated.
4. Surface water measuring point established and well network resurveyed on November 12, 2021.

Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., BINGHAMTON EAST, BINGHAMTON WEST, CASTLE CREEK, CHENANGO FORKS, NEW YORK, 2023



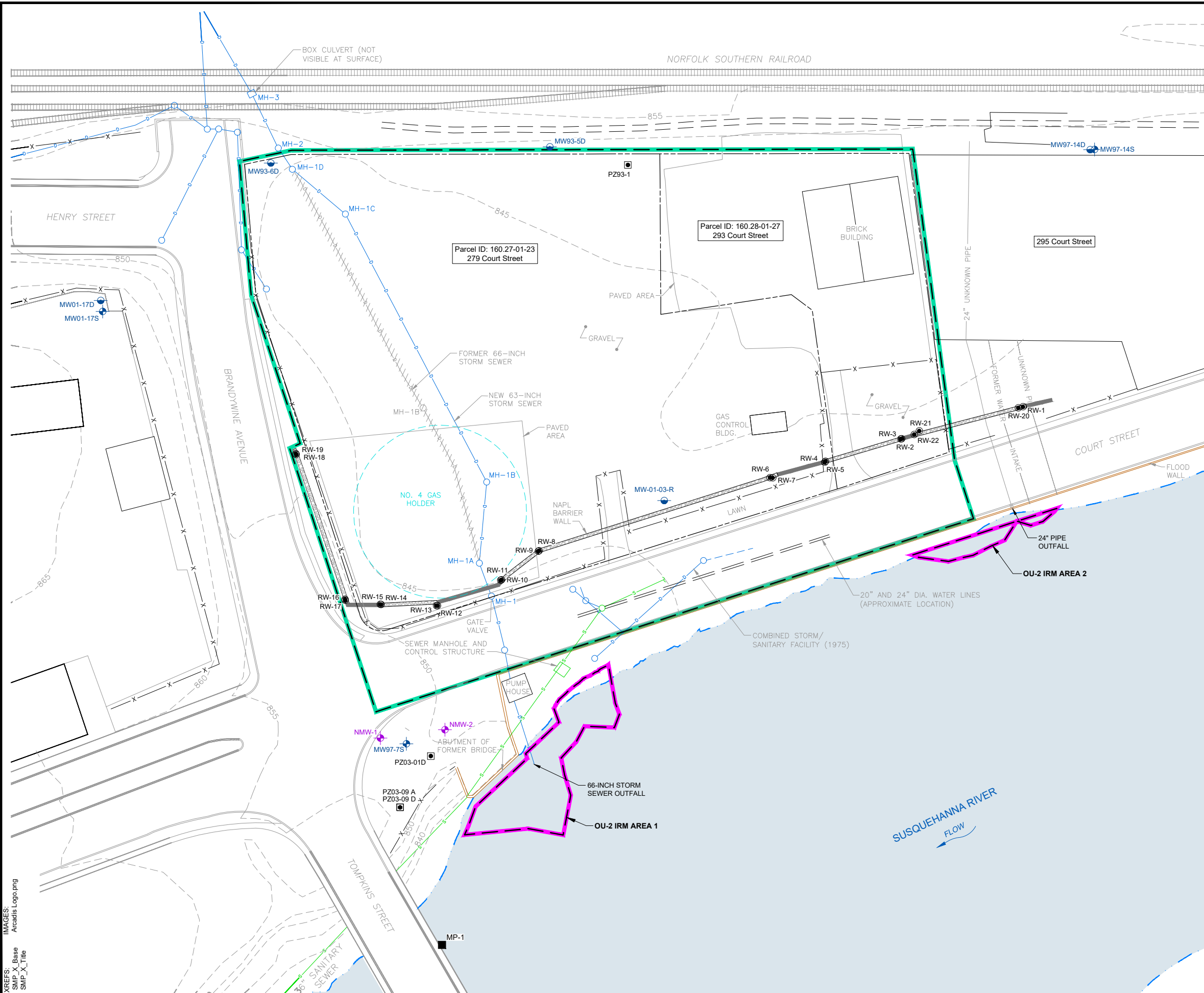
NYSEG
COURT STREET FORMER MGP SITE
BINGHAMTON, NEW YORK
SITE MANAGEMENT PLAN

SITE LOCATION MAP



FIGURE

1



- NOTES:**
1. BASE MAP PROVIDED BY NYSEG (JUNE 12, 1997).
 2. GROUND SURFACE CONTOURS DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303; FLOWN DECEMBER 2, 1973 AND MAPPED APRIL 1, 1974.
 3. BASEMAP REFERENCE DATUMS:
HORIZONTAL: NORTH AMERICAN DATUM OF 1983 (NAD83), NEW YORK STATE PLANE CENTRAL ZONE 3102.
VERTICAL: NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
 4. STORM SEWER LOCATION DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303, ENTITLED: PRELIMINARY REPORT, COMPREHENSIVE STORM DRAINAGE, EXISTING FACILITIES, PREPARED BY VERNON O. SHUMAKER, CONSULTING ENGINEER, VESTAL, NEW YORK, DATE NOT PROVIDED.
 5. ALL LOCATIONS ARE APPROXIMATE. SITE PLAN DEPICTS BOTH HISTORICAL AND CURRENT SITE FEATURES, INCLUDING MONITORING WELLS.
 6. OU-2 CONSISTS OF SEDIMENTS IMPACTED BY THE SITE WHICH WERE REMEDIATED IN 2018/2019.



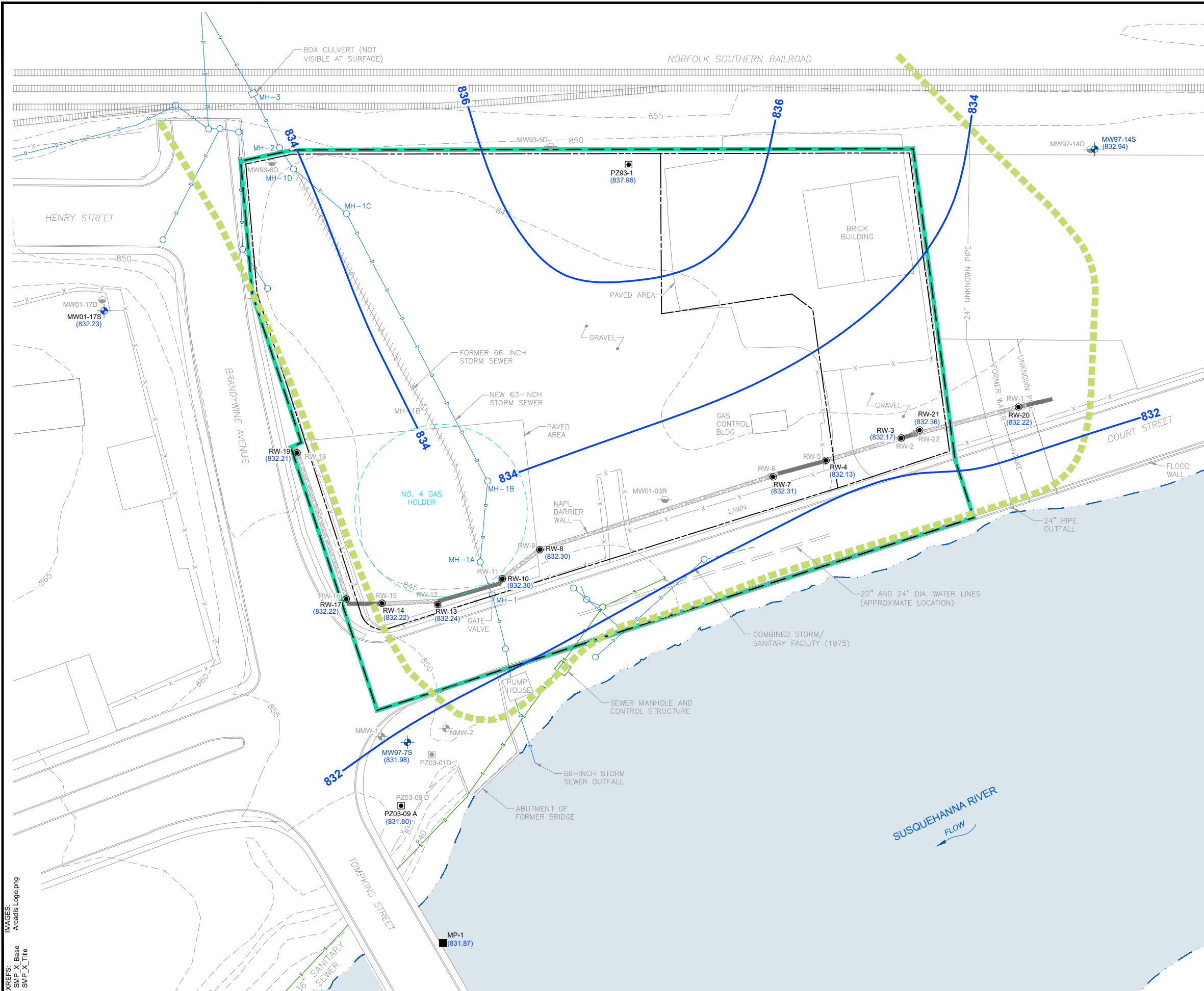
SITE PLAN



C:\Users\bdeclercq\DC\ACCDocs\Arcadis ACC USAUS-9999999-NYSEG_COURT ST_BINGHAMTON_NY\Project Files\10_WIP\101_ARC_ENV\202601-DWGSMP_Fig 3_Water Table Map 4-22-25.dwg BY: DECLERCQ, BRIAN SAVED: 3/9/2026 10:26 AM

XREFS:
SMP_X_Base
SMP_X_Title

IMAGES:
Arcadis Logo.png



- LEGEND:**
- NYSEG PROPERTY LINES AND ENVIRONMENTAL EASEMENT LIMITS
 - OPERABLE UNIT BOUNDARY AND INSTITUTIONAL CONTROL LIMITS
 - GROUND SURFACE ELEVATION (FT AMSL)
 - FENCE
 - RAILROAD TRACK
 - FLOOD WALL
 - SANITARY SEWER LINE
 - STORM SEWER LINE
 - ABANDONED STORM SEWER LINE
 - HISTORIC FEATURE
 - EDGE OF SILT
 - NAPL BARRIER WALL
 - JET GROUT PANEL
 - SHALLOW MONITORING WELL
 - DEEP MONITORING WELL
 - NAPL MONITORING WELL
 - PIEZOMETER
 - RECOVERY WELL
 - RIVER STAFF GAUGE
 - 836 WATER TABLE CONTOUR (SEE NOTE 6)
 - (837.96) GROUNDWATER ELEVATION (SEE NOTE 6)

- NOTES:**
- BASE MAP PROVIDED BY NYSEG (JUNE 12, 1997).
 - GROUND SURFACE CONTOURS DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303; FLOWN DECEMBER 2, 1973 AND MAPPED APRIL 1, 1974.
 - GROUND SURFACE AND BASEMAP REFERENCE DATUMS: VERTICAL: NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29) HORIZONTAL: NORTH AMERICAN DATUM OF 1983 (NAD83), NEW YORK STATE PLANE, CENTRAL ZONE 3102
 - STORM SEWER LOCATION DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303, ENTITLED: PRELIMINARY REPORT, COMPREHENSIVE STORM DRAINAGE, EXISTING FACILITIES, PREPARED BY VERNON O. SHUMAKER, CONSULTING ENGINEER, VESTAL, NEW YORK, DATE NOT PROVIDED.
 - ALL LOCATIONS ARE APPROXIMATE. SITE PLAN DEPICTS BOTH HISTORICAL AND CURRENT SITE FEATURES, INCLUDING MONITORING WELLS.
 - GROUNDWATER ELEVATIONS REFERENCED TO MEAN SEA LEVEL USING NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

0 40' 80'
GRAPHIC SCALE

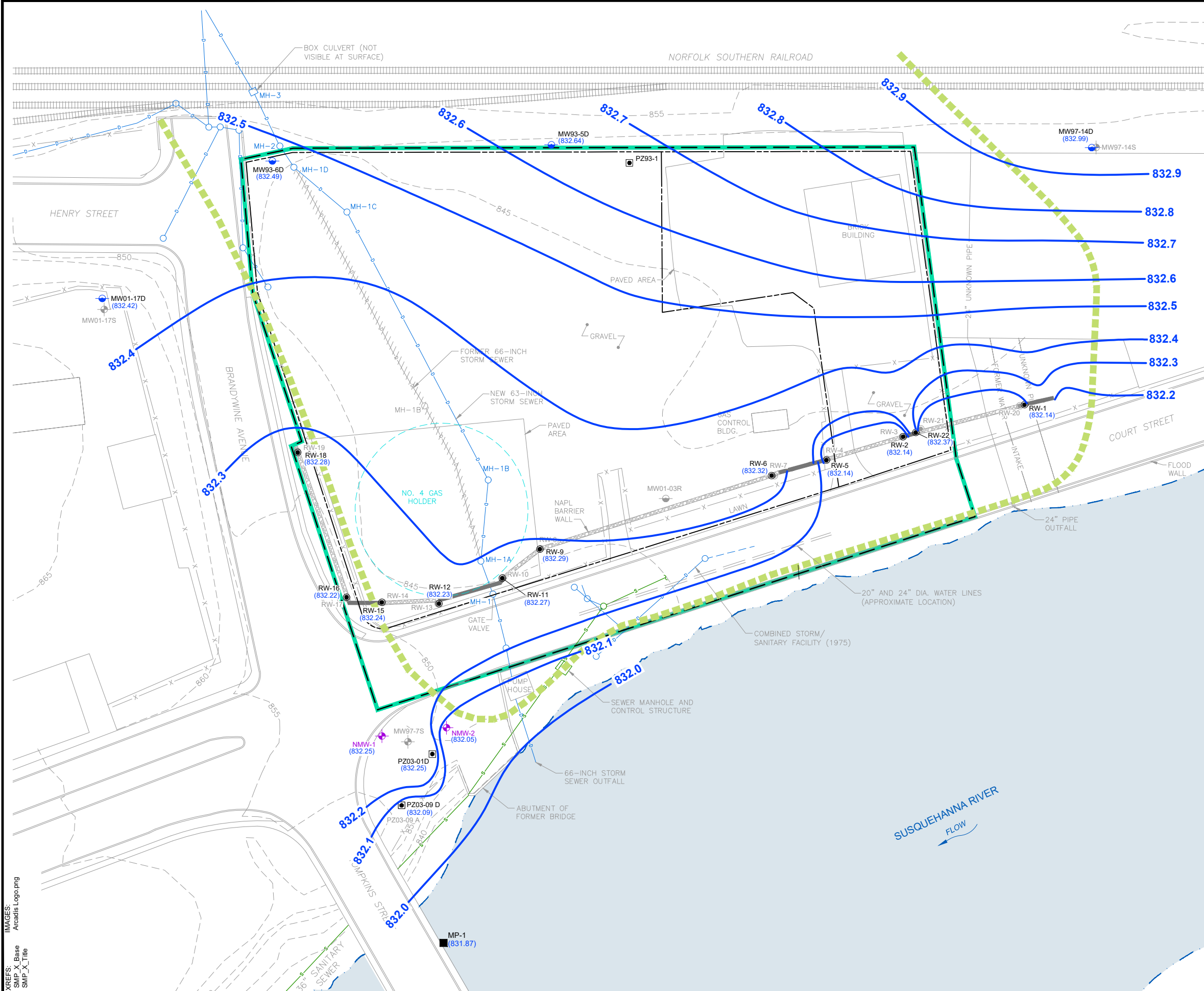
NYSEG
COURT STREET FORMER MGP SITE
BINGHAMTON, NEW YORK
SITE MANAGEMENT PLAN

**WATER TABLE MAP -
APRIL 22, 2025**

ARCADIS

FIGURE
3

C:\Users\bielerq\Documents\Arcadis ACC USAUS-99999999-NYSEG_COURT_ST_BINGHAMTON_NY\Project Files\10_WIP\10T_ARC_ENV\202601-DWG\SMP_Fig 4_Sand & Gravel Surface Map 4-22-25.dwg
BY: DECLERCO, BRIAN
SAVED: 3/6/2026 1:10 PM



LEGEND:

- NYSEG PROPERTY LINES AND ENVIRONMENTAL EASEMENT LIMITS
- OPERABLE UNIT BOUNDARY AND INSTITUTIONAL CONTROL LIMITS
- GROUND SURFACE ELEVATION (FT AMSL)
- FENCE
- RAILROAD TRACK
- FLOOD WALL
- SANITARY SEWER LINE
- STORM SEWER LINE
- ABANDONED STORM SEWER LINE
- HISTORIC FEATURE
- EDGE OF SILT
- NAPL BARRIER WALL
- JET GROUT PANEL
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- NAPL MONITORING WELL
- PIEZOMETER
- RECOVERY WELL
- RIVER STAFF GAUGE
- POTENTIOMETRIC CONTOUR (DASHED WHERE INFERRED) (SEE NOTE 6)
- GROUNDWATER ELEVATION (SEE NOTE 6)

NOTES:

- BASE MAP PROVIDED BY NYSEG (JUNE 12, 1997).
- GROUND SURFACE CONTOURS DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303; FLOWN DECEMBER 2, 1973 AND MAPPED APRIL 1, 1974.
- GROUND SURFACE AND BASEMAP REFERENCE DATUMS: VERTICAL: NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929 HORIZONTAL: NORTH AMERICAN DATUM (NAD) OF 1983, NEW YORK STATE PLANE, CENTRAL ZONE 3102.
- STORM SEWER LOCATION DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303, ENTITLED: PRELIMINARY REPORT, COMPREHENSIVE STORM DRAINAGE, EXISTING FACILITIES, PREPARED BY VERNON O. SHUMAKER, CONSULTING ENGINEER, VESTAL, NEW YORK, DATE NOT PROVIDED.
- ALL LOCATIONS ARE APPROXIMATE. SITE PLAN DEPICTS BOTH HISTORICAL AND CURRENT SITE FEATURES, INCLUDING MONITORING WELLS.
- GROUNDWATER ELEVATIONS REFERENCED TO MEAN SEA LEVEL USING NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

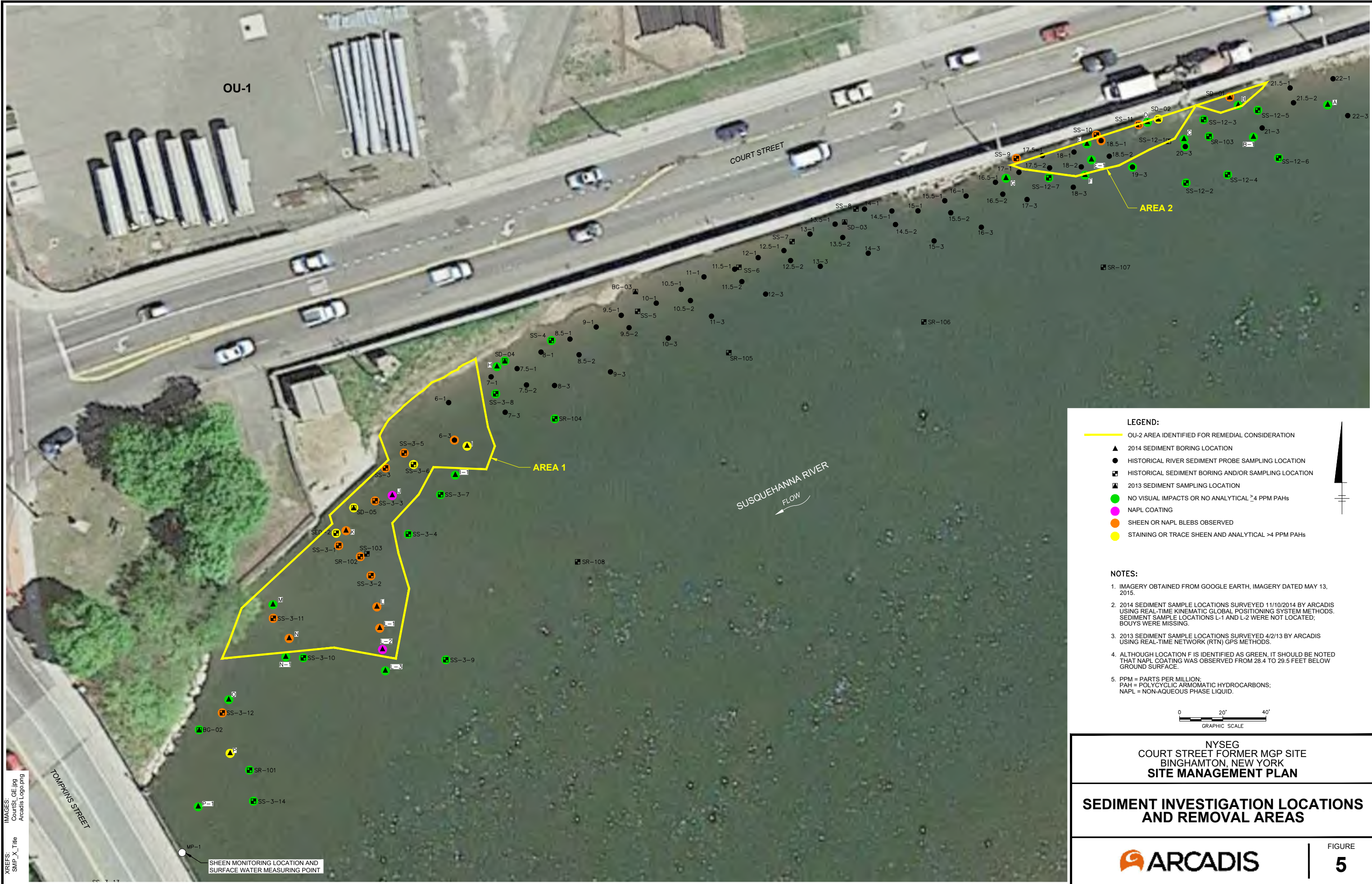


NYSEG
COURT STREET FORMER MGP SITE
BINGHAMTON, NEW YORK
SITE MANAGEMENT PLAN

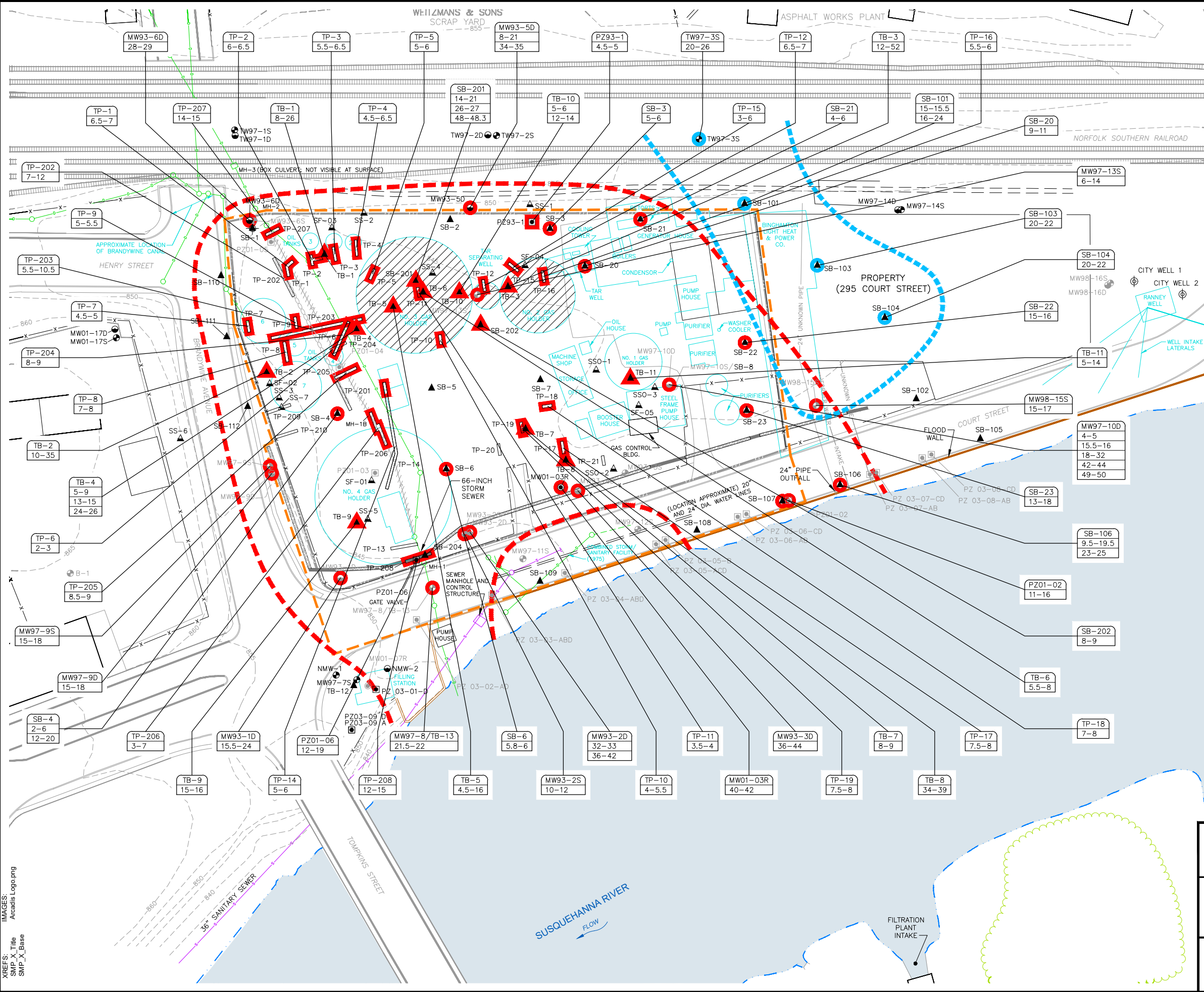
SAND AND GRAVEL POTENTIOMETRIC
SURFACE MAP - APRIL 22, 2025



FIGURE
4



C:\Users\briclerq\Documents\Arcadis ACC USAUS-9999999-NYSEG_COURT ST_BINGHAMTON_NY\Project Files\10_WIP\101_ARC_ENV202601-DWG(SMP_Fig 6_Extent of NAPL in OU-1.dwg BY: DECLERCO, BRIAN SAVED: 7/9/2026 7:18 AM

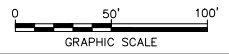


LEGEND:

- FLOOD WALL
- OPERABLE UNIT BOUNDARY
- NYSEG PROPERTY LINES
- SANITARY SEWER LINE
- STORM SEWER LINE
- ABANDONED STORM SEWER LINE
- GROUND SURFACE ELEVATION CONTOUR (FT AMSL)
- NAPL BARRIER WALL
- JET GROUT PANEL
- HISTORICAL FEATURE
- BURIED CONCRETE WALL
- RAILROAD TRACK
- FENCE
- REMOVAL AREA (SEE NOTE 7)
- MONITORING WELL (SHALLOW)
- MONITORING WELL (DEEP)
- MONITORING WELL (BEDROCK)
- PIEZOMETER
- CITY MONITORING WELL
- SURFACE SOIL SAMPLE
- TEST PIT
- SOIL BORING
- DECOMMISSIONED/ABANDONED WELL, PIEZOMETER
- LOCATION ID
ft bgs
- NAPL OR SHEEN (MGP-RELATED)
- NAPL OR SHEEN (PETROLEUM-RELATED)
- PROBABLE EXTENT OF COAL-TAR-RELATED NAPL
- PROBABLE EXTENT OF PETROLEUM-RELATED NAPL

NOTES:

- BASE MAP PROVIDED BY NYSEG (JUNE 12, 1997).
- SURFACE ELEVATIONS DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303, FLOWN DECEMBER 2, 1973 AND MAPPED APRIL 1, 1974.
- ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL USING NATIONAL GEODETIC VERTICAL DATUM OF 1929, HORIZONTAL DATUM: NAD 83 NEW YORK STATE CENTRAL 3102.
- ALL INVESTIGATION LOCATIONS SURVEYED BY HAWK ENGINEERING, P.C. BINGHAMTON, N.Y. EXCEPT THE FOLLOWING SEDIMENT PROBING AND SAMPLING LOCATIONS:
 - LOCATIONS WITH AN "SS" OR "SF" PREFIX;
 - LOCATIONS WITH A "-2" SUFFIX; AND
 - SEDIMENT SAMPLING LOCATIONS SED-1 AND SED-2.
- STORM SEWER LOCATION DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303, ENTITLED: PRELIMINARY REPORT, COMPREHENSIVE STORM DRAINAGE, EXISTING FACILITIES. PREPARED BY VERNON O. SHUMAKER, CONSULTING ENGINEER, VESTAL, NEW YORK, DATE NOT PROVIDED.
- ALL LOCATIONS ARE APPROXIMATE. SITE PLAN DEPICTS BOTH HISTORIC AND CURRENT SITE FEATURES.
- NO. 3 GAS HOLDER AND TAR SEPARATING WELL REMOVED TO A DEPTH OF 10 FEET BELOW GRADE IN 2000, NO. 2 GAS HOLDER REMOVED IN 2004.



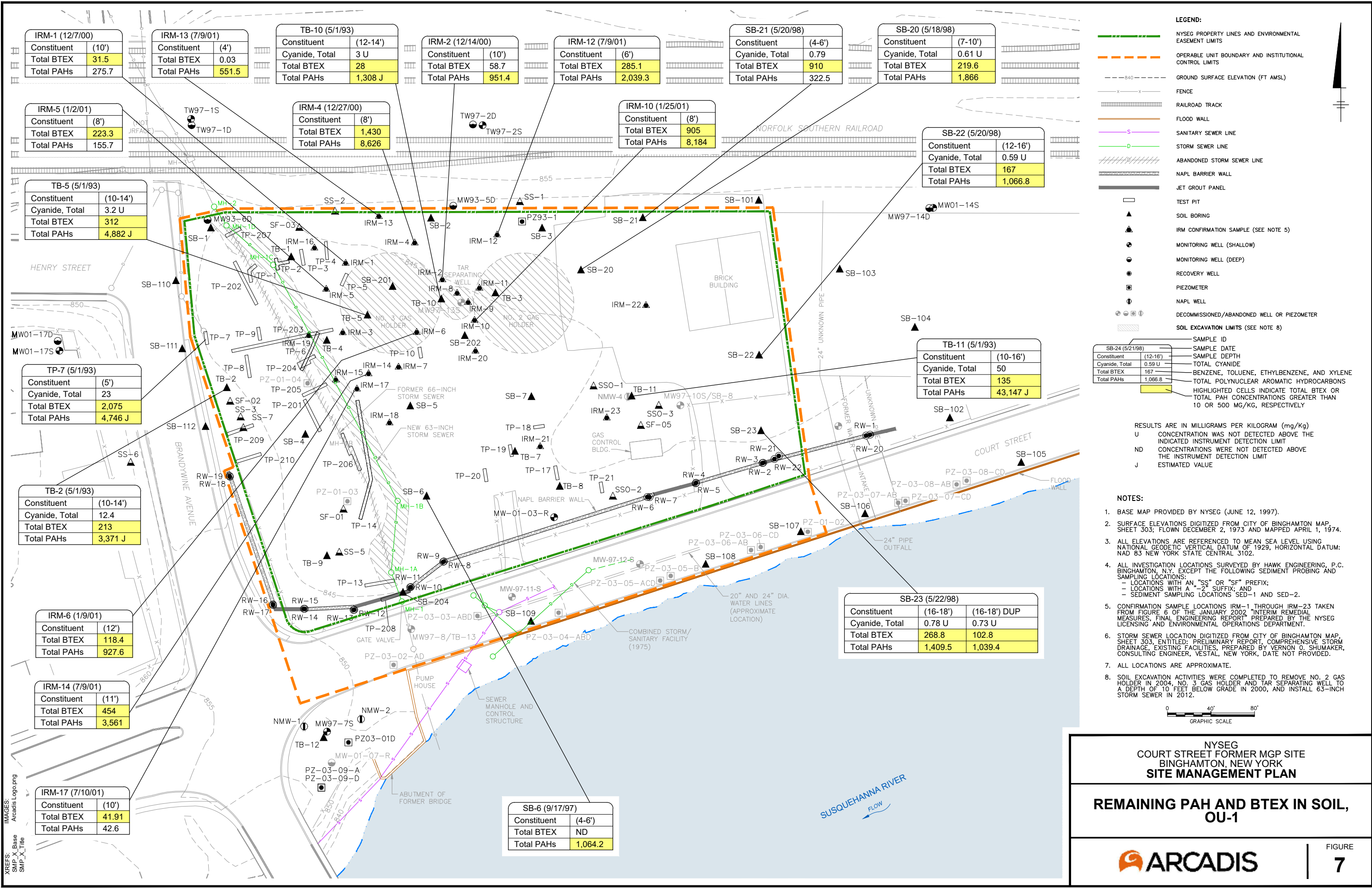
NYSEG
COURT STREET FORMER MGP SITE
BINGHAMTON, NEW YORK
SITE MANAGEMENT PLAN

**APPROXIMATE EXTENT
OF NAPL IN OU-1**

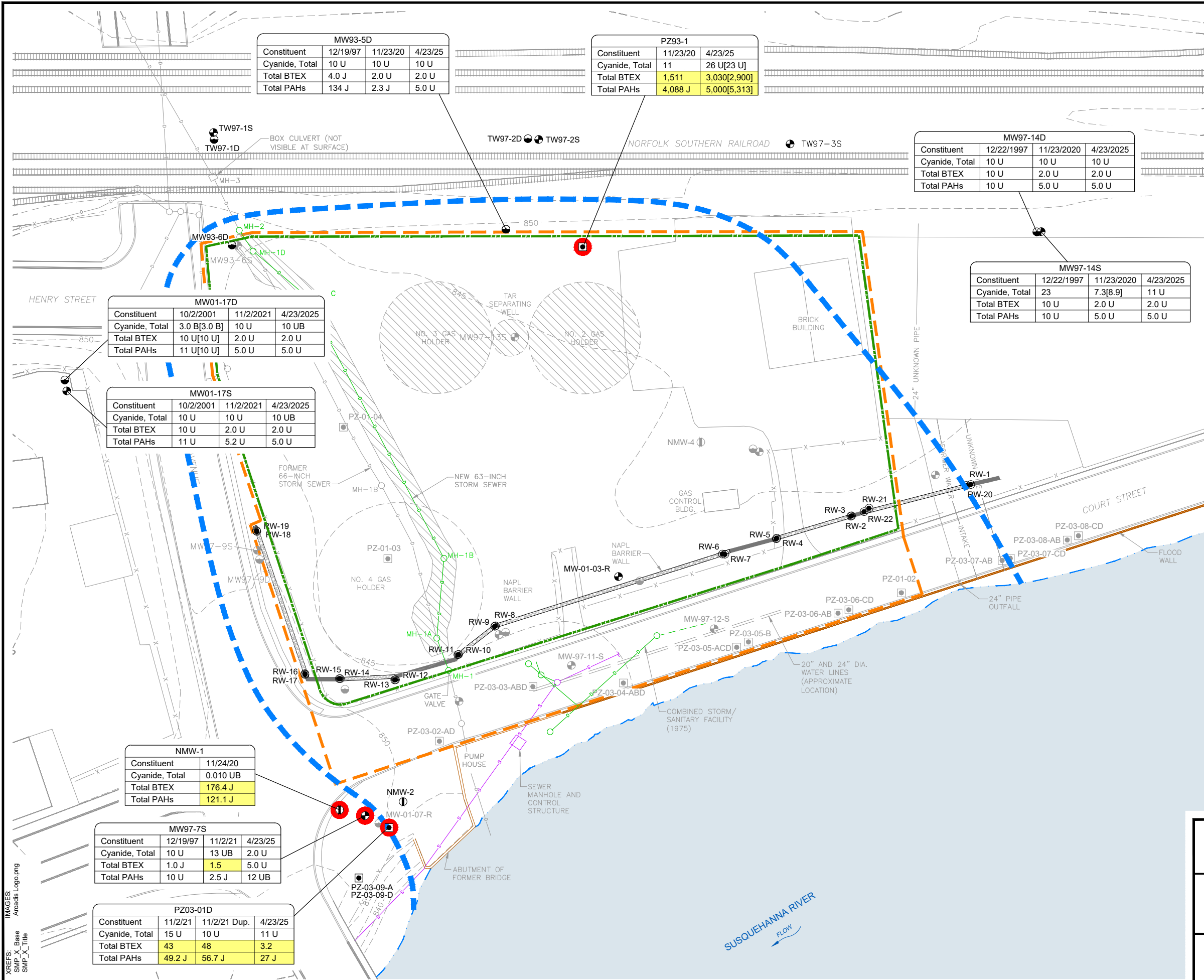
ARCADIS

FIGURE
6

C:\Users\bielclercq\Documents\Arcadis ACC USAUS-9999999-NYSEG_COURT ST_BINGHAMTON_NY\Project Files\10_WIP\10T_ARC_ENV202601-DWG\SMP_Fig 7_Remaining PAH & BTEX in OU-1.dwg BY: DECLERCO, BRIAN SAVER: 7/19/2026 7:23 AM



C:\Users\bdclerc\OneDrive\Arcadis ACC US\AUS-99999999-NYSEG_COURT ST_BINGHAMTON_NY\Project Files\10_WPI10T_ARC_ENV\202601-DWG\SMP_Fig 8_Remaining Contamination in GW.dwg
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MW93-5D			
Constituent	12/19/97	11/23/20	4/23/25
Cyanide, Total	10 U	10 U	10 U
Total BTEX	4.0 J	2.0 U	2.0 U
Total PAHs	134 J	2.3 J	5.0 U

PZ93-1			
Constituent	11/23/20	4/23/25	
Cyanide, Total	11	26 U[23 U]	
Total BTEX	1,511	3,030[2,900]	
Total PAHs	4,088 J	5,000[5,313]	

MW97-14D			
Constituent	12/22/1997	11/23/2020	4/23/2025
Cyanide, Total	10 U	10 U	10 U
Total BTEX	10 U	2.0 U	2.0 U
Total PAHs	10 U	5.0 U	5.0 U

MW97-14S			
Constituent	12/22/1997	11/23/2020	4/23/2025
Cyanide, Total	23	7.3[8.9]	11 U
Total BTEX	10 U	2.0 U	2.0 U
Total PAHs	10 U	5.0 U	5.0 U

MW01-17D			
Constituent	10/2/2001	11/2/2021	4/23/2025
Cyanide, Total	3.0 B[3.0 B]	10 U	10 UB
Total BTEX	10 U[10 U]	2.0 U	2.0 U
Total PAHs	11 U[10 U]	5.0 U	5.0 U

MW01-17S			
Constituent	10/2/2001	11/2/2021	4/23/2025
Cyanide, Total	10 U	10 U	10 UB
Total BTEX	10 U	2.0 U	2.0 U
Total PAHs	11 U	5.2 U	5.0 U

NMW-1			
Constituent	11/24/20		
Cyanide, Total	0.010 UB		
Total BTEX	176.4 J		
Total PAHs	121.1 J		

MW97-7S			
Constituent	12/19/97	11/2/21	4/23/25
Cyanide, Total	10 U	13 UB	2.0 U
Total BTEX	1.0 J	1.5	5.0 U
Total PAHs	10 U	2.5 J	12 UB

PZ03-01D			
Constituent	11/2/21	11/2/21 Dup.	4/23/25
Cyanide, Total	15 U	10 U	11 U
Total BTEX	43	48	3.2
Total PAHs	49.2 J	56.7 J	27 J

MW99-3S			
Constituent	12/18/97		
Cyanide, Total	10 U		
Total BTEX	ND		
Total PAHs	2 J		

SAMPLE ID

SAMPLE DATE

TOTAL CYANIDE

BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENE

TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS

HIGHLIGHTED CELLS INDICATE THE PRESENCE OF INDIVIDUAL BTEX OR PAH COMPOUNDS AT CONCENTRATIONS ABOVE NYSDEC CLASS GA STANDARDS/GUIDANCE VALUES

RESULTS ARE IN MICROGRAMS PER LITER (µg/L)

U CONCENTRATION WAS NOT DETECTED ABOVE THE INDICATED INSTRUMENT DETECTION LIMIT

ND CONCENTRATIONS WERE NOT DETECTED ABOVE THE INSTRUMENT DETECTION LIMIT

J ESTIMATED VALUE

Dup DUPLICATE SAMPLE

B COMPOUND WAS FOUND IN THE BLANK AND SAMPLE

UB COMPOUND CONSIDERED NON-DETECT AT THE LISTED VALUE DUE TO ASSOCIATED BLANK CONTAMINATION

- NOTES:**
- BASE MAP PROVIDED BY NYSEG (JUNE 12, 1997).
 - SURFACE ELEVATIONS DIGITIZED FROM CITY OF BINGHAMTON MAP, SHEET 303; FLOWN DECEMBER 2, 1973 AND MAPPED APRIL 1, 1974.
 - ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL USING NATIONAL GEODETIC VERTICAL DATUM OF 1929, HORIZONTAL DATUM: NAD 83 NEW YORK STATE CENTRAL 3102.
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 - ALL LOCATIONS ARE APPROXIMATE. SITE PLAN DEPICTS BOTH HISTORIC AND CURRENT SITE FEATURES, INCLUDING MONITORING WELLS.
 - SOIL EXCAVATION ACTIVITIES WERE COMPLETED AS PART OF IRM'S PERFORMED IN 2006 AND 2011/2012.
 - INFERRED EXTENT OF IMPACTED GROUNDWATER BASED ON THE PROBABLE EXTENT OF COAL TAR RELATED NAPL (FIGURE 6) AND GROUNDWATER SAMPLING COMPLETED IN 2020, 2021, AND 2025.
 - SOIL EXCAVATION ACTIVITIES WERE COMPLETED TO REMOVE NO. 2 GAS HOLDER IN 2004, NO. 3 GAS HOLDER AND TAR SEPARATING WELL TO A DEPTH OF 10 FEET BELOW GRADE IN 2000, AND INSTALL 63-INCH STORM SEWER IN 2012.

Appendix A

Environmental Easement

**ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36
OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW**

THIS INDENTURE made this 25th day of May, 2016, between Owner(s) New York State Electric & Gas Corporation, having an office at 70 Farm View Drive, New Gloucester, Maine 04260, County of Cumberland, State of Maine (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 279 Court Street in the City of Binghamton, County of Broome and State of New York, known and designated on the tax map of the County Clerk of Broome as tax map parcel number: Section 160.27 Block 01 Lot 23, being the same as that property conveyed to Grantor by deeds dated March 5, 1888, February 29, 1988, January 10, 1889, June 28, 1900, December 12, 1900 and June 6, 1903 and recorded in the Broome County Clerk's Office in Liber and Page 133/496, 135/282, 137/446, 180/133, 182/168 and 193/374, respectively.

WHEREAS, Grantor, is the owner of real property located at the address of 293 Court Street in the City of Binghamton, County of Broome and State of New York, known and designated on the tax map of the County Clerk of Broome as tax map parcel number: Section 160.28 Block 01 Lots 27, being the same as that property conveyed to Grantor by deed dated September 10, 1999 and recorded in the Broome County Clerk's Office in Liber and Page 1918/481.

WHEREAS, the property subject to this Environmental Easement (the "Controlled Property") comprises approximately 3.93 +/- acres, and is hereinafter more fully described in the Land Title Survey dated February 25, 2016 prepared by Paul James Olszewski, P.L.S., PLLC, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Order on Consent Index Number: D7-001-96-03, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Broome County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property

shall state in at least fifteen-point bold-faced type:

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

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by

the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to: Site Number: 704031
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to: Site Control Section
Division of Environmental Remediation

NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

New York State Electric & Gas Corporation:

By: Mary Smith

Print Name: Mary Smith

Vice President -
Title: General Services Date: _____

By: Joseph J. Syta

(control)

Print Name: Joseph J. Syta

Vice President, Controller
Title: & Treasurer Date: _____

Grantor's Acknowledgment

STATE OF NEW YORK)
COUNTY OF Monroe) ss:

On the 20th day of April, in the year 2016, before me, the undersigned, personally appeared Mary Smith, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Anna M Sabers
Notary Public - State of New York

ANNA M. SABERS
Notary Public, State of New York
No. 01SA6072590
Qualified in Monroe County
Commission Expires April 08, 2017

STATE OF NEW YORK)
COUNTY OF MONROE) ss:

On the 20th day of APRIL, in the year 2016, before me, the undersigned, personally appeared JOSEPH J. SYTA, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

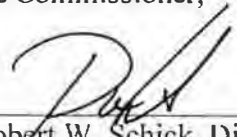
Christina K Sardou
Notary Public - State of New York

CHRISTINA K. SARDOU
Notary Public, State of New York
Genesee County

Registration No. 01SA6015061
Commission Expires: October 19, 2018

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

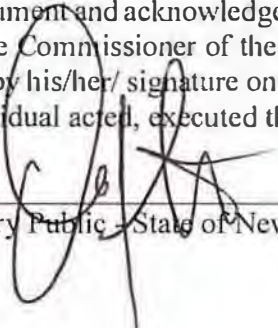
By:


Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 25 day of May, in the year 2016, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.


Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2018

SCHEDULE "A" PROPERTY DESCRIPTION

NYSEG

Binghamton Court Street MGP Site (OU-1)

Site No. 7-04-031

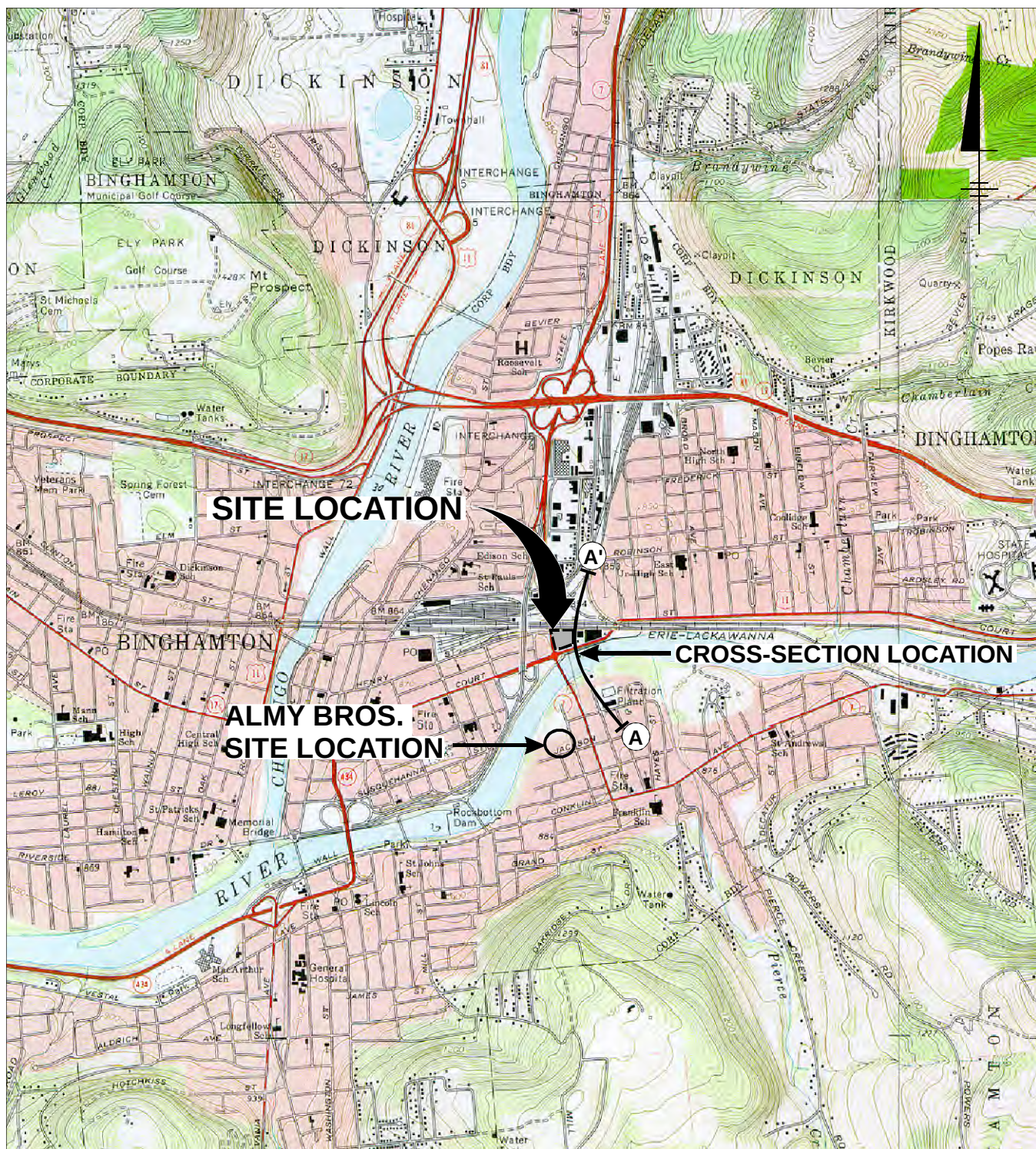
Legal Description of Environmental Easement Area

All that tract or parcel of land situate in the City of Binghamton, County of Broome and State of New York bonded and described as follows: Beginning at a point of the easterly highway boundary of Brandywine Avenue at the southerly boundary of lands owned by Erie Lackawanna Railroad; thence N76°44'36"E, along said railroad's southerly boundary, for a distance of 38.60 feet to a point; then N89°57'31"E, continuing along said railroads southerly boundary for a distance of 503 feet to a mag nail on the northwesterly corner of lands belonging to 295 Court Street Associates LLC, by deed recorded in the Broome County Clerk's office in Book 1883 of Deeds at Page 772; thence S07°18'11"E along said westerly boundary of said 295 Court Street Associates LLC, for a distance of 246.50 feet to a spike on the northerly highway boundary of Court Street, also known as U.S. Route 11; thence S72°13'46"W along said highway boundary for a distance of 92.50 feet to a point; thence S71°19'32"W, continuing along said highway boundary for a distance of 284 feet to a point; thence S72°19'55"W, continuing along said northerly boundary for a distance of 95.71 feet to a point of curvature; thence westerly, continuing along said northerly highway boundary, following a curve to the right having a radius of 20 feet, an arc distance of 31 feet to a point on the easterly highway boundary of said Brandywine Avenue; thence N18°40'57"W, along said easterly highway boundary for a distance of 257.80 feet to a point of curvature; thence northerly, continuing along said easterly highway boundary, following a curve to the right having a radius of 142 feet, an arc distance of 32.47 feet to a point; thence N05°36'48"W, continuing along said easterly highway boundary for a distance of 96.35 feet to a point and place of beginning, containing 3.93 plus or minus acres of land.

PROJECT No. BING160.27-01-23

Appendix B

Select Remedial Investigation Figures



REFERENCE: Base map source: USGS 7.5 Min. Topo. Quad., Binghamton East, NY., Binghamton West, NY., Castle Creek, NY., Chenango Forks, NY. (1968, Photorevised 1976).

2,000 ft 0 2,000 ft

GRAPHIC SCALE



QUADRANGLE
LOCATION

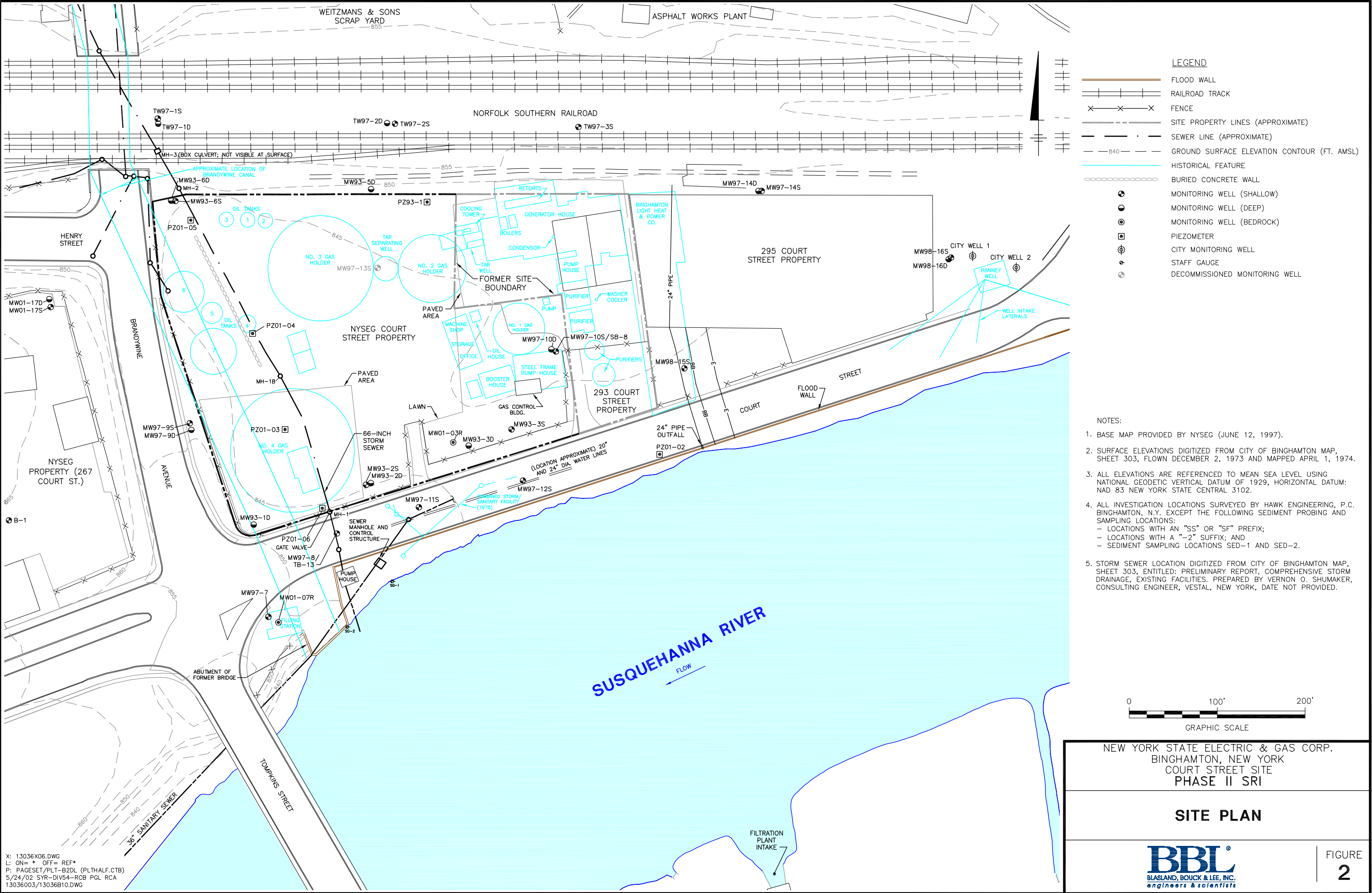
NEW YORK STATE ELECTRIC & GAS CORP.
BINGHAMTON, NEW YORK
COURT STREET SITE

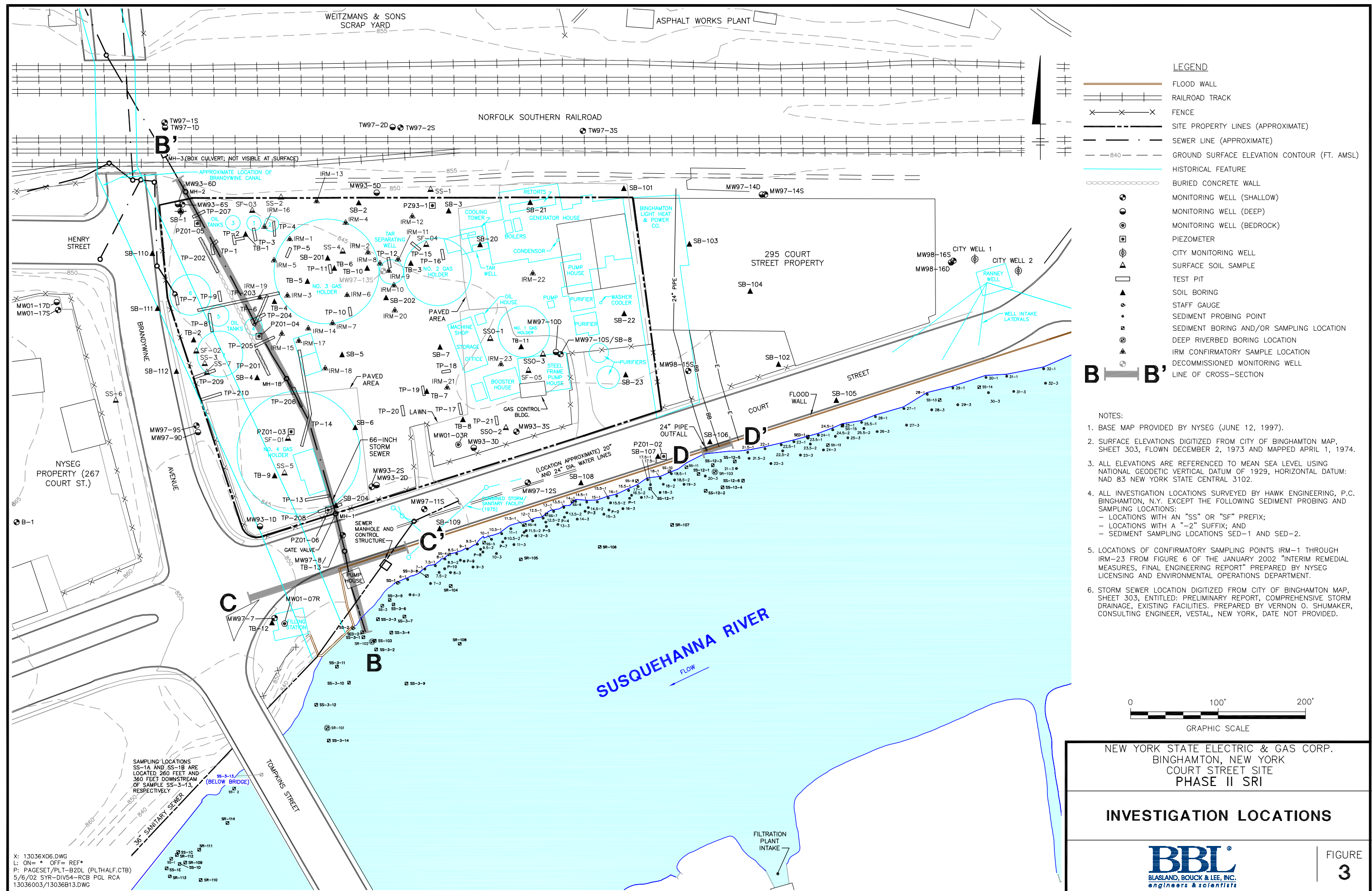
PHASE II SUPPLEMENTAL REMEDIAL INVESTIGATION

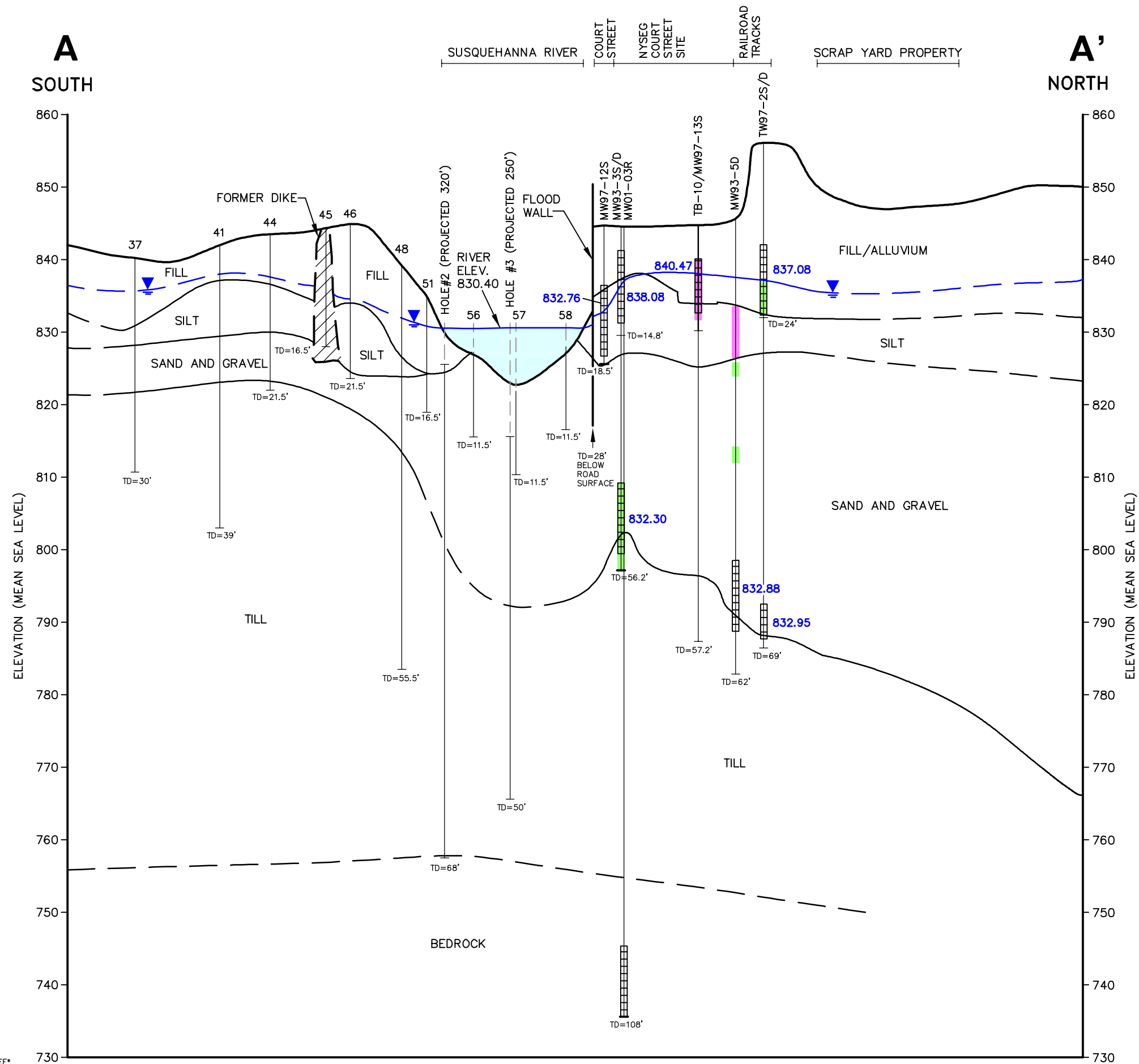
SITE LOCATION AND SELECTED FEATURES

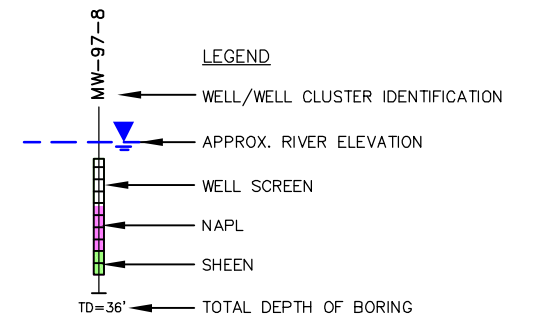
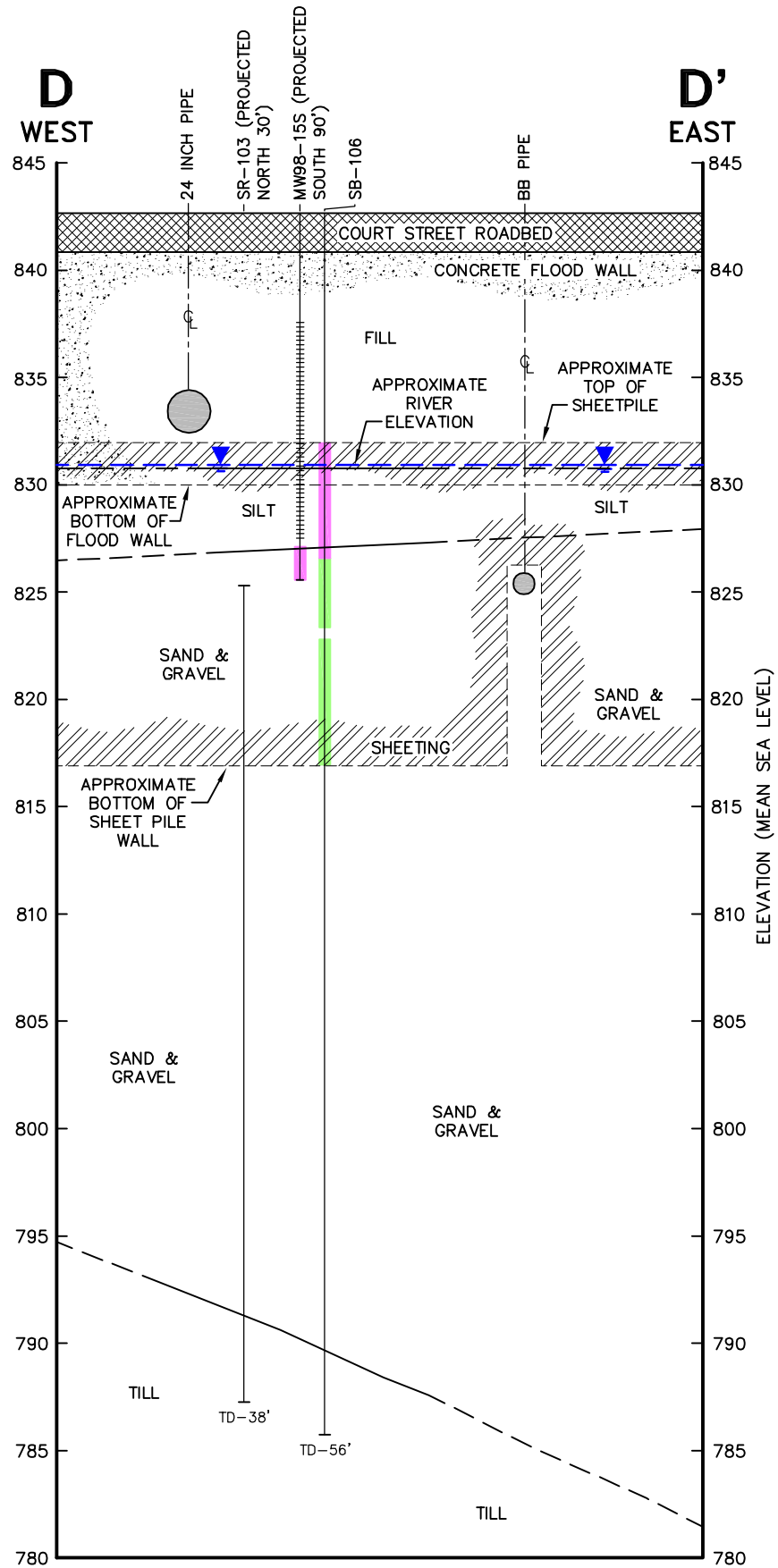
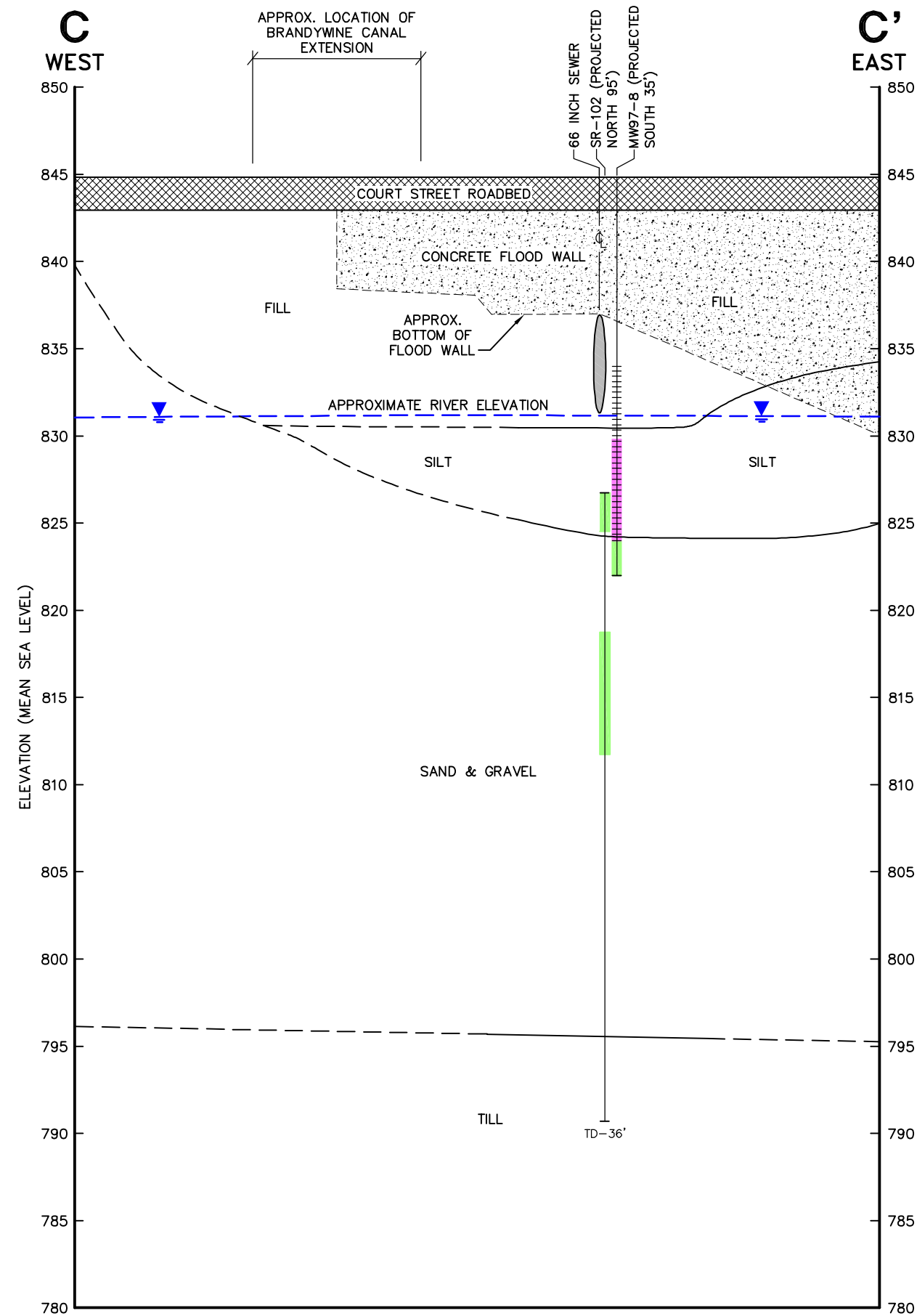
BBL[®]
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
1









- NOTES:
1. ALL ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL USING NATIONAL GEODETIC VERTICAL DATUM OF 1929.
 2. DASHED LINES ARE INFERRED.

NEW YORK STATE ELECTRIC & GAS CORP.
COURT STREET SITE
BINGHAMTON, NEW YORK
PHASE II SRI

**GEOLOGIC CROSS-SECTIONS
C-C' AND D-D'**

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
8

L: ON= * OFF= REF*
P: PAGESET/PLT-BL
5/16/02 SYR-54-PGL SDL RCA
13036003/13036V15.DWG

0 30' 60'
HORIZONTAL SCALE (FEET)

0 5' 10'
HORIZONTAL SCALE (FEET)

Appendix C

Well Construction Logs



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. MW935D

Project: NYSEG

Location: Court St., Binghamton, NY

Date Start/Finish: 6/3/93 - 6/3/93
Drilling Company: Parratt Wolf Inc.
Driller's Name: Doug Richmond
Rig Type: CME Mobil - 57
Spoon Size: 2-inch I.D.
Hammer Weight: 140
Height of Fall: 30-inches
Drilling Method: HSA
Bit Size: Auger Size: 4 1/2-inch ID

Northing:
Easting:
Well Casing Elev.: 848.3 ft.
Corehole Depth: 62 ft.
Borehole Depth: 62 ft.
Ground Surface Elev.: 844.9 ft.

General Location:

Depth (ft.)	Sample/Run Number	Sample/Int./Type	Blows/6 in.	N	Recovery (ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials
0												Brown fine to coarse SAND and fine GRAVEL, some silt, trace clay, moist, loose.			
1															
2			1		0.6			0.3	0.0						
3	1		2	3											
4			1		11			0.2	13			Gray ASH, some coal, moist, very loose.			
5	2		2	3								Brown fine to coarse SAND, some silt, trace clay, moist, loose.			
6			1		0.2			5.6	15.7			Gray ASH, some coal lense 5.5' - 6.0' grades to fine to coarse SAND, some medium size coal, trace silt, wet, very loose.			
7	3		1	2											
8			1		13			11.5	374			Gray-brown ASH, some fine to coarse sand, some coal tar residue in matrix, wet, very loose.			
9	4		1	1											
10			4		11			45.2	496			Gray-brown SILT, some clay, some coal tar residue and fibrous material in matrix, wet, very soft.			
11	5		5	9											
12			10		0.9			2.4	262			grades to green-gray SILT, trace clay, some coal tar residue in matrix, damp to moist, medium stiff.			
13	6		12	32											
14			20												
15	7		24	19				7.0	263			grades to brown-gray SILT, some oxidation staining, damp, very stiff.			
16			7												
17	8		12	22											
18			7		11			73.5	337			grades with trace amber coal tar residue in matrix.			
19			19	33											
20	9		14												
21			9		19			71.3	283						
22			4												
23			5	12								Brown fine to coarse SAND and fine to medium GRAVEL, some silt, some oil globules, wet, loose.			
24			7												
25			8												
26			4	16				11.6	47.2			grades to dark gray fine SAND, some silt, trace oil sheen, wet, loose, slight coal tar odor.			
27	10		4	8											
28			4												
29			4												
30			4												

6-inch diameter outer protective PVC casing with locking cap installed to 3.4' above ground level.

Cement surface pad 1.5' - 0.0'

2-inch diameter stainless steel (SS) well riser 46.47' - 2.76' above ground level

Geologist Initials: TRO

Remarks:

Water Levels

Date	Time	Elevation

Project No.: 130.08



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. MW935D

Project: NYSEG

Location: Court St., Binghamton, NY

Date Start/Finish: 6/3/93 - 6/3/93

Drilling Company: Parratt Wolf Inc.

Driller's Name: Doug Richmond

Rig Type: CME Mobil - 57

Spoon Size: 2-inch I.D.

Hammer Weight: 140

Height of Fall: 30-inches

Drilling Method: HSA

Bit Size: Auger Size: 4 1/2-inch ID

Northing:

Easting:

Well Casing Elev.: 848.3 ft.

Corehole Depth: 62 ft.

Borehole Depth: 62 ft.

Ground Surface Elev.: 844.9 ft.

General Location:

Depth (ft.)	Sample/Run Number	Sample/Int./Type	Blows/6 in.	N	Recovery (ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials
22			3		16			4.9	16.9						
23	#		4	8											
24			4		16			9.2	6.2			grades to brown fine SAND, some silt, no evidence of coal tar residue or oil globules, wet, loose.			
25	12		5									grades to fine to coarse SAND.			Cement/bentonite grout 40.0' - 15'
26			6	13				6.9	4.4						
27	13		7		18										
28			4	9				4.8	6.3						
29	14		5		17										
30			4	10								grades to fine SAND, some silt.			
31	15		6		15			25	102			Brown SILT, some clay lense 30.5' - 31.0'.			
32			9	14								grades to tan brown fine SAND and SILT.			
33	16		12		20			13.2	7.1			grades to brown fine to coarse SAND, little silt, oil sheen at 32.2 feet in isolated area.			
34			9	21								grades to some silt, trace coal pieces, trace oil sheen.			
35	17		5		20			7.7	128			grades to fine SAND and SILT.			
36			6	11				15.5	178			No oil sheen or coal tar residue after 36.0'			
37	18		6		11										
38			9	16											
39	19		7		11			18	6.5						
40			7	16											
41	20		13		12			4.8	NA			Oxidation staining.			Bentonite seal 43.4' - 40.0'
42			5	15											
43	21		10		13			18	4.3						Grade # 00 Silica Sand pack 44.0' - 43.4'
44			8	18											

Geologist Initials: TRO

Remarks:

Project No.: 130.08

Water Levels

Date	Time	Elevation



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. MW935D

Project: NYSEG

Location: Court St., Binghamton, NY

Date Start/Finish: 6/3/93 - 6/3/93

Drilling Company: Parratt Wolf Inc.

Driller's Name: Doug Richmond

Rig Type: CME Mobil - 57

Spoon Size: 2-inch I.D.

Hammer Weight: 140

Height of Fall: 30-inches

Drilling Method: HSA

Bit Size: Auger Size: 4 1/2-inch ID

Northing:

Easting:

Well Casing Elev.: 848.3 ft.

Corehole Depth: 62 ft.

Borehole Depth: 62 ft.

Ground Surface Elev.: 844.9 ft.

General Location:

Depth (ft.)	Sample/Run Number	Sample/Int./Type	Blows/6 in.	N	Recovery (ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials
44			1		12			25	40.2			grades to fine to coarse SAND, little silt.			
45	22		6									grades to fine SAND and SILT.			
46			13		11			3.1	46.3						
47	23		6												
48			8		17										
49	24		12		10			4.4	3.5						
50			8												
51	25		13		21			20.6	191						
52			12		10										
53	26		13					NA	5.7			black stained silt lense at 51.0' - 51.1'.			
54			15		18							grades to fine to coarse SAND, some silt.			
55	27		9									Silt lenses at 53.0' and 53.5'			
56			10		25										
57			15		0.2			0.0	3.8			Green-brown SILT, some fine to medium gravel, little fine to coarse sand, damp to moist, medium dense.			
58															
59															
60															
61	28		16		0.4			0.0	NA			grades to medium dense to dense.			
62			16												
63			28	34											
64			34												
65															
66															

Bottom of boring at 62.0 ft.

NOTES:

Augered 0.0 - 2.0' feet without sampling.

Ground water level 6/16/93.

WOH - Weight of hammer

NR - No recovery

NA - Not available

0.010-inch slot stainless steel (SS) well screen 56.37' - 46.47'

Grade # 0 Silica Sand pack 62.0' - 44.0'

Bottom of well set at 56.92'

Geologist Initials: TRO

Remarks:

Augered 54.2' - 60.0' without sampling. Water level obtained 7/7/93

Water Levels

Date	Time	Elevation

Project No.: 130.08



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. MW938D

Project: NYSEG

Location: Court St, Binghamton, NY

Date Start/Finish: 6/8/93 - 6/8/93
Drilling Company: Parratt Wolf Inc.
Driller's Name: Doug Richmond
Rig Type: CME Mobil - 57
Spoon Size: 2-inch I.D.
Hammer Weight: 140
Height of Fall: 30-inches
Drilling Method: HSA
Bit Size: Auger Size: 4 1/2-inch ID

Northing:
Easting:
Well Casing Elev.: 847.51 ft.
Corehole Depth: 60.8 ft.
Borehole Depth: 60.8 ft.
Ground Surface Elev.: 844.1 ft.

General Location:

Depth (Ft.)	Sample/Run Number	Sample/In/Type	Blows/6 in.	N	Recovery (Ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials			
0																		
1																		
2																		
3																		
4																		
5																		
6	1		8		0.3			0.0	0.0									
7			6															
8			3															
9			2															
10																		
11	2		3		NR			0.0	NA									
12			2															
13			1															
14			1															
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100																		
Geologist Initials: TRO												Remarks:				Water Levels		
Project No.: 130.08																Date	Time	Elevation



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. MW936D

Project: NYSEG

Location: Court St., Binghamton, NY

Date Start/Finish: 6/8/93 - 6/8/93

Drilling Company: Parratt Wolf Inc.

Driller's Name: Doug Richmond

Rig Type: CME Mobil - 57

Spoon Size: 2-inch I.D.

Hammer Weight: 140

Height of Fall: 30-inches

Drilling Method: HSA

Bit Size: Auger Size: 4 1/2-inch ID

Northing:

Easting:

Well Casing Elev.: 847.51 ft.

Corehole Depth: 60.8 ft.

Borehole Depth: 60.8 ft.

Ground Surface Elev.: 844.1 ft.

General Location:

Depth (ft.)	Sample/Run Number	Sample Int./Type	Blows/6 in.	N	Recovery (Ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials
22			1		11			0.0	NA			grades to fine to coarse SAND, some silt.			
23	5		2												
24			3					0.0	0.0						
25	6		4		18										
26			4					16.3	0.2						
27	7		6												
28			5		11										
29	8		4		19			NA	47.3			grades with some coal tar residue in matrix.			
30			6									No coal tar residue or oil sheen after 29.5'.			
31	9		8		0.8			0.0	11			grades to brown fine SAND and SILT.			
32			12					0.0	0.2						
33	10		6		12										
34			7					1.0	0.2						
35	11		11												
36			5		11							grades to gray brown fine to coarse SAND, trace silt.			
37	12		7					1.1	0.7			grades with trace fine to medium gravel.			
38			9		18										
39	13		11		13			0.1	0.2						
40			4												
41	14		9		22										
42			10					15	0.8						
43	15		10		13										
44			13		23										
45			16					0.0	0.0						
46			7		16										
47			7												
48			14												
49			13												

Cement/bentonite grout 43.8' - 15'

Bentonite seal 46.8' - 43.8'

Geologist Initials: TRO

Remarks:

Water Levels

Date	Time	Elevation

Project No.: 130.08



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. MW936D

Project NYSEG

Location: Court St., Binghamton, NY

Date Start/Finish: 6/8/93 - 6/8/93
Drilling Company: Parratt Wolf Inc.
Driller's Name: Doug Richmond
Rig Type: CME Mobil - 57
Spoon Size: 2-inch I.D.
Hammer Weight: 140
Height of Fall: 30-inches
Drilling Method: HSA
Bit Size: Auger Size: 4 1/2-inch ID

Northing:
Easting:
Well Casing Elev: 847.51 ft.
Corehole Depth: 60.8 ft.
Borehole Depth: 60.8 ft.
Ground Surface Elev: 844.1 ft.

General Location:

Depth (Ft.)	Sample/Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (Ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials
44			7		13			0.0	0.0						
45	16		9	24											
46			15		18			0.0	0.0			grades to medium dense.			
47	17		9	20											
48			15		19			0.4	0.0			grades to little silt.			Grade # 00 Silica Sand pack 48.0' - 46.8'
49	18		13	24											
50			15					0.0	0.4						
51	19		18		18										Grade # 0 Silica Sand pack 60.8' - 48.0'
52			19	35								Fine SAND and SILT lense at 51.2 feet.			
53	20		22		17			0.5	0.0			grades to gray/brown fine to coarse SAND, some silt, moist, medium dense.			
54			23	45											
55	21		17		0.4			0.6	0.0						
56			21												
57	22		11	22											
58			20		0.3			0.0	12						0.010-inch slot stainless steel (SS) well screen 59.8' - 49.8'
59	23		31	58											
60			27												
61	24		23		11			0.0	0.0			Brown-green SILT and fine to medium GRAVEL, medium dense.			
62			24	47								grades to brown fine to coarse SAND and fine GRAVEL, some silt, wet, medium dense.			
63			23									grades to brown-green SILT and fine to medium GRAVEL, some sand, moist, dense to very dense.			
64			20		0.4			0.3	0.1			Bottom of boring at 60.8 ft.			Bottom of well set at 59.85'
65			100/3									NOTES: Augered 0.0 - 5.0' feet without sampling.			
66												Ground water level 6/16/93.			
67												WOH - Weight of hammer			
68												NR - No recovery			
69												NA - Not available			
Geologist Initials: TRO											Remarks: Water level obtained 7/7/93				
Project No.: 130.08											Water Levels				
											Date	Time	Elevation		



BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

Well No. ~~P2-1~~ PZ93-1

Project: NYSEG

Location: Court St., Binghamton, NY

Date Start/Finish: 6/9/93 - 6/9/93
Drilling Company: Parratt Wolf Inc.
Driller's Name: Doug Richmond
Rig Type: CME Mobil - 57
Spoon Size: 2-inch I.D.
Hammer Weight: 140
Height of Fall: 30-inches
Drilling Method: HSA
Bit Size: Auger Size: 4 1/2-inch ID

Northing:
Easting:
Well Casing Elev.: 848.4 ft.
Corehole Depth: 12 ft.
Borehole Depth: 12 ft.
Ground Surface Elev.: 844.8 ft.

General Location:

Depth (Ft.)	Sample/Run Number	Sample/Int/Type	Blows/6 in.	N	Recovery (Ft.)	Recovery (%)	RQD (%)	PID Field (ppm)	PID Headspace (ppm)	Drilling Water Level	Geologic Col.	Stratigraphic Description	Misc. Test	Well Column	Well Materials
0												Brown fine to coarse SAND and fine to medium GRAVEL, trace silt and clay, some brick fragments.			2-inch diameter schedule 40 PVC well riser 3.6' - 2.24' above ground level
1								0.0	0.0						
2			5		12										
3	1		4												
4			3		11			19.9	49.2			Gray COAL and ASH, some fine to coarse sand, dry, loose.			Cement/bentonite grout 1.0' - 0.0'
5	2		3									Brown fine to medium GRAVEL, trace fine to coarse sand, some black staining, wet, loose, sheen on water.			Bentonite seal 2.0' - 1.0'
6					0.8			7.7	103						
7	3											Gray SILT, trace clay, some black staining, wet, soft.			0.010-inch slot schedule 40 PVC well screen 8.5' - 3.5'
8					0.6			11.5	247			Brown fine to coarse SAND and fine to medium GRAVEL, trace silt and clay, lense 7.0' - 7.5'.			Grade # 0 Silica Sand pack 12.0' - 2.0'
9	4											Black stained wood pieces 7.5' - 8.0' and 9.0' - 10.0'.			
10					14			2.3	275			grades to gray SILT and CLAY, some black staining, some coal tar residue, soft, semiplastic.			
11	5														
12												Bottom of boring at 12.0 ft.			Bottom of Piezometer well set at 8.5'
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															

Geologist Initials: TRO + VAD

Project No.: 130.08

Remarks:

Water Levels		
Date	Time	Elevation

Date Start/Finish: 12/10/97 / 12/11/97 Drilling Company: MAXIM Technologies, Inc. Driller's Name: Rodney Bush Drilling Method: HSA Auger Size: 4.25 ID in. Rig Type: 82 Acker Spoon Size: 2 in.	Northing: 767165.72745 Easting: 1006893.23697 Well Casing: 845.57 feet Borehole Depth: 40 ft. Ground Surface: 845.91 feet Geologist: Matthew W. Erbe	Well No: MW97-14D Client: New York State Electric & Gas Location: Conrail Right of Way Binghamton, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 845.91 ft										GROUND SURFACE	9" diameter flushmount curb box installed.
	845	S-1	NA	5	13	0.6	0.0			Asphalt. (FILL)	
				8						Dark brown SILT, some fine to coarse Sand and fine Gravel, trace brick, stiff, dry. (FILL)	
		S-2	9	30/2	NA	0.4	0.0			Tan fine SAND and SILT, some fine, subangular Gravel.	Cement surface seal 0.0' to 0.5' bgs.
				NA						At 2.8', concrete.	#40 Silica sand 0.4' to 1.0' bgs inside of curb box.
				NA						No Recovery.	
5		S-3	2	3	5	0.0	NA				Type I Portland Cement/5% Bentonite Grout 1.0' to 30.0' bgs.
	840			2							
		S-4	27	6	12	0.1	NA			Poor recovery. Brown SILT, fine to coarse, round to subround Sand, slag, brick, concrete, medium dense, dry to moist (FILL).	
				6							
				5							
		S-5	2	1	2	0.1	0.2			Orange, very fine to fine SAND, some Silt, rootlets, occasional coarse, round Sand, very loose, moist.	2" diameter, Schedule 40 PVC well riser 0.3' to 34.8' bgs.
				1							
10		S-6	1	1	2	1.5	0.8			Orange, very fine SAND, some Silt, rootlets, several faint, red-brown laminations throughout, very loose, moist to wet.	
	835			1							
				1							
				2							
		S-7	2	2	6	2.0	1.6			As above.	
				4							
				2							
		S-8	1	10	5	1.1	1.7			Grades to orange-brown, very fine to fine SAND, little Silt, loose, wet.	
6											

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Remarks:

bgs - below ground surface. NA=Not available. First attempt had auger refusal at 6' bgs. Moved 3' south and refusal again, augers pull up stiff steel cables and rebar. Third attempt moved 10' east.

Saturated Zones

Date / Time	Elevation	Depth
2/11/98	832.95	12.96

Client:
New York State Electric & Gas

Location:
Conrail Right of Way
Binghamton, New York

Well No: MW97-14D
Total Depth = 40 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
830		S-8		4 5	5	1.1	1.7			Brown, fine SAND, some very fine Sand, little Silt, orange mottling and laminations.	Type 1 Portland Cement/5% Bentonite Grout 1.0' to 30.0' bgs. 2" diameter, Schedule 40 PVC well riser 0.3' to 34.9' bgs. Bentonite chips 30.0' to 32.0' bgs. #0 Silica sand pack 32.0' to 40.0' bgs.
		S-9		4 5 8 10	11	1.5	1.9				
		S-10		5 7 7 7	14	0.8	1.1			Orange-brown, fine to coarse SAND, little Silt and fine, angular Gravel, medium dense, wet.	
825		S-11		6 8 12 12	20	0.7	1.0			Orange-brown, well rounded, fine to medium GRAVEL (quartzite, red sandstone, dark gray siltstone), little Silt, trace fine to coarse Sand, medium dense, wet.	
		S-12		10 11 15 17	26	0.5	1.1			As above, more fine Gravel, little fine to coarse Sand.	
820		S-13		13 10 10 7	20	0.5	0.9			Gray-brown, fine to coarse Sand, some fine Gravel, little Silt.	
		S-14		25 17 14 19	31	0.2	0.8			Orange-brown, fine to coarse SAND and fine, round to subangular GRAVEL, little Silt.	
		S-15		13 15 14 9	29	0.5	1.4			As above, gray-brown, some fine to coarse Sand.	
815		S-16		15 14 7 10	21	1.0	0.9			As above.	
		S-17		11 10 10 10	20	0.1	0.9			Dark gray, fine to medium, subangular GRAVEL, some fine to coarse Sand, little orange-brown Silt, loose.	
810		S-18		10 9	22	0.9	0.4			Brown, fine to medium SAND, some fine subangular Gravel, trace Silt, medium dense.	

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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
2/11/98	832.95	12.96 ▼

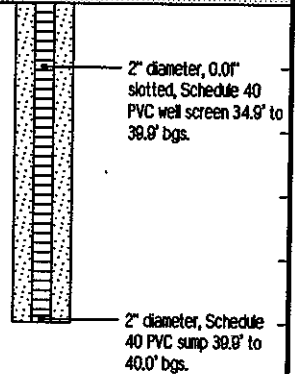
Client:
New York State Electric & Gas

Location:
Conrail Right of Way
Binghamton, New York

Well No: MW97-14D

Total Depth = 40 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
810		S-18		13 10	22	0.9	0.4				
		S-19		5 5 9 9	14	0.8	0.3			Dark gray well sorted fine to coarse subangular SAND, trace Silt and medium rounded Gravel (siltstone), coarsening downward.	
		S-20		4 11 16 16	27	0.7	0.2			Brownish gray fine to medium SAND, trace coarse subangular Sand and Silt.	
40										Pushed GRAVEL from 39' to 40' bgs. (TILL?)	
805		S-21		12 38 24 65/.4	62	0.8	0.3			Olive-gray coarse SAND and fine to medium, round to subround GRAVEL (siltstone, shale), some fine to medium Sand, little Clay and Silt, well cemented, very dense (TILL).	
										Bottom of spoons at 42' bgs. Bottom of boring at 40' bgs.	
45											
800											
60											
795											
55											



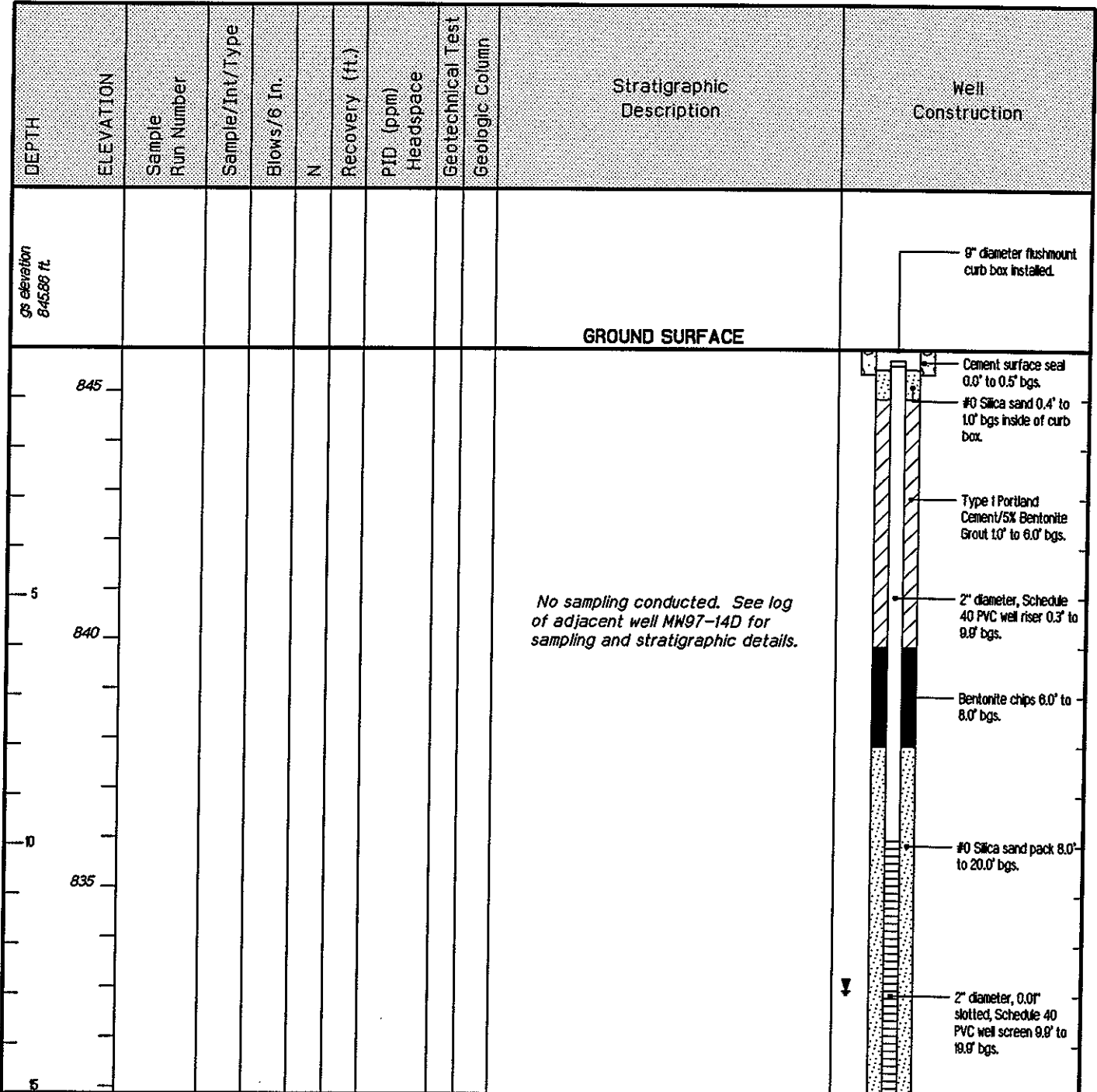
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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
2/11/98	832.95	12.96 ▼

Date Start/Finish: 12/10/97 / 12/11/97 Drilling Company: MAXIM Technologies, Inc. Driller's Name: Rodney Bush Drilling Method: HSA Auger Size: 4.25 ID in. Rig Type: 82 Acker	Northing: 767165.84629 Easting: 1006897.14703 Well Casing: 845.55 feet Borehole Depth: 20 ft. Ground Surface: 845.86 feet Geologist: Matthew W. Erbe	Well No: MW97-14S Client: New York State Electric & Gas Location: Conrail Right of Way Binghamton, New York



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Remarks:

bgs - below ground surface. NA=Not available. Installed approximately 4' east of MW97-14D.

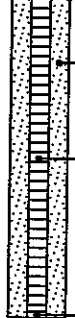
Saturated Zones

Date / Time	Elevation	Depth
2/11/98	832.95	12.91 ↓

Client:
New York State Electric & Gas

Location:
Conrail Right of Way
Binghamton, New York

Well No: MW97-14S
Total Depth = 20 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
830										No sampling conducted. See log of adjacent well MW97-14D for sampling and stratigraphic details.	 #10 Silica sand pack 8.0' to 20.0' bgs. 2" diameter, 0.01" slotted, Schedule 40 PVC well screen 8.9' to 19.9' bgs. 2" diameter, Schedule 40 PVC sump 19.9' to 20.0' bgs.
20	825										
25	820									Bottom of boring at 20' bgs.	
30	815										
35											

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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
2/11/98	832.95	12.91 ↓

Date Start/Finish: 9/18/01
Drilling Company: Lyon Drilling
Driller's Name: Harry Lyon
Drilling Method: Hollow Stem Auger

Sampler Size: 2-in. & 3-in. Split Spoon
Auger Size: 4.25-in. ID
Rig Type: CME 55-Truck Mount Rig

Northing: 767043.09
Easting: 1006086.29

Casing Elevation: 861.45 ft. AMSL
Surface Elevation: 861.16 ft. AMSL
Well Depth: 61.3 ft. bgs

Descriptions By: Michael K. Cobb

Well ID: MW01-17D

Client: New York State Electric and Gas

Location: Court Street
 Binghamton, NY

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
0										
		NA	0-0.5	NA	NA	0.0	NA		ASPHALT.	
860		1	0.5-2	5 3 3	8	1.2	1.2	x x x	Dark brown to black medium to coarse SAND FILL as Cinders, little Gravel, dry, loose, no odor/staining/sheen.	Flushmount 8" diameter Curb-box
				2 7 10 7					Red-brown fine SAND, some Silt, little medium to coarse Sand and Gravel, trace Fill, moist, no odor/staining/sheen.	Cement Pad
		2	2-4		17	0.9	1.0		Light brown fine to coarse SAND and fine to medium GRAVEL (broken coarse Gravel probable Cobbles), no Fill traces apparent, dry, crumbly, no odor/staining/sheen.	2" diameter sch 40 PVC Riser (0 - 54.5' bgs)
				12 11 10 6						
5		3	4-6		21	0.6	1.4			
				16 7 8 7					Light brown fine to coarse SAND and fine to medium rounded GRAVEL, no Fill traces, dry, crumbly, no odor/staining/sheen.	Cement Bentonite Grout (0 - 48.5' bgs)
855		4	6-8		15	1.6	2.0			
				8 10 8 14						
		5	8-10		18	0.8	1.6			
10				19 14 10 10						
		6	10-12		24	1.0	2.8			
				18 4 4 4					Medium brown fine to coarse SAND, some fine Gravel, little medium Gravel, dry, generally loose, moist in shoe, no odor/staining/sheen.	
		7	12-14		8	1.0	2.2			
				3 4 3 1					As above, moist throughout, trace Silt in partings, no odor/staining/sheen.	
15		8	14-16		7	0.5	1.3			

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Remarks: Horiz. datum: NAD83-State Plane NY Central
 Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
9/18/01	30'	
Depth measured from top of casing.		

Client:

New York State Electric and Gas

Well ID: MW01-17D

Site Location:

Court Street
Binghamton, NY

Well Depth: 61.3 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
845				2					Medium brown fine to coarse SAND, some fine Gravel, little medium Gravel, trace Silt in partings, moist to wet, generally loose, no odor/staining/sheen.	
		9	16-18	2	4	0.9	1.6			
				2						
				3						
				3					As above, with pink granite Gravel, moist to wet, no odor/staining/sheen. Hole checked, no standing water.	
		10	18-20	7	17	1.0	1.4			
				10						
20				10						
				16					Light to medium brown fine to medium GRAVEL and fine to coarse SAND, moist, no odor/staining/sheen.	
		11	20-22	7	15	1.2	1.1			
				8						
				5						
				8					Rock in shoe, poor recovery.	
		12	22-24	6	14	0.1	NA			
				8						
				16						
				12					Medium brown fine to coarse SAND and fine to medium GRAVEL, many rock types/colors, moist, no odor/staining/sheen.	
25		13	24-26	34	39	1.3	2.4			
				5						
				4						
835				3						
		14	26-28	14	17	0.7	2.2			
				3						
				3					As above, trace brown Silt, no odor/staining/sheen.	
		15	28-30 3-in SS	WOR NA NA NA	NA	0.3	1.8			
30										
				6					Multicolored fine to coarse GRAVEL, some fine to coarse Sand, little brown Silt smearing all, wet, no odor/staining/sheen.	
830		16	30-32 3-in SS	6 2 4	NA	1.3	1.5			
				1						
				2						
		17	32-34	2	4	1.8	3.0		Brown fine to medium SAND, trace coarse Sand and fine Gravel, loose, soupy, wet, no odor/staining/sheen.	
				3						
				6					Dark brown fine to medium SAND, little coarse Sand and fine Gravel, trace Silt, wet, soupy, no odor/staining/sheen.	
35		18	34-36	4 3 3	7	1.1	2.3			

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Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
9/18/01	30'	

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: MW01-17D

Site Location:

Court Street

Binghamton, NY

Well Depth: 61.3 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
825				3					Dark brown fine to medium SAND, little coarse Sand and fine Gravel, trace Silt, poor recovery, wet, soupy, no odor/staining/sheen.	
		19	36-38	3						
				7	10	0.2	1.6			
				9						
		20	38-40	2					Dark olive-gray fine SAND, trace Silt, well sorted, loose, wet, no bedding apparent, no odor/staining/sheen.	2" diameter sch 40 PVC Riser (0 - 54.5' bgs)
				2	6	1.2	2.5			
				4						
40				6						
		21	40-42	4					Olive-gray fine to medium SAND, some coarse Sand and fine rounded Gravel, loose, wet, no odor/staining/sheen.	
				2	4	1.1	2.1			
				2						
				2						
		22	42-44	1						Cement Bentonite Grout (0 - 48.5' bgs)
				2	3	1.0	2.2			
				3						
		23	44-46	4						
45				4						
				5	9	1.0	2.9			
				5						
		24	46-48	NA					Medium brown fine to medium SAND, some coarse Sand and fine Gravel (generally rounded), trace Silt in pockets, wet, no odor/staining/sheen.	
				4	11	1.2	2.9			
				7						
				10						
		25	48-50	5					Olive well-sorted fine SAND, trace Silt, wet, no bedding, no odor/staining/sheen.	
				7	14	0.9	2.3			
				7						
				9						
50				2					As above, trace coarse Sand and fine Gravel.	Medium Bentonite Chips (48.5' - 52.4' bgs)
				5						
		26	50-52	7	12	1.8	2.8			
				10						
				7					Olive well sorted fine SAND, trace Silt, medium dense, wet, no odor/staining/sheen.	
				7						
		27	52-54	9	16	0.9	3.5			Grade 0 Silica Sand (52.4' - 59.5' bgs)
				9						
				5					Olive-gray fine SAND, some medium Sand, trace fine to medium Gravel, medium dense, wet, no odor/staining/sheen.	
				9						
55		28	54-56	10	19	0.9	2.5			2" ID 0.010 slot PVC Screen (54.5' - 59.5' bgs)
				10						

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Remarks: Horiz. datum: NAD83-State Plane NY Central
 Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
9/18/01	30'	

Depth measured from top of casing.

Well ID: MW01-17D

Binghamton, NY

Well Depth: 61.3 ft. bgs

[illegible]

Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.

9/18/01	30'

Depth measured from top of casing.

Date Start/Finish: 9/19/01 Drilling Company: Lyon Drilling Driller's Name: Harry Lyon Drilling Method: Hollow Stem Auger Sampler Size: 2-in. Split Spoon Auger Size: 4.25-in. ID Rig Type: CME 55-Truck Mount Rig	Northing: 767034.1 Easting: 1006087.89 Casing Elevation: 861.32 ft. AMSL Surface Elevation: 861.65 ft. AMSL Well Depth: 37 ft. bgs Descriptions By: Michael K. Cobb	Well ID: MW01-17S Client: New York State Electric and Gas Location: Court Street Binghamton, NY

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
0										Flushmount 8" diameter Steel Curb-box
860		NA	NA	NA	NA	NA	NA		No Sampling. Blind Drill with auger plug. For soil descriptions, see the boring log of adjacent well MW01-17D.	Locking Expandable Cap Cement Pad
5										2" diameter sch 40 PVC Riser (0 - 27' bgs)
855										Cement Bentonite Grout (0.5 - 15.5' bgs)
10										
850										
15										Medium Bentonite Chips (15.5' - 23.5' bgs)

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Remarks: Hole is 9' South of 17D.
 Horiz. datum: NAD83-State Plane NY Central
 Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
9/19/01	30'	
Depth measured from top of casing.		

Client:

New York State Electric and Gas

Well ID: MW01-17S

Site Location:

Court Street
Binghamton, NY

Well Depth: 37 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
845	NA	NA	NA	NA	NA	NA	NA		No Sampling. Blind Drill with auger plug. For soil descriptions, see the boring log of adjacent well MW01-17D.	
20										
840										
25										
835										
30										
830										
35										

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Remarks: Hole is 9' South of 17D.
Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
9/19/01	30'	
Depth measured from top of casing.		

Client:

New York State Electric and Gas

Well ID: MW01-17S

Site Location:

Court Street
Binghamton, NY

Well Depth: 37 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
825	NA	NA	NA	NA	NA	NA	NA		No Sampling. Blind Drill with auger plug. For soil descriptions, see the boring log of adjacent well MW01-17D.	 Grade 0 Silica Sand (25.5' - 37' bgs) 2" ID 0.010 slot PVC Screen (27' - 37' bgs)
40										
820										
45										
815										
50										
810										
55										

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Remarks: Hole is 9' South of 17D.
Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
9/19/01	30'	
Depth measured from top of casing.		

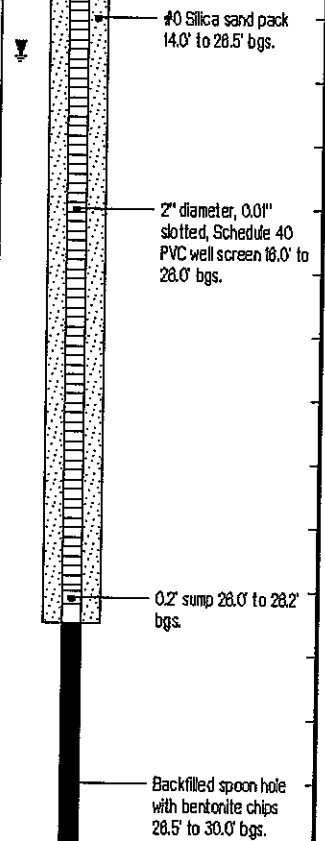
Client:
New York State Electric & Gas

Location:
Court Street
Binghamton, New York

Well No: MW97-7S

Total Depth = 26.5 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
1										Brown fine to medium, rounded GRAVEL, little fine Sand and Silt, moist.	
20	830	S-1		NA	NA	0.7	NA			As above.	
25	825									Wet at 21.0' bgs.	
30	820	S-2		NA	NA	0.3	NA			Three small red sandstone and granite Gravels.	
		S-3		NA	NA	1.0	NA			Gray brown fine to coarse GRAVEL, some Silt, little fine to medium Sand, saturated.	
35	815									Bottom of boring 26.5' bgs. Bottom of spoons 30.0' bgs.	



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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
2/11/98	832.01	17.62

Date Start/Finish: 07-24-01 / 08-02-01 Drilling Company: Lyon Drilling Driller's Name: Harry Lyon Drilling Method: Hollow Stem Auger/ Spun Casing/HX Rock Coring Sampler Size: 2-in. & 3-in. Split Spoon Auger Size: 4.25-in. ID Rig Type: CME 55-Truck Mount Rig	Northing: 766879.91 Easting: 1006546.13 Casing Elevation: 847.05 ft. AMSL Surface Elevation: 844.19 ft. AMSL Well Depth: 108.1 ft. bgs Descriptions By: Michael K. Cobb	Well ID: MW01-03R Client: New York State Electric and Gas Location: Court Street Binghamton, NY

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/In/Type	Blows per 6 inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
845										
0		1	0-2	3 4 4 5	8	1.2	0.0		Medium brown SILT and fine SAND, little coarse Sand and fine Gravel, Organics, loose, dry, no odor/sheen/staining.	2" PVC Riser (~2.5 ags - 98' bgs)
		2	2-4	3 3 3 2	6	0.4	0.1		Medium brown fine SAND, some Silt, little coarse Sand and fine Gravel, dry, loose, no odor/sheen/staining.	Cement/Bentonite Grout (0 - 93' bgs)
840		3	4-6	2 1 2 3	3	0.6	0.2		Medium dark brown SILT, some medium to coarse Sand, some fine to medium Gravel, Coal fragments, medium Till lodged in shoe, moist, no odor/sheen/staining.	
-5		4	6-8	8 4 1 2	5	1	0.1		Medium brown fine SAND, some medium to coarse Sand and Gravel, moist, no odor/sheen/staining. Gray brown CLAY, little Silt, trace fine to medium rounded Gravel, soft, medium plasticity, moist, little oxidation staining, no odor or sheen.	
		5	8-10	1 3 3 6	6	0.8	0.1		Tan SILT, trace Clay, soft, blocky, moist, little oxidation, trace black staining, no odor or sheen.	Cement/Bentonite Grout (0 - 45' bs)
-10		6	10-12	1 3 3 4	6	1.7	0.1		Tan SILT and CLAY, moderately plastic, blocky texture, moist to wet, soft, oxidation staining, no black staining, no odor, or sheen.	6-inch OD Steel Casing (0 - 45' bgs)
		7	12-14	3 4 5 7	9	1.6	0.3			
830		8	14-16	3 5 7 7	12	0.4	0.3		Tan CLAY, little Silt, medium to high plasticity, wet, no odor, trace oxidation staining, no odor or sheen.	10-inch Auger Hole (0 - 45' bgs)
-15										

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Remarks: Horiz. datum: NAD83-State Plane NY Central
 Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
7/23/01	13.3'	

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: MW01-03R

Site Location:

Court Street
Binghamton, NY

Well Depth: 108.1 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
		9	16-18 3-in SS	7 7 7 6	NA	1.6	0.2		Tan to gray SILT and CLAY, medium to highly plastic, blocky texture, wet, oxidation staining, no odor or sheen.	
82.5		10	18-20	1 1 5 9	6	1.1	0.0		No Recovery. Medium angular gravel-sized Quartz lodged in shoe.	2" PVC Riser (~2.5 ags - 98' bgs)
20		11	20-22	5 7 10 7	17	1.2	0.2		Medium SAND, little fine Sand, loose, wet, no odor/sheen/staining.	Cement/Bentonite Grout (0 - 93' bgs)
									Tan CLAY and SILT, blocky, stiff, no odor/sheen/staining.	
									Medium gray SAND, some coarse Sand and fine Gravel, trace fine Sand and Silt, wet, loose, no odor/sheen/staining.	
									Medium gray medium SAND, some coarse Sand, little fine Gravel, trace fine Sand and Silt, wet, loose, no odor/sheen/staining.	
82.0		12	22-24	3 4 3 7	7	1.8	0.2		Dark gray to black fine SAND, trace coarse Sand, wet, loose, faint MGP-type odor, no sheen or staining.	Cement/Bentonite Grout (0 - 45' bs)
25		13	24-26	2 3 5 7	8	1.2	0.2		Dark gray-black medium SAND, little fine to coarse Sand, trace fine rounded Gravel, wet, faint MGP-type odor, no sheen or staining.	6-inch OD Steel Casing (0 - 45' bgs)
		14	26-28	3 5 7 4	12	1.1	0.3		As above, with trace medium Gravel, 1" tan Silt and Clay seam, soft at 29.5' bgs.	
81.5		15	28-30	WOR 1 3 3	4	2	0.0		Dark gray medium SAND, little coarse Sand and fine Gravel, trace medium rounded Gravel, no odor/sheen/staining.	10-inch Auger Hole (0 - 45' bgs)
30		16	30-32	2 3 4 4	7	2	0.1		Medium gray very fine SAND and SILT, wet, soft, faint MGP odor throughout, no sheen or staining.	
		17	32-34	WOR 2 2 3	4	2	0.2		Medium gray fine to medium SAND, loose, wet, faint odor, no sheen or staining.	
81.0									Medium gray very fine SAND, little Silt, dilatant, faint odor, no sheen or staining.	
35		18	34-36	1 1 4 8	5	2	0.1		Medium gray fine SAND, trace Silt, Silt/Clay parting, wet, faint odor, little MGP odor from 34'-34.5', staining at 35.1' bgs, no sheen.	

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engineers & scientists

Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
7/23/01	13.3'	

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: MW01-03R

Site Location:

Court Street

Well Depth: 108.1 ft. bgs

Binghamton, NY

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
19		36-38	4 6 6 7	12	2	0.1			Medium gray fine SAND, little trace Silt, little parting of Silt at 38.5', Amber discoloration in bands from 37.5'-38' bgs, MGP-type odor concentrated in bands, no sheen or staining.	2" PVC Riser (~2.5 ags - 98' bgs)
20	805	38-40	WOH/ 1.5 4 NA	NA	1.5	0.0			Dark gray-black (olive) fine to medium SAND, very loose, wet, 1" thick wide tan soft Silty Clay lens at 38.5' bgs, no odor/sheen/staining	Cement/Bentonite Grout (0 - 45' bs)
21		40-42	4 8 16 18	24	2	18.5			Dark gray black fine SAND, Intervals of black NAPL (medium viscosity), Trace NAPL throughout fine intervals, mostly saturated with NAPL from 41'-42' bgs.	6-inch OD Steel Casing (0 - 45' bgs)
22		42-44	30 50/4" NA NA	NA	0.2	0.2			Tan SILT and fine to medium angular GRAVEL, little fine to coarse Sand, dense, No NAPL, no odor/sheen/staining. [TILL]	10-inch Auger Hole (0 - 45' bgs)
23	800	44-46	38 41 35 39	76	1.2	0.1			Olive tan SILT and fine to coarse GRAVEL, Black shale fragments, very hard, no odor/staining. [TILL]	4.5-inch Borehole (45' - 103' bgs)
24		46-48	50/0.3'	NA	0.0	0.0			No Recovery. Rounded Gravel and broken Rock found in the spoon, loose and no fines. Infer Cobble or Boulder obstruction. Rollerbit through boulder to 47.8' bgs.	
25	795	48-50	38 60 50/0.2' NA	60	1.1	0.0			Light brown matrix composed of SILT, little Clay, some gray Rock fragments (mostly Shale with trace fossil), fine subangular to angular Gravel and coarse Sand, no odor/sheen/staining, hard. [TILL]	
26	50	50-52	45 50/0.2' NA NA	NA	0.7	0.0			As above, with trace medium Sand. [TILL]	Cement/Bentonite Grout (0 - 93' bgs)
27		52-54	50/0.3'	NA	0.0	0.0			No Recovery. Rollerbit advances to 54.5' bgs. Cobbles and boulder from 52'-53' bgs, less hard from 53'-54'.	
28	790	54-55	70 50/0.2'	NA	0.6	0.1			Light gray brown SILT matrix and coarse SAND and fine angular GRAVEL (mostly black shale), little Clay, very hard, wet, no odor/sheen/staining. [TILL]	
NA	55	55.2-56	NA	NA	NA	NA			No Sampling, drill to 56' bgs.	

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Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
7/23/01	13.3'	

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: MW01-03R

Site Location:

Court Street
Binghamton, NY

Well Depth: 108.1 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
		29	56-56.7	46 50/0.2	NA	0.5	0.0		Light gray-brown (khaki) SILT matrix with gray-black coarse SAND and fine subangular to angular GRAVEL, little Clay, massive (no consistent concentration of clasts), very hard, wet, no odor/sheen/staining. [TILL]	
		NA	56.7-58	NA	NA	NA	NA		No Sampling, drill to 58' bgs.	2" PVC Riser (~2.5 ags - 98' bgs)
		30	58-58.3	50/0.3	NA	0.3	0.1		As above from 58'-56.7' bgs, with little medium Sand.	
785									No Sampling, drill to 61.2' bgs.	
60		NA	58.3- 61.2	NA	NA	NA	NA			Cement/Bentonite Grout (0 - 93' bgs)
		31	61.2- 62.8	HW Core	NA	1.1	0.0		HQ CORE RUN (61.2-62.8' bgs): Light brown SILT and little CLAY matrix with medium to coarse SAND and fine to coarse subrounded to angular GRAVEL, multiple rock types (includes shale, siltstone, pink granite), wet, hard, No odor/sheen/stains. [TILL]	
		NA	62.8- 63.5	NA	NA	NA	NA		No Sampling, drill to 63.5' bgs.	
780		32	63-63.5	50/0.2	NA	0.1	0.0		As above from 61.2'-62.8' bgs. [TILL]	
									No Sampling, drill to 66.2' bgs.	
65		NA	63.7- 66.2	NA	NA	NA	NA			4.5-inch Borehole (45' - 103' bgs)
		33	66.2- 66.9	45 50/0.2	NA	0.7	0.0		As above from 61.2'-62.8' bgs. [TILL]	
		NA	66.9-68	NA	NA	NA	NA		No Sampling, drill to 68' bgs.	
		34	68-68.7	50 50/0.2	NA	0.7	0.0		As above from 61.2'-62.8' bgs, with trace oxidation staining, no odor or sheen. [TILL]	
775		NA	68.7-70	NA	NA	NA	NA		No Sampling, drill to 70' bgs.	
70		35	70-70.7	55 50/0.2	NA	0.5	0.8		Light brown SILT and little CLAY matrix with medium to coarse SAND and fine to coarse subrounded to angular GRAVEL, multiple rock types (includes shale, siltstone, pink granite), little oxidation staining, little dark brown discoloration at 70.7' bgs, wet, hard, no odor/sheen/stains. [TILL]	
		NA	70.7- 72.6	NA	NA	NA	NA		No Sampling, drill to 72' bgs.	
		36	72-72.6	55 50/0.1	NA	0.5	0.6		As above from 70'-70.2' bgs. [TILL]	
									No Sampling, drill to 75' bgs, no sheens in return water.	
770		NA	72.6-75	NA	NA	NA	NA			
75		37	75-75.4	75/0.4	NA	0.4	0.0		Light brown SILT, little brown Silt and Clay matrix, some medium to coarse Sand and Gravel (primary shale fragments), horizontal bedded (possible weathered Brown), no odor/sheen/staining. [TILL]	
		NA	75.4- 80.5	NA	NA	NA	NA			

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Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
7/23/01	13.3'	

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: MW01-03R

Site Location:

Court Street
Binghamton, NY

Well Depth: 108.1 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
765		NA	75.4-80.5	NA	NA	NA	NA		No Sampling, drill to 80.5' bgs, no sheens in return water.	2" PVC Riser (~2.5 ags - 98' bgs)
80		38	80.5-81.2	48 50/0.2'	NA	0.5	0.0		Light brown SILT and medium to coarse SAND, some fine angular Gravel, little Clay matrix, gray oxidation staining, hard, wet, no odor or sheen. [TILL]	Cement/Bentonite Grout (0 - 93' bgs)
									No Sampling, drill to 85.5' bgs.	4.5-inch Borehole (45' - 103' bgs)
760		NA	81.2-85.5	NA	NA	NA	NA			
85		39	85.5-86.2	25 50/0.2'	NA	0.4	0.0		As above from 80.5'-81.2' bgs. [TILL]	
		NA	86.2-90.2	NA	NA	NA	NA		No Sampling, drill to 90.2' bgs. Driller reports hard drilling, probable Cobbles throughout zone.	
755		40	90.2-90.7	75	NA	0.5	0.0		As above from 80.5'-81.2' bgs, with more weathered shale. [TILL] Refusal at 90.7' bgs.	
90		NA	90.7-94.2	NA	NA	NA	NA		No Sampling. Driller reports rock surface at 92' bgs. Rollerbit advance to 94.2' bgs to confirm.	
750				Min/ft	RQD					
95		1	94.2-97.5	3:00 3:30	34	2.5	NA		Dark gray SHALE with horizontal bedding, slightly weathered, medium hard, no staining/sheens/odor. BREAKS: Oxidation on fracture face at 94.5'; Clay in fracture at 95' and 95.4' bgs; broken zone from 92.2'-95.4'.	Bentonite (93' - 96' bgs)

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Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
7/23/01	13.3'	

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: MW01-03R

Site Location:

Court Street
Binghamton, NY

Well Depth: 108.1 ft. bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches/ Minutes per foot	N - Value / RQD (%)	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction	
		1	94.2-97.5	4:30 5:30	34	2.5	NA		Dark gray SHALE with horizontal bedding, slightly weathered, medium hard, no staining/sheens/odor. BREAKS: Little Clay in fracture at 96.2'; Trace weathering (ill-fitting fracture) at 96.7'; vertical hairline fracture from 96.4'-96.6'; and Vertical break from 96.6'-96.7'.	2" PVC Riser (~2.5 ags - 98' bgs) Grade 0 Sand Pack (96' - 108' bgs) 2" Diameter PVC Screen (98' - 108' bgs) 3-7/8-inch Rollerbit Borehole (103' - 108' bgs)	
745		2	97.5-102.4	5:00 10:00 10:00 9:00 10:00	20.4	4.9	NA		Dark gray to almost black SHALE, slightly weathered, horizontal bedding and closed bedding, medium hard, no sheens, no odor, no staining. BREAKS: Horizontal breaks at 98.3' (trace Clay), 98.9' (Clay, weathered), 99.3' & 99.4' (trace Clay), 101.6' (little Clay, slight weathering), 102.1' & 102.2' (slight weathering); Broken zone from 98.5'-98.7' (gray Clay, weathered), 100.6'-100.7' & 101.9'-102'. Subvertical fracture from 98.7'-98.9'.		
-100								No Recovery, clay seam or void.			
740				6:00 6:00					Dark gray, close bedded SHALE, medium hard, slightly weathered, horizontal bedding, no odor/sheens/staining. BREAKS: Horizontal breaks at 102.8' (slightly weathered), 103.2'-103.4' (trace Clay, slightly weathered), 103.5' (little weathered, Clay), 104.9' (trace weathering), 105' & 105.2' (trace weathering), 105.9' (trace Clay), 106.4' (mostly fresh), & 107.4' (trace Clay); vertical fracture from 104.9'-105.9' (trace weathering, cuts across horizontal fractures).		
-105				6:00 6:00 6:00 6:00					Boring first drilled and sampled to till with 4-1/4" HSA, then overdrilled with 6-1/4" HSA to set outer steel casing. Till drilled with 4.5-in. OD spun casing to refusal at 72.5' bgs. Remainder of till drilled uncased with 3-7/8-in. rollerbit to rock surface. HQ core drilled 15' into rock. After hole collapsed, spun casing withdrawn to replace bit, then readvanced to rock surface and 11' into rock to 103' bgs. Rollerbit cleared hole to 108' bgs and well set.		
735		3	102.4-108.1	86	5.2	NA					
-110											
730											
-115											

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Remarks: Horiz. datum: NAD83-State Plane NY Central
Vert. datum: NGVD 29

Water Level Data

Date	Depth	Elev.
7/23/01	13.3'	

Depth measured from top of casing.

Date Start/Finish: 1/2/04 - 1/5/04 Drilling Company: Lyon Drilling Driller's Name: Harry Lyon Drilling Method: Hollow Stem Auger	Northing: 766671.21 Easting: 1006357.07 Casing Elevation: 847.49' AMSL Surface Elevation: 848.1' AMSL Borehole Depth: 50' bgs Descriptions By: Michael R. Arlauckas	Well ID: PZ03-01 Client: New York State Electric and Gas Location: Court Street Binghamton, NY
Sampler Size: 2-in. & 3-in. Split Spoon Auger Size: 4.25-in. ID Rig Type: CME 55-Truck Mount Rig		

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
850										
0									Hand Auger to 5.0' bgs.	8" diameter Flush-Mount Curb Box with bolt-on lid
845		NA	0-5	NA	NA	NA	0.0			Concrete Surface Seal (0.0' - 1.0' bgs) Sand Drain (0.8' - 1.0' bgs)
5		1	5-6	6 13	NA	1.1	0.0	x x x x	Dark brown fine to coarse SAND, trace subangular fine to medium Gravel, Concrete, Brick fragments, moist. [FILL]	Cement/Bentonite Grout (1.0' - 41.9' bgs)
		2	6-8	16 14 14 12	28	0.9	0.0		Brown fine to coarse SAND, little Rock fragments, trace Clay, trace Silt, dry.	
840		3	8-10 3-in. SS	5 4 2 5	NA	0.7	0.0		Brown fine to coarse SAND, little subangular fine Gravel, trace Silt, dry.	
10		4	10-12 3-in. SS	2 3 5 4	NA	0.8	0.0			
		5	12-14	4 4 2 1	6	0.6	0.0		Brown fine to medium SAND, some coarse Sand, trace subangular fine Gravel, dry.	1-inch ID sch. 40 PVC Flush Thread Riser (0.4' - 45.0' bgs)
835		6	14-16	1 1 1 1	2	0.9	0.0		Brown to light brown fine to coarse SAND, some subrounded to rounded medium to coarse Gravel, moist to wet.	
15										



Remarks: NA = Not Applicable.
 bgs = below ground surface.
 AMSL = Above Mean Sea Level.
 Well Depth: 47.0' bgs.

Horizontal Datum: NAD83 - New York Central State Plane
 Vertical Datum: NGVD89

Water Level Data

Date	Depth	Elev.

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: PZ03-01

Site Location:

Court Street
Binghamton, NY

Borehole Depth: 50' bgs

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
20	830	7	16-18	2	6	1.1	0.0		Brown fine to coarse SAND, some fine to medium subrounded Gravel, trace very fine Sand and Silt, wet.	
				2						
				4						
				5						
	8	18-20	3-in. SS	5	NA	0.6	0.0		Brown to tan medium to coarse rounded GRAVEL, little medium to coarse Sand, wet, slight hydrocarbon odor.	
				6						
				8						
	9	20-22	3-in. SS	3	NA	0.5	0.0			
				6						
	825	10	22-24	11	8	0.0	0.0		No Recovery.	
				12						
				4						
2										
25	11	24-26	3	NA	0.7	0.0		Brown fine to medium subrounded to rounded GRAVEL, some very fine to medium Sand, wet, slight odor.		
			3							
			3							
			1							
820	12	26-28	1	2	0.0	0.0		No Recovery.		
			1							
			1							
			1							
30	13	28-30	4	NA	0.5	0.0		Brown fine to medium GRAVEL, some fine to coarse Sand, trace Silt, loose, wet.		
			7							
			9							
			13							
815	14	30-32	4	10	1.1	0.0				
			5							
			5							
			9							
35	15	32-34	14	NA	1.1	0.0		Brown fine to medium SAND, little coarse Sand, little fine to medium subrounded Gravel, loose, wet.		
			15							
			16							
			18							
35	16	34-36	8	20	0.9	0.0		Brown medium to coarse subrounded to rounded GRAVEL, very loose, wet.		
			11							
			9							
			5							



BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Remarks: NA = Not Applicable.
bgs = below ground surface.
AMSL = Above Mean Sea Level.
Well Depth: 47.0' bgs.

Horizontal Datum: NAD83 - New York Central State Plane
Vertical Datum: NGVD89

Water Level Data

Date	Depth	Elev.

Depth measured from top of casing.

Borehole Depth: 50' bqs

[illegible]

Depth measured from top of casing.

Client:

New York State Electric and Gas

Well ID: PZ03-09 AD**Site Location:**Court Street
Binghamton, NY**Borehole Depth:** 50.6' below grade

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction	
835				11					Brown fine to medium SAND, trace coarse Sand, moist.		
		6	16-18 3-in. SS	7 21 8	NA	1.1	0.0		16.7' - 16.9' Broken Rock fragments.	PZ03-09D: 1-inch ID sch. 40 PVC Flush Thread Riser (0.6' - 46' bgs)	
		7	18-20	5 8 7 7	15	1.5	0.0		Dark brown fine to medium SAND, trace subrounded to rounded fine Gravel, moist.	#00N Morie Silica Sandpack (11' - 23.5' bgs)	
20									19.5' Wet.		
									Same as above, little subrounded to rounded fine to medium Gravel, wet.		
830		8	20-22 3-in. SS	10 10 9 10	NA	1.6	0.0			PZ03-09A: 2-inch ID sch. 40 PVC 0.010" slotted Well Screen (13' - 23' bgs)	
		9	22-24	3 5 6 6	11	1.5	0.0				
		10	24-26 3-in. SS	14 15 20 7	NA	1.4	0.0		Brown fine to medium SAND, some subrounded to rounded fine to medium Gravel, wet.		
25											
825		11	26-28	1 1 2 1	3	1.8	0.0		Same as above, little subrounded to rounded fine to medium Gravel, wet.		
		12	28-30 3-in. SS	4 6 9 9	NA	1.5	0.0			Hydrated Bentonite Seal (23.5' - 44' bgs)	
30											
820		13	30-32 32-34	6 3 2 2	5	0.9	0.0		Brown fine to medium SAND, little very fine Sand, trace subrounded to rounded fine Gravel, wet.		
		14	3-in. SS	2 3 7 7	NA	0.6	0.0				
		15	34-36	3 6 5 3	11	0.8	0.0		Brown to dark brown fine to coarse SAND, some subrounded to subangular fine to medium Gravel, wet.		
35											
 BLASLAND, BOUCK & LEE, INC. engineers & scientists Remarks: NA = Not Applicable/Not Available; bgs = below ground surface; AMSL = Above Mean Sea Level. PZ03-09A Well Depth: 23.0' bgs. PZ03-09D Well Depth: 48.0' bgs. Horizontal Datum: NAD83 - New York Central State Plane Vertical Datum: NGVD89									Water Level Data		
									Date	Depth	Elev.
									Depth measured from top of casing.		

Client:

New York State Electric and Gas

Well ID: PZ03-09 AD

Site Location:

Court Street
Binghamton, NY

Borehole Depth: 50.6' below grade

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
815		16	36-38 3-in. SS	13 15 24 15	NA	0.6	0.0		Dark brown medium to coarse SAND, some subrounded to subangular medium Gravel, trace Rock fragments, wet.	
		16	38-40	5 11 7 7	18	0.7	0.0			PZ03-09D: 1-inch ID sch. 40 PVC Flush Thread Riser (0.6' - 46' bgs)
40		17	40-42 3-in. SS	12 20 30 38	NA	1.1	0.0			Hydrated Bentonite Seal (23.5' - 44' bgs)
810		18	42-44	8 16 16 23	32	1.5	0.0		Dark brown medium to coarse SAND, some subrounded to subangular fine to medium Gravel, wet.	
		19	44-46 3-in. SS	21 32 38 38	NA	0.5	0.0		Same as above, little Silt.	#00N Morie Silica Sandpack (44' - 48.5' bgs)
45		20	46-48	17 18 15 16	33	NA	0.0		Tan to brown SILT, little subrounded to subangular fine Gravel, trace fine Sand, moist to wet.	PZ03-09D: 1-inch ID sch. 40 PVC 0.010" slotted Well Screen (46' - 48' bgs)
805		21	48-50 3-in. SS	38 50/3 NA NA	NA	0.9	0.0		Dark brown SILT, little subrounded to subangular fine to medium Gravel, trace Clay, moist.	
		22	50-52	41 50/0	NA	0.6	0.0		48.3' Olive green SILT, some Clay, little subangular fine Gravel, hard, dry. [TILL]	Hydrated Bentonite Chips (48.5' - 50.6' bgs)
50										
800										
55										



Remarks:

NA = Not Applicable/Not Available; bgs = below ground surface; AMSL = Above Mean Sea Level.
PZ03-09A Well Depth: 23.0' bgs.
PZ03-09D Well Depth: 48.0' bgs.

Horizontal Datum: NAD83 - New York Central State Plane
Vertical Datum: NGVD89

Water Level Data

Date	Depth	Elev.

Depth measured from top of casing.

Date Start/Finish: 1/18/04 Drilling Company: Prosonic Corporation Driller's Name: Gerald Sealey Drilling Method: Rotosonic/ 5" Core Barrel	Northing: 766686.12 Easting: 1006314.54 Casing Elevation: 849.1' AMSL Surface Elevation: 849.65' AMSL Borehole Depth: 47' below grade Descriptions By: Kristina Gross Michael R. Arlauckas	Well ID: SB-305/NMW-1 Client: New York State Electric and Gas Location: Court St. Binghamton, NY
Sampler Size: NA Auger Size: NA Rig Type: Rotosonic		

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
850	0									
845	5	NA	0-7	NA	NA	NA	0.0		Hand Auger to 7' bgs.	8" diameter Flush-Mount Curb Box with bolt-on lid Concrete Surface Seal (0.0' - 1.0') Sand Drain (0.7' - 1.2' bgs) Cement/Bentonite Grout (1.2' - 27.5' bgs) 2-inch ID sch. 40 PVC Flush Thread Riser (0' - 32' bgs)
840	10								7.0' - 7.8' Brownish gray coarse SAND, some Silt, little fine Gravel, little fine Sand, wet, loose. [FILL] 7.8' - 8.6' Grayish brown SILT and fine to medium GRAVEL, little fine Sand, moist to dry, hard. 8.6' - 16.7' Brown fine to medium GRAVEL and fine to coarse SAND, little Silt, moist to dry. Faint fuel odor at 9.9' bgs, increasing with depth.	
835	15	1	7-17	NA	NA	5.1	0.0			



Remarks: NA = Not Applicable/Not Available.
 bgs = below ground surface.
 AMSL = Above Mean Sea Level.
 NMW-1 Well Depth: 47.0' bgs.

Horizontal Datum: NAD83 - New York Central State Plane
 Vertical Datum: NGVD89

Water Level Data

Date	Depth	Elev.

Depth measured from top of casing.

Client:

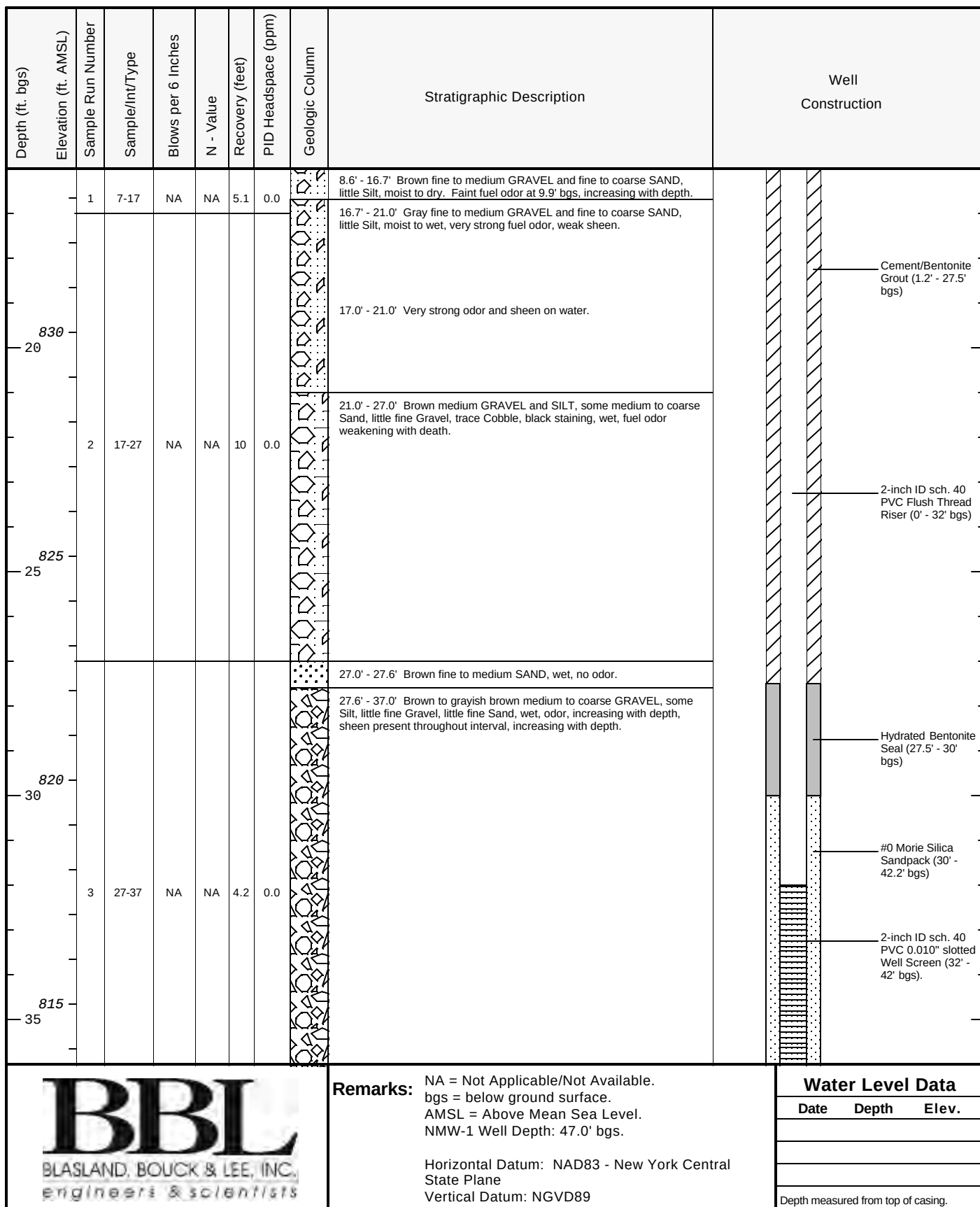
New York State Electric and Gas

Well ID: **SB-305/NMW-1**

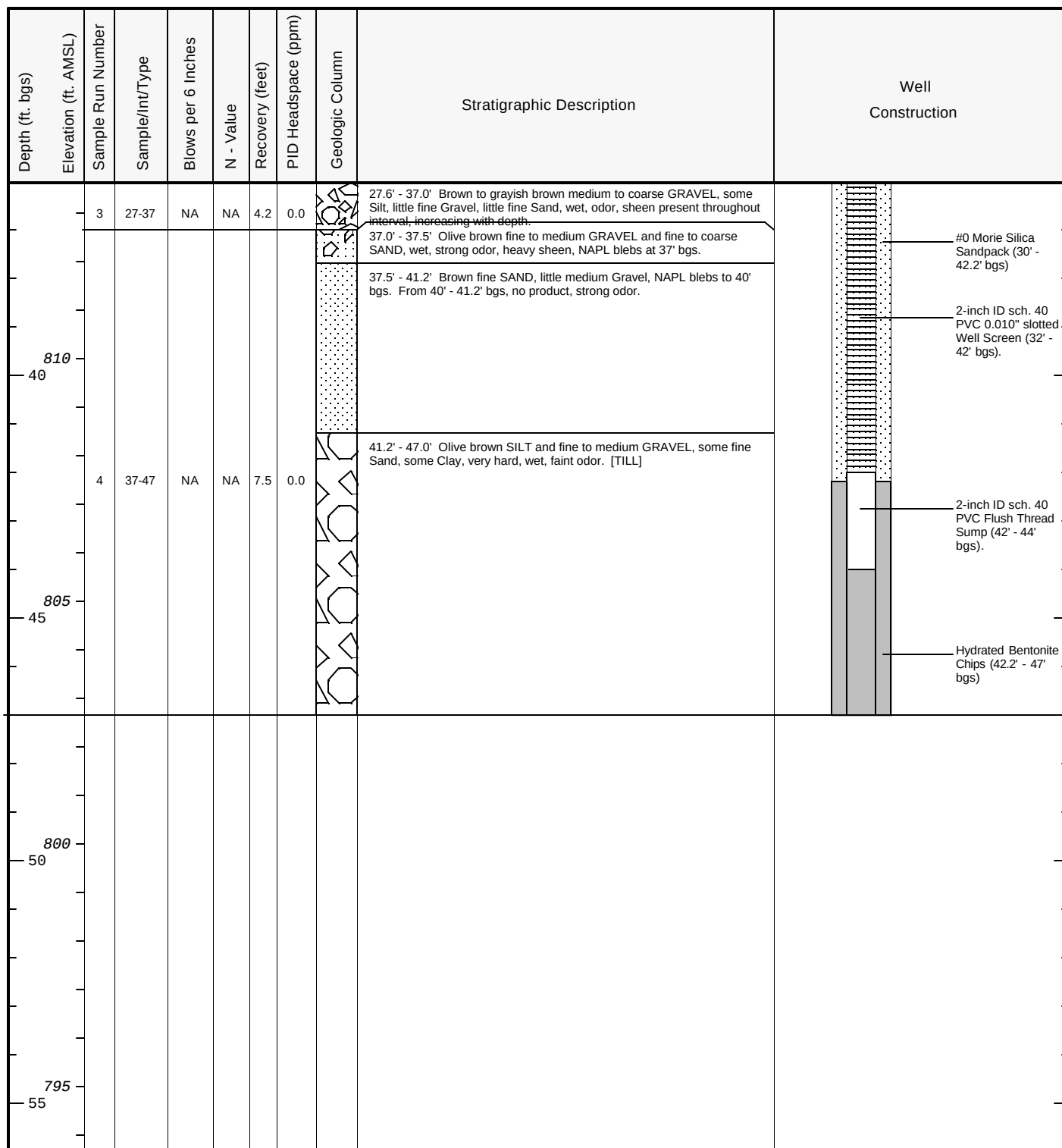
Site Location:

Court St.
Binghamton, NY

Borehole Depth: 47' below grade



Borehole Depth: 47' below grade



Depth measured from top of casing.

Date Start/Finish: 1/17/04 Drilling Company: Prosonic Corporation Driller's Name: Gerald Sealey Drilling Method: Rotosonic/ 5" Core Barrel	Northing: 766693.48 Easting: 1006368.64 Casing Elevation: 846.46' AMSL Surface Elevation: 846.69' AMSL Borehole Depth: 47' below grade Descriptions By: Kristina Gross Michael R. Arlauckas	Well ID: SB-304/NMW-2 Client: New York State Electric and Gas Location: Court St. Binghamton, NY
Sampler Size: NA Auger Size: NA Rig Type: Rotosonic		

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
0										
845		NA	0-7	NA	NA	NA	0.0		Hand Auger to 7' bgs.	8" diameter Flush-Mount Curb Box with bolt-on lid Concrete Surface Seal (0.0' - 1.0' bgs) Sand Drain (0.7' - 1.2' bgs)
5										
840										
									7.0' - 8.2' Gray brown SILT and fine to medium GRAVEL, some coarse Gravel, little fine Sand, trace Coal, moist to wet. [FILL]	
									8.2' - 17.0' Orangish brown SILT and fine to medium GRAVEL, some coarse Gravel, some Clay, trace fine Sand, hard, dry to moist.	
10										
835		1	7-17	NA	NA	3.5	0.0			Cement/Bentonite Grout (1.2' - 33' bgs)
15										2-inch ID sch. 40 PVC Flush Thread Riser (0' - 32' bgs)



Remarks: NA = Not Applicable/Not Available.
 bgs = below ground surface.
 AMSL = Above Mean Sea Level.
 NMW-2 Well Depth: 44.0' bgs.

Horizontal Datum: NAD83 - New York Central State Plane
 Vertical Datum: NGVD89

Water Level Data

Date	Depth	Elev.

Depth measured from top of casing.

Client:

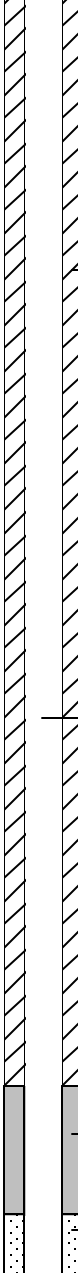
New York State Electric and Gas

Well ID: **SB-304/NMW-2**

Site Location:

Court St.
Binghamton, NY

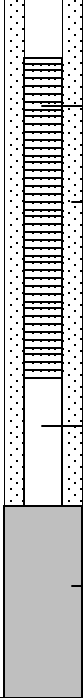
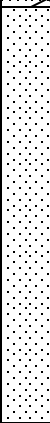
Borehole Depth: 47' below grade

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction															
830		1	7-17	NA	NA	3.5	0.0		Orangish brown SILT and fine to medium GRAVEL, some coarse Gravel, some Clay, trace fine Sand, hard, dry to moist.	 Cement/Bentonite Grout (1.2' - 33' bgs) 2-inch ID sch. 40 PVC Flush Thread Riser (0' - 32' bgs) Hydrated Bentonite Seal (33' - 35' bgs) #0 Morie Silica Sandpack (35' - 44' bgs)															
									17.0' - 19.2' Gray brown fine to medium GRAVEL, some coarse Gravel, little fine Sand, moderate to strong fuel odor, wet.																
20									19.2' - 27.0' Orange brown fine to medium GRAVEL, some coarse Gravel, little fine Sand, little to trace Silt, faint fuel odor, wet.																
825		2	17-27	NA	NA	5.0	0.0																		
25																									
820									27.0' - 27.7' Dark blackish gray fine to coarse SAND, faint fuel odor, wet.																
									27.7' - 37.0' Grayish brown fine to medium subrounded to rounded GRAVEL, little fine Sand, trace Silt, no odor, wet.																
30																									
815		3	27-37	NA	NA	5.2	0.0																		
35																									
BLASLAND, BOUCK & LEE, INC. engineers & scientists									Remarks: NA = Not Applicable/Not Available. bgs = below ground surface. AMSL = Above Mean Sea Level. NMW-2 Well Depth: 44.0' bgs. Horizontal Datum: NAD83 - New York Central State Plane Vertical Datum: NGVD89	Water Level Data <table><thead><tr><th>Date</th><th>Depth</th><th>Elev.</th></tr></thead><tbody><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></tbody></table> Depth measured from top of casing.	Date	Depth	Elev.												
Date	Depth	Elev.																							

Client:

New York State Electric and Gas

Well ID: SB-304/NMW-2**Site Location:**Court St.
Binghamton, NY**Borehole Depth:** 47' below grade

Depth (ft. bgs)	Elevation (ft. AMSL)	Sample Run Number	Sample/Int/Type	Blows per 6 Inches	N - Value	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well Construction
810		3	27-37	NA	NA	5.5	0.0		Grayish brown fine to medium subrounded to rounded GRAVEL, little fine Sand, trace Silt, no odor, wet.	 2-inch ID sch. 40 PVC 0.010" slotted Well Screen (37' - 42' bgs). #0 Morie Silica Sandpack (35' - 44' bgs) 2-inch ID sch. 40 PVC Flush Thread Sump (42' - 44' bgs). Hydrated Bentonite Chips (44' - 47' bgs)
									37.0' - 38.5' Dark grayish brown fine SAND, faint MGP odor, wet.	
40									38.5' - 40.5' Grayish brown fine to medium GRAVEL, little coarse Sand, loose, wet. NAPL blebs from 39' - 40' bgs.	
805		4	37-47	NA	NA	5.5	0.0		40.5' - 47.0' Grayish brown fine SAND, some medium to coarse Sand, wet.	
45										
800										
50										
795										
55										

**Remarks:**

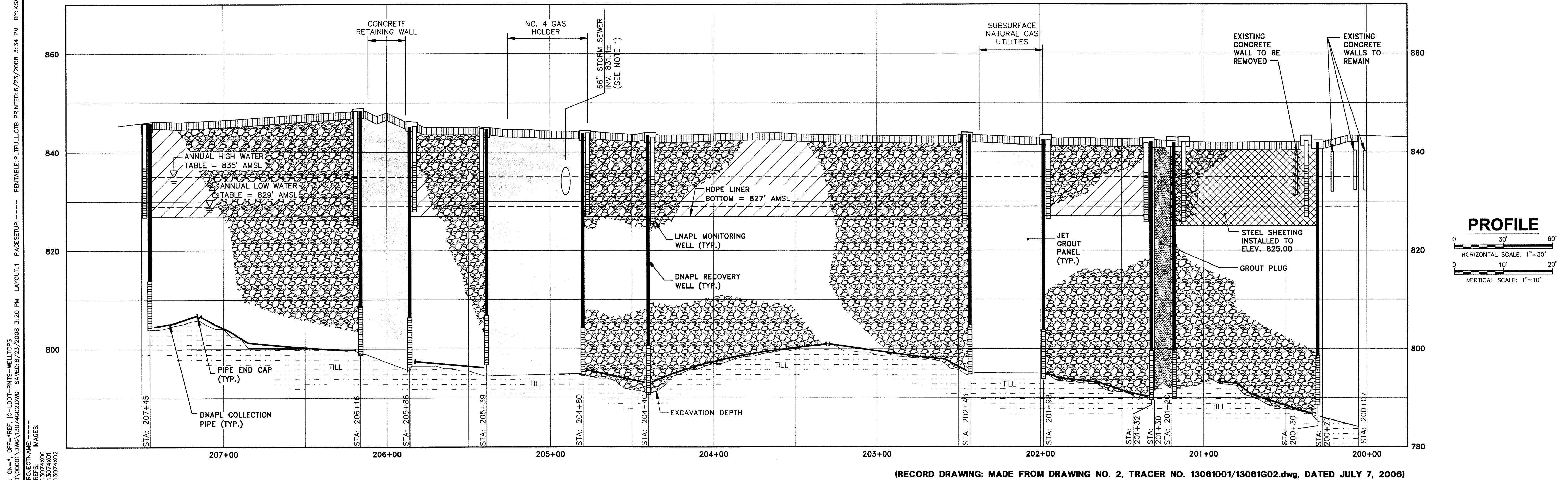
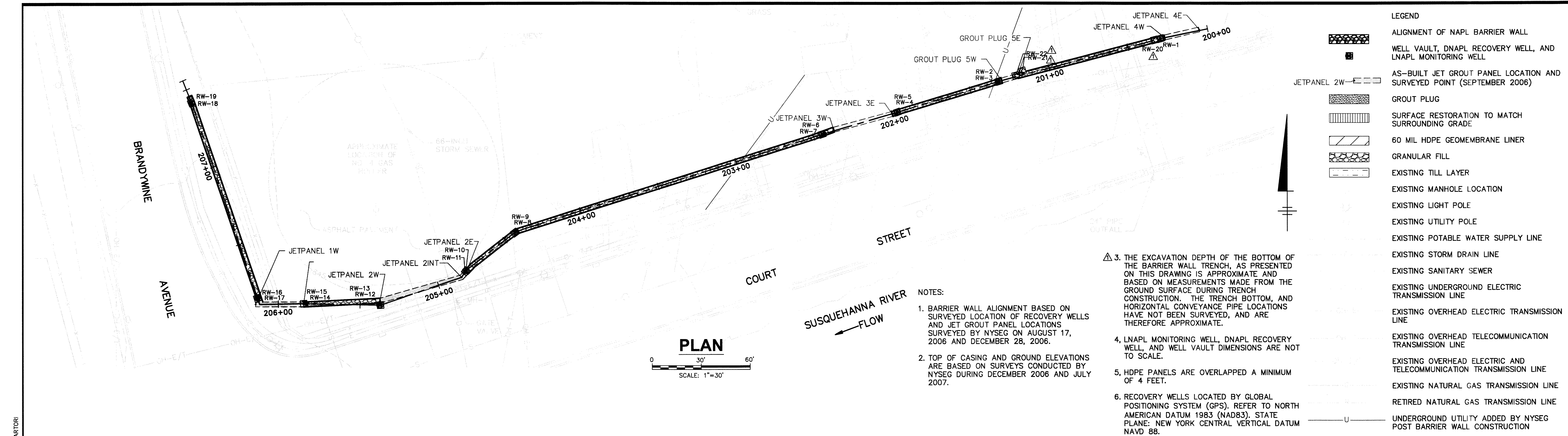
NA = Not Applicable/Not Available.
bgs = below ground surface.
AMSL = Above Mean Sea Level.
NMW-2 Well Depth: 44.0' bgs.

Horizontal Datum: NAD83 - New York Central State Plane
Vertical Datum: NGVD89

Water Level Data

Date	Depth	Elev.

Depth measured from top of casing.



SYN-85-GHS GNS KLS
L: 01-*, OFF-*, REF: JC-LDDT-PNTS-WELLTOPS
G: CAD ACT: 13071307A, 00001, 00001, 00001, 13074002.DWG, 13074002.DWG, 13074001, 13074002

PROJECT NAME: BINGHAMTON COURT STREET FORMER MGP SITE
XREF: 13074000, 13074001, 13074002

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED.
USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
1	6/09/08	REVISED TO ADDRESS NYSDEC COMMENTS AND UPDATE WELL LOCATIONS AND DEPTHS	NES/KLS

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name
MARGARET A. CARRILLO-SHERIDAN
Professional Engineer's No.
082251
State
NY
Date Signed
23 June 2008
Project Mgr.
DLM
Designed by
MCS
Drawn by
GHS

ARCADIS BBL
Infrastructure, environment, facilities

NEW YORK STATE ELECTRIC & GAS CORPORATION • BINGHAMTON, NEW YORK
BINGHAMTON COURT STREET FORMER MGP SITE
NAPL BARRIER WALL IRM FINAL REPORT
AS-BUILT NAPL BARRIER WALL
PLAN AND PROFILE

BBL Project No.
130.61
Date
MARCH 2, 2007
ARCADIS of New York, Inc.
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

1

Appendix D

Excavation Work Plan

NYSEG

Excavation Work Plan

**Binghamton Court Street Former Manufactured Gas
Plant Site, Operable Unit No. 1 & No. 2
Broome County, Binghamton, New York
NYSDEC Site No. 7-04-031**

July 2026

Excavation Work Plan

Binghamton Court Street Former Manufactured Gas Plant Site, Operable Unit No.1 & No. 2

July 2026

Prepared By:

Arcadis of New York, Inc.
One Lincoln Center, 110 West Fayette Street, Suite 300
Syracuse
New York 13202
Phone: 315 446 9120
Fax: 315 449 0017

Prepared For:

NYSEG
18 Link Drive
Binghamton, New York 13902-5224

Our Ref:

30280133

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Appendices

Appendix A – NYSDEC Request to Import/Reuse fill or Soil Form

This Excavation Work Plan (EWP) has been prepared as an appendix to the July 2026 Draft Site Management Plan (SMP) to support potential future intrusive (i.e., subsurface) activities at the NYSEG Binghamton Court Street Former Manufactured Gas Plant (MGP) Site located in Binghamton, New York (the Site).

1 Notification

At least 15 days prior to the start of any activity that is anticipated to encounter remaining impacts or breach or alter the site's cover system, the site owner or their representative will notify the NYSDEC contact listed below. The contact information provided below will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Section 1.3 of the SMP.

Justin Starr
New York State Department of Environmental Conservation (NYSDEC)
Division of Environmental Remediation
625 Broadway, 11th Floor
Albany, New York 12233-7014
518.402.9797
888.459.8667 (toll free)
justin.starr@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of impacted soil to be excavated, any modifications of truck routes, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of constituents of concern, potential presence of grossly impacted media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work, and submittals (e.g., reports) to the NYSDEC documenting the completed intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120 and 29 CFR 1926 Subpart P;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix E of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP. The alteration, restoration and modification of engineering controls

must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations.

2 Soil Screening Methods

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed during all excavations into known or potentially impacted material (remaining impacts) or a breach of the cover system. A qualified environmental professional as defined in 6 NYCRR Part 375, a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the certificate of completion (COC).

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section 7 of this EWP.

3 Soil Staging Methods

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Stockpiles will be inspected by the qualified environmental professional at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site during active site work and be available for inspection by the NYSDEC.

4 Materials Excavation and Load-Out

A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will oversee all invasive work and the excavation and load-out of all excavated material. The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements at the Site will be investigated by the qualified environmental professional, the owner of the property, the remedial party (if applicable), and contractors. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site. A site utility stakeout will be completed for all utilities prior to any ground intrusive activities at the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements). A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for inspecting that all outbound

trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the Site will be inspected daily for evidence of off-site soil tracking. The qualified environmental professional will be responsible for inspecting that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed by the contractor as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

5 Materials Transport Off-Site

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

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

Truck transport routes are as follows:

- Proceed west on Court Street.
- Turn left onto Ramp to North Shore Drive (NY Route 363 – North)
- Continue to NY Route 7
- Proceed on Interstate 81, as desired.

All trucks loaded with site materials will exit the vicinity of the Site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site to minimize off-site disturbance. Off-site queuing will be prohibited.

6 Materials Disposal Off-Site

All material excavated and removed from the Site will be treated as impacted and regulated material and will be transported and disposed off-site in a permitted facility in accordance with all local, State and Federal regulations. If disposal of material from this Site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC project manager. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D debris recovery facility) Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and impacted soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted soil cleanup objectives (SCOs) is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 360-15 registered or permitted facility).

7 Materials Reuse On-Site

The qualified environmental professional as defined in 6 NYCRR part 375 will observe that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Impacted on-site material, including historic fill and impacted soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances [April 2023 or date of current version, whichever is later] guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill material for reuse on-site will be segregated and staged as described in Section 2 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager.

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

8 Fluids Management

All liquids to be removed from the Site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations.

Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

9 Cover System Restoration

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Record of Decision. The existing cover system is comprised of a minimum of 12 inches of clean soil, asphalt pavement, concrete covered sidewalks, etc. The demarcation layer, consisting of (orange snow fencing material, white geotextile or equivalent material, etc.) will be replaced to provide a visual reference to the top of the remaining potentially impacted material that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining impacted material. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP. The alteration, restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

10 Backfill From Off-Site Sources

All materials proposed for import to the Site will be approved by the qualified environmental professional, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at <http://www.dec.ny.gov/regulations/67386.html>, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. A copy of the form is presented in Appendix A of this EWP.

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

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for commercial/industrial use. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards for commercial/industrial use are listed in Appendix 5 of Division of Environmental Remediation (DER) DER-10 Technical Guidance for Site Investigation and Remediation (DER-10). Soils that meet 'general' fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC project manager. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

11 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed by the contractor and inspected by the qualified environmental professional once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site during active work and available for inspection by the NYSDEC, corrective actions will be taken as follows:

- All necessary repairs will be made immediately.
- Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.
- All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.
- Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP will be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

12 Excavation Contingency Plan

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

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (i.e., target analyte list (TAL) metals, target compound list (TCL) volatiles and semi-volatiles (including 1,4-dioxane), TCL pesticides and polychlorinated biphenyls (PCBs), and per- and poly-fluoroalkyl substances (PFAS)), unless the site history and previous sampling results provide sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected impacted media identified by screening during invasive site work will be promptly communicated by phone within two hours to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

13 Community Air Monitoring Plan

Air monitoring station locations will be determined based on wind directions at the beginning of each shift. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations. Exceedances of action levels listed in the Generic Community Air Monitoring Plan (GCAMP), included as Appendix F to the SMP, will be reported to NYSDEC and New York State Department of Health (NYSDOH) Project Managers.

Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 part-per-million, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 micrograms per cubic meter, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 micrograms per cubic meter or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work with Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

14 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-site. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of

all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

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

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

15 Dust Control Plan

Particulate monitoring must be conducted according to the Generic Community Air Monitoring Plan (GCAMP) provided in Appendix F of the SMP. If particulate levels at the site exceed the thresholds listed in the GCAMP or if airborne dust is observed on the site or leaving the site, the dust suppression techniques listed below will be employed. The remedial party will also take measures listed below to prevent dust production on the Site.

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

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

16 Other Nuisances

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

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

Appendix A

NYSDEC Request to Import/Reuse Fill or Soil Form



**NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**



Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

Site Name:

Site Number:

The allowable site use is:

Have Ecological Resources been identified?

Is this soil originating from the site?

How many cubic yards of soil will be imported/reused?

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone?

Does it contain less than 10%, by weight, material that passes a size 100 sieve?

Is this virgin material from a permitted mine or quarry?

Is this material recycled concrete or brick from a DEC registered processing facility?

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Name and address of fill source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

Signature

Date

Print Name

Firm

Appendix E

Health and Safety Plan



Site Specific Health and Safety Plan

Template Revision: 21 a

Project Name: New York State Electric & Gas Corporation
Binghamton Court Street
293-295 Court Street
Binghamton, NY 13904

Project Number: 30226870
Client Name: New York State Electric & Gas Corporation
Date: 3/12/2025
HASP Expires: 3/12/2026
Revision: 0

Approvals:

HASP Developer: Molly Greene

Project Manager: Joe Bistrovich

HASP Reviewer: Veronica Bean

HASP Reviewer Name Typed

A handwritten signature in black ink that reads "Veronica L. Bean".

HASP Reviewer Signature (handwritten or digital signature)

Emergency Information

Site Address:

293-295 Court Street
Binghamton, NY 13904

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
Binghamton Police Bureau		607-723-5321
Binghamton Fire Department		607-772-7133
Emergency Other (specify): NYS Spill Hotline		1-800-457-7362
Primary Client Contact:	Levia Terrell	607-432-1652
	John Ruspantini	607-762-8787
WorkCare (non-life-threatening injury/illness):		1-888-449-7787
Project H&S:	Dan Zuck	315-671-9152
Task Manager:	Joe Bistrovich	315-671-9697
Project Manager:	Joe Bistrovich	315-671-9697
H&S Specialist:	Alec MacAdam	720-454-0948
Area H&S Director:	Aaron Svitana	925-360-2313

Hospital Name and Address:

UHS Binghamton General Hospital
10-42 Mitchell Ave
Binghamton, NY 13903

Hospital Phone Number:

607-762-2200

Supplemental Client Contact Information:

Other Important Phone Numbers:

Poison Control Center	1-800-222-1222
Nat. Response Ctr. (spills in reportable quantities)	1-800-424-8802
U.S. Coast Guard (spills to water)	1-800-424-8802

Incident Reporting Protocol Within Arcadis

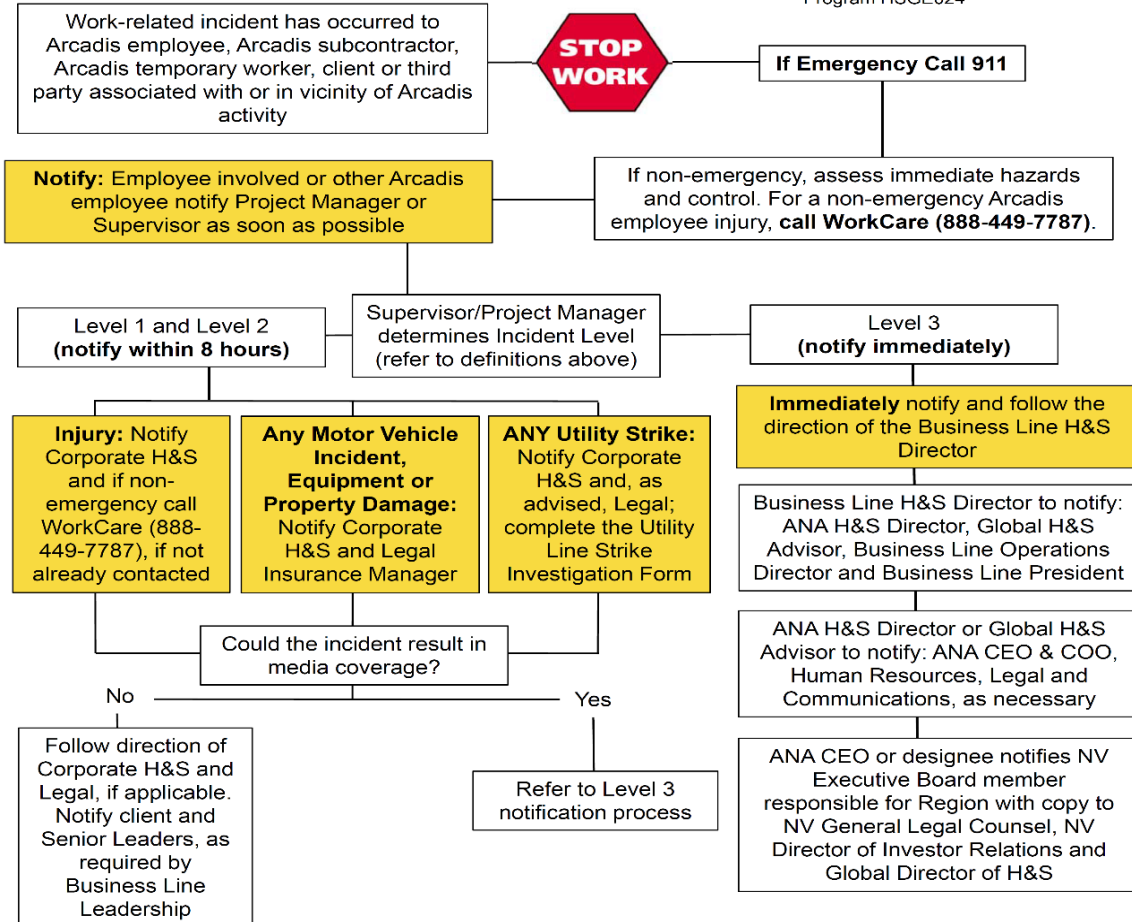
Incident Levels

Level 1: First aid/self-treated, work-related injury (contact WorkCare as soon as possible); minor property or equipment damage (less than or equal to \$100); vehicle loss event* (no injuries, no third-party involvement or other vehicle involvement).

Level 2: Professional Medical Treatment (if non-emergency injury or illness, employee must contact WorkCare as soon as possible); moderate property or equipment damage (greater than \$100 but less than or equal to \$5,000); ANY utility strike incident, any motor vehicle accident* (including injury or third-party involvement).

Level 3: Immediately report fatality, severe or catastrophic injury and/or overnight hospitalization required; significant property or equipment damage (greater than \$5,000); missing person or incident that generates media coverage.

* Refer to Motor Vehicle Safety Program HSGE024



Client Incident Reporting Protocol

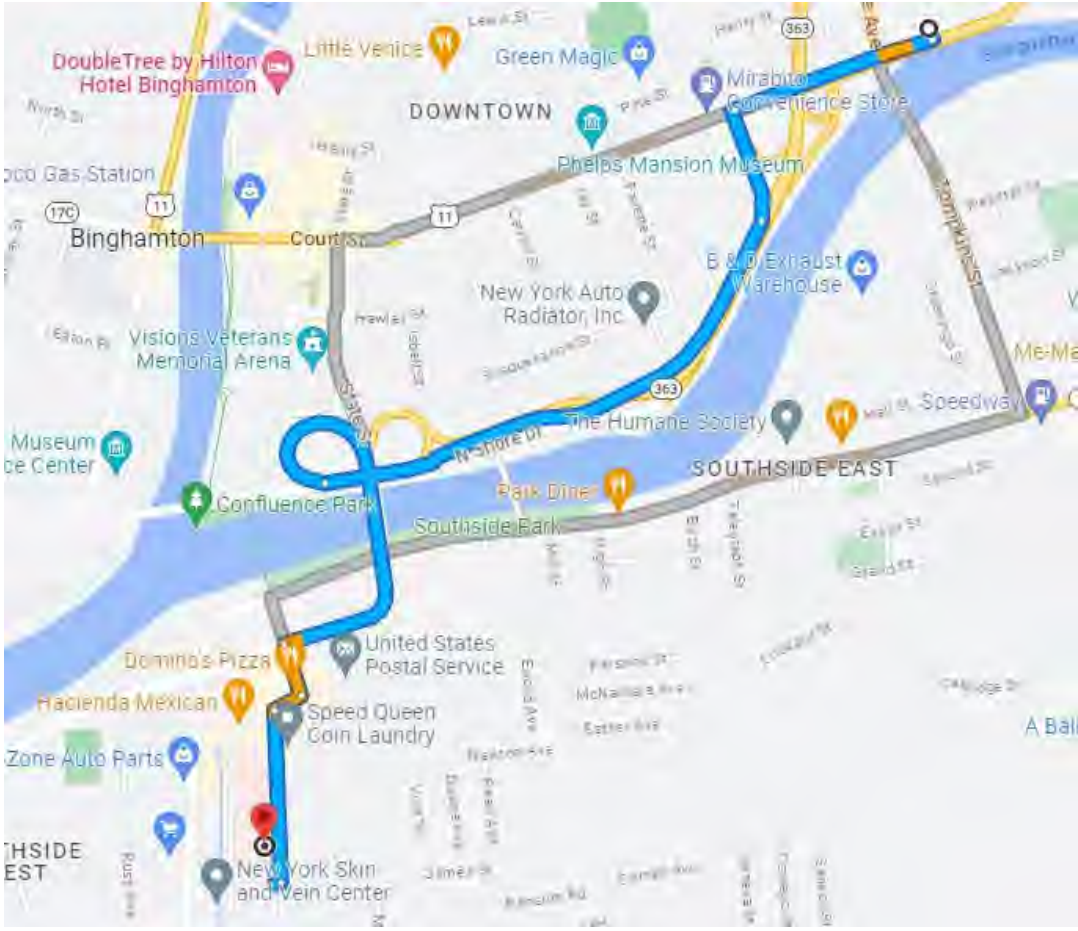
Dial 911/Facility Emergency Number/Work Care as applicable.

Contact PM: Joe Bistrovich

Contact Corporate H&S: Aaron Svitana

Contact Client: Levia Terrell or John Ruspantini

Route to the Hospital



293 Court St
Binghamton, NY 13904

- Take NY-363 S/N Shore Dr to S Washington St
4 min (1.8 mi)
- Head west on Court St toward Brandywine Ave
0.3 mi
- Turn left onto the ramp to NY-434 W/Vestal
0.2 mi
- Merge onto NY-363 S/N Shore Dr
0.6 mi
- Use the right lane to merge onto NY-434 W/State St via the ramp to Vestal
0.6 mi
- Continue to follow NY-434 W
- Take Mitchell Ave to your destination
2 min (0.4 mi)
- Turn left onto S Washington St
407 ft
- Turn right onto Vestal Ave
226 ft
- Turn left onto Mitchell Ave
0.2 mi
- Turn right
43 ft

UHS Binghamton General Hospital
10-42 Mitchell Ave, Binghamton, NY 13903

Site Map Showing Assembly Areas



Site Type

The project site is an active facility with the following attributes:

Buildings	Active
Commercial	Residential
Industrial	

Surrounding Land Use and Topography

The site is bordered to the north by a major Norfolk and Southern Railroad line and yard, an asphalt works plant, and a scrap yard; to the south by Court Street, which runs parallel to the Susquehanna River; to the east by the 295 Court Street Associates, LLC; and to the west by Brandywine Avenue.

Topography at the site is generally flat with an overall slope to the south towards the Susquehanna River.

Simultaneous Operations (SimOps)

SimOps is expected or will be conducted in proximity to Arcadis work activities on the project site. SimOps creates unique hazards that could affect Arcadis employees and subcontractors and SimOps hazards identified on site will be addressed in the JSA or similar governing document (i.e. permit) for affected Arcadis work tasks. If the SimOps work activities create a high hazard to Arcadis staff or subcontractors, Arcadis will utilize stop work until the SimOps activity is complete or will coordinate work activities with SimOps workers and/or client to ensure SimOps work hazards are mitigated.

Site Background

The site formerly housed a manufactured gas plant (MGP) from approximately 1888 to 1939, during which time operations gradually expanded until covering the entire site. Various structures were located within the site. All aboveground structures associated with the MGP were dismantled by 1969.

Project Tasks

The following tasks are identified for this project:

1	Monitor well - Well sounding, water level or product measurements using probes, tapes or downhole water parameter measurements
2	Biological- Vegetation maintenance, clearing and/or removal using manual methods
3	Biological - Sampling/surveys - Vegetation
4	Site Inspection
5	Oversight - Oversight of contractors

The following documents/plans/support associated with the above task(s) are attached or to be provided:

☒ Required Checklists/Work Forms

Tailgate Safety Briefing Form
Vehicle Inspection Checklist

☐ Required Permits

☒ Required H&S Standards

Motor Vehicle Safety Program_ARC HSGE024
Stop Work Authority_ARC HSGE009
Hand and Power Tools_ARC HSFS008
Hearing Conservation_ARC HSIH008

Short Service Employees (SSEs), Part Time As Needed Employees (PTANs) and Temporary Agency Employees

SSEs (employees who are employed with Arcadis for less than 1 year or are Inexperienced Workers), PTANS and Temporary Workers are not anticipated to be working on this project. If staffing changes occur during this project and these workers are utilized, the project team working in conjunction with the administrative supervisor will ensure applicable requirements of ARC HSGE019 "Short Service Employees" are completed. These workers will be identified in the project Tailgate Safety Meeting Form.

Roles and Responsibilities

Name	Role	Short Service Employee
1 Joe Bistrovich	Project Manager (PM)	No
2 Joe Bistrovich	Task Manager	No
3 Dave Cornell	Field Technical Lead	No
4 Dan Zuck	Site Safety Officer (SSO) (HAZWOPER)	No

☐ The staff listed above are the initial participants on this project phase of work. This phase of work will have rotating staff on a daily or weekly basis. See Project scheduling tool or equivalent tool for current staff roles and responsibilities.

Training

All Arcadis employees are required to have the following training to be on site:

Selected Arcadis employees are required to have the following additional training:

	Names or Numbers from above	
Arcadis Basic H&S Training Suite(1)	Construction Safety - 10 Hour	4, 5
Hazwoper 40-Hour	Hazwoper 8-Hour Supervisor	4, 5
Hazwoper 8-Hour Annual Refresher	BBP (Bloodborne Pathogens)	3, 4
None	Fire Extinguisher (non-certificate)	3, 4
None	First Aid/CPR	3, 4
Client specific/Other:	None	
	None	

(1) The Arcadis Basic H&S Training Suite includes the following non-certificate trainings: H&S Orientation, Hazard Communication (HAZCOM/GHS), Emergency Action Planning (EAP), Personal Protective Equipment, and Hearing Conservation. The Suite also includes the following certificate issued training: Smith System Forward/Backing Training.

Protecting Our People: Our Health, Safety and Wellbeing Principles

Staff working on any of the task(s) listed above must utilize the six Arcadis Fundamental H&S Principles to ensure work is conducted safely. These principles include: 1) Use of TRACK, 2) H&S Planning, 3) Stop Work Authority, 4) "If Not Me Then Who", 5) Stewardship, and 6) Incident Reporting. Every project team member plays an important role in project health and safety. This is more than just having a HASP, training, or PPE. Proactive staff engagement with these principles is critical to a safe work environment.



General Task Hazard Assessment and Risk Control (HARC)

General:		Site-Wide																																													
The 12 hazard category HARC ratings are not available in this General THA. The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet project needs.																																															
<table><tr><th colspan="2">Risk Assessment Matrix</th><th colspan="4">Likelihood Ratings</th></tr><tr><th colspan="2">Consequences Ratings</th><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><th>People</th><th>Property</th><th>0 Almost Impossible</th><th>1 Possible but Unlikely</th><th>2 Likely to Happen</th><th>3 Almost Certain to Happen</th></tr><tr><td>1-Slight or No Health Effect</td><td>Slight or No Damage</td><td>0-Low</td><td>1-Low</td><td>2-Low</td><td>3-Low</td></tr><tr><td>2-Minor Health Effect</td><td>Minor Damage</td><td>0-Low</td><td>2-Low</td><td>4-Medium</td><td>6-Medium</td></tr><tr><td>3-Major Health Effect</td><td>Local Damage</td><td>0-Low</td><td>3-Low</td><td>6-Medium</td><td>9-High</td></tr><tr><td>4-Fatalities</td><td>Major Damage</td><td>0-Low</td><td>4-Medium</td><td>8-High</td><td>12-High</td></tr></table>						Risk Assessment Matrix		Likelihood Ratings				Consequences Ratings		A	B	C	D	People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	3 Almost Certain to Happen	1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low	2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium	3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High	4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High
Risk Assessment Matrix		Likelihood Ratings																																													
Consequences Ratings		A	B	C	D																																										
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	3 Almost Certain to Happen																																										
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low																																										
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium																																										
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High																																										
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High																																										
Hazard																																															
Driving - On road - Injury or vehicle damage from motor vehicle accident or incident																																															
Suggested FHSB Ref:	3.4	To mitigate this hazard, use TRACK and the following:																																													
Overall Unmitigated Risk:	HIGH	Smith System (on line)																																													
Mitigated Risk:	MEDIUM	JSAs																																													
Comments:	Use Smith System "5-Keys" when driving. See Driving JSA for details.																																														
Hazard																																															
Driving - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.																																															
Suggested FHSB Ref:	3.4, 3.21	To mitigate this hazard, use TRACK and the following:																																													
Overall Unmitigated Risk:	HIGH	Smith System (on line)																																													
Mitigated Risk:	LOW	Driver awareness/use of stop work authority																																													
Comments:	Use route planning. Keep eyes moving while driving. See Driving JSA.																																														
Hazard																																															
Biological - skin/eye irritation or damage from poisonous plants																																															
Suggested FHSB Ref:	3.17.11	To mitigate this hazard, use TRACK and the following:																																													
Overall Unmitigated Risk:	LOW	See HASP "Tick/Poisonous Plant Hazards" Section																																													
Mitigated Risk:	LOW	Job Briefing/Site Awareness																																													
Comments:	Use skin pre-treatment lotions when available.																																														
Hazard																																															
Biological - bites or stings from exposure to insects or arachnids																																															
Suggested FHSB Ref:	3.17: 2,3,7,8,9,10	To mitigate this hazard, use TRACK and the following:																																													
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)																																													
Mitigated Risk:	LOW	Job Briefing/Site Awareness																																													
Comments:	Do body check daily. For ticks see also HASP Tick/Poisonous Plant section																																														
Hazard																																															
Biological - cuts, scrapes, skin/eye puncture from exposure to physically damaging plants																																															
Suggested FHSB Ref:	3.17.11	To mitigate this hazard, use TRACK and the following:																																													
Overall Unmitigated Risk:	MEDIUM	Job Briefing/Site Awareness																																													
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)																																													
Comments:																																															

General Task HARC (continued)

Hazard		
Environmental - Thermal stress - Injury or illness from heat or cold		
Suggested FHSHB Ref:	3.16	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Field H&S Handbook
Mitigated Risk:	LOW	JSAs
Comments:	Use job rotation or rest breaks. Stay hydrated and eat regularly.	
Hazard		
Environmental - Inclement weather -Injury or equipment damage from inclement weather		
Suggested FHSHB Ref:	3.12	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Weather Monitoring
Mitigated Risk:	LOW	Cont./Emerg. Planning
Comments:	Use 10/30 rule for lightning. See FHSHB section 3.12.2 for details.	
Hazard		
Motion - Musculoskeletal - Injury from lifting, twisting , stooping, or awkward body positions		
Suggested FHSHB Ref:	3.29.1	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. See FHSHB/HASP Stretching Worksheet. Job rotation.	
Hazard		
Motion - Musculoskeletal - Injury from repeated work activity or body motion		
Suggested FHSHB Ref:	3.29.2	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Field H&S Handbook
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use job rotation or lifting aids. See FHSHB/HASP Stretching Worksheet.	
Hazard		
Gravity - Falls - Injury due to slips and trips		
Suggested FHSHB Ref:	3.26.4, 4.11	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	Housekeeping
Comments:	Use footwear appropriate for site conditions, plan routes and do not hurry while walking.	

Task Specific HARC

Task 1:	Monitor well - Well sounding, water level or product measurements using probes, tapes or downhole water parameter measurements						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		3.9			
Biological*	L	Chemical	L	Driving*	-	Electrical	-
Environmental*	L	Gravity*	M	Mechanical	-	Motion*	L
Personal Safety	-	Pressure	L	Radiation	-	Sound	L
* Hazard rating, if present, excludes General THA hazards in this category.							
Hazard #1							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSB Ref:		3.27.4		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Machine Guarding			
Mitigated Risk:		LOW		Operator Competency per Standard			
Comments:							
Hazard #2							
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye							
Suggested FHSB Ref:		2.5, 3.22		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Engineering Controls (specify in comments)			
Mitigated Risk:		LOW		First Aid/CPR Training (designated person)			
Admin controls: review proper technique, cutting away from the body, cutting techniques when using any sharp object.							
Comments: Engineering controls: Use PVC cutters in place of a knife when cutting tubing.							

Task 2:	Biological- Vegetation maintenance, clearing and/or removal using manual methods						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		3.28			
Biological*	M	Chemical	-	Driving*	-	Electrical	-
Environmental*	L	Gravity*	L	Mechanical	L	Motion*	M
Personal Safety	-	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Personal safety - Fatigue - Injury or illness caused while working when fatigued							
Suggested FHSB Ref:		3.21		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Job Rotation			
Mitigated Risk:		LOW		Field H&S Handbook (see ref. above)			
Comments:							

Task 3:	Biological - Sampling/surveys - Vegetation						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		3.9			
Biological*	M	Chemical	-	Driving*	-	Electrical	-
Environmental*	L	Gravity*	L	Mechanical	-	Motion*	L
Personal Safety	-	Pressure	-	Radiation	-	Sound	L

Task 4:	Site Inspection			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		NA
Biological*	-	Chemical	-	Driving*
Environmental*	-	Gravity*	-	Mechanical
Personal Safety	-	Pressure	-	Radiation
				Electrical
				Motion*
				Sound
Hazard #1				
Personal safety - Fatigue - Injury or illness caused while working when fatigued				
Suggested FHSB Ref:	3.21	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM	Job Rotation		
Mitigated Risk:	LOW	Job Briefing/Site Awareness		
Comments:				

Task 5:	Oversight - Oversight of contractors			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		3.9
Biological*	L	Chemical	L	Driving*
Environmental*	M	Gravity*	L	Mechanical
Personal Safety	L	Pressure	L	Radiation
				Electrical
				Motion*
				Sound
Hazard #1				
Motion - Struck by - Bodily injury from impact with moving object				
Suggested FHSB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM	Site Awareness		
Mitigated Risk:	LOW	H&S Standards		
Comments:				
Hazard #2				
Environmental - Sun or wind -Skin injury from sun or wind exposure				
Suggested FHSB Ref:	3.12	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)		
Mitigated Risk:	LOW	Field H&S Handbook (see ref. above)		
Comments:				

Tick and Poisonous Plant Hazards

For all projects with outdoor work, biological hazards must be addressed in the tailgate safety meeting each day. The following controls must be used to mitigate biological hazards while working and must also be discussed in the tailgate safety meeting.

Controlling Tick Hazards

Risk Guide for Ticks:

Low	Paved areas; parking lots; well manicured lawns and fields; no work taking place within 15 feet of vegetated areas; work in REGIONS with no tick populations; sub-freezing temperatures, snow or ice cover on ground.*
Medium	Brush hogged fields, wetlands, and grasslands; forested areas with little undergrowth; weeds less than knee height; moderately dense foliage; sporadic or moderately vegetated shaded areas; average leaf accumulation and decaying material on the ground; work taking place in fields after application of insecticide; work in REGIONS with a recognized moderate tick populations; outdoor work during spring, summer and fall months.*
High	Uncut fields, wetlands, forested areas, and grasslands; weeds taller than knee height; heavy dense foliage; heavily vegetated shaded areas; excessive accumulations of leaves and decaying material on the ground; work in REGIONS with recognized heavy tick populations; areas with posted tick hazard warnings; outdoor work during spring, summer and fall months.*

*Cold weather does not eliminate risk of exposure to deer ticks as they may be active all year in areas that experience subfreezing temperatures.

Ticks are ranked as a **Medium** risk for this project

Care should be taken to avoid walking through or working in tall grasses, overgrown or bushy vegetation to the extent reasonable and practical. No single control is effective against ticks.

Select required controls below:

Engineering Controls

- ☐ Mowing of work area
- ☒ Clearing overgrown vegetation
- ☐ Pesticide application
- ☐ Other: _____

Administrative Controls

- ☒ Complete tick check morning/evening
- ☐ Scheduled tick check: _____
- ☒ Inspect backpacks, equipment cases, etc. daily
- ☒ Vehicle cab - maintain good housekeeping
- ☐ Other: _____

Personal Protective Equipment

☒ Light colored clothing	☐ White coveralls/Tyvek
☐ Light colored hat/hardhat	☒ Taped cuffs/pant legs
☒ Pants tucked in boots	☐ Tick gators
☒ Shirt tucked into pants	☐ Double sided tape/duct tape sticky side out
☐ Long sleeved shirt and long pants	☐ Insect mesh/netting for face/head or whole body suit
☐ White Tyvek pants	☐ Other: _____

Repellents

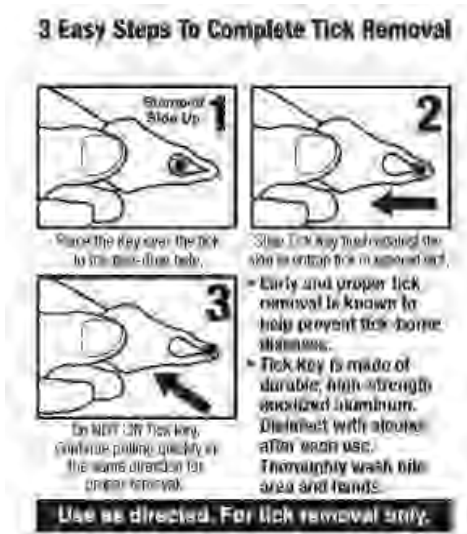
☐ Repellents will not be used	☒ Deet 20-40% applied to skin
☐ Permethrin impregnated clothing (purchased)	☐ Other: _____
☒ Permethrin (0.5% self applied/treated to clothing)	

Permethrin must be applied to clothing within the past 6 weeks or within 6 garment washings. Do not apply permethrin directly to skin. Follow manufacturer's application instructions.

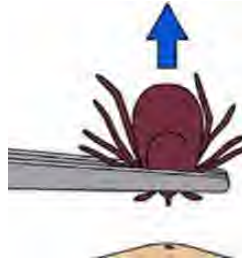
Tick Removal and First Aid

Ticks removed within 24 hours of embedment represent a very low risk for adverse outcomes. Perform tick checks as directed above. To properly remove a tick:

Using a Tick Removal Tool



Using Tweezers



- 1) Use point tip tweezers, if available, to reduce potential of crushing the ticks body
- 2) Grasp the tick as close to skin as possible
- 3) Pull upward with even pressure.

Do not crush tick with fingers

After removal, wash affected area with alcohol or iodine. Wash hands thoroughly after removal. Document date/time of the removal in field notes, field form or H&S app. If rash or fever develops, call WorkCare

Poisonous Plants (Poison Ivy, Poison Oak, Poison Sumac)

All work outdoors, regardless of time of year, must address poisonous plant hazards and controls in the tailgate safety meeting. For low risk projects, the discussion should consider potential vegetation exposure near fences, buildings, work near trees, etc.

Controlling Exposure to Poisonous Plants

Poisonous Plants are ranked as a **Low** risk on this project

Select required controls below:

Engineering Controls

- ☒ Not applicable
- ☐ Mowing of work area
- ☐ Clearing overgrown vegetation
- ☐ Herbicide application
- ☐ Other: _____

Administrative Controls

- ☒ Identify and avoid (see ID Quick Guide below)
- ☒ Watch for signs or symptoms of exposure
- ☒ Vehicle cab - maintain good housekeeping
- ☐ Other: _____

Personal Protective Equipment

- ☒ Gloves
- ☐ Hat/hardhat/head covering
- ☒ Pants tucked in boots
- ☒ Shirt tucked into pants
- ☐ Long sleeved shirt and long pants

- ☐ White coveralls/Tyvek
- ☒ Taped cuffs/pant legs
- ☐ Dust mask (during burning activities, etc.)
- ☐ Other: _____

Repellents

☒	Repellents will not be used
☐	Barrier creams
☐	Other: _____

Skin Decontamination

☒	Wash with post-exposure soap and water
☐	Wash with soap and water (use hot water if available)
☒	Hot shower at end of day
☐	Other: _____

Equipment Decontamination

Due to the low risk associated with poisonous plants on this project, portable equipment and tools may still have a potential to be contaminated with urushiol (the oil that causes allergic reactions and dermatitis in poisonous plants covered by this plan). It is recommend to decontaminate handles, grips, and hand holds of tools and equipment with post-exposure soap and water or alcohol spray (if safe to do so for the equipment/tool being decontaminated) as a best practice.

Clothing Decontamination

Wash work clothing in hot water separate from other clothing. Even though there is a low risk for poisonous plants on this project, work boots should be considered potentially contaminated with urushiol. Decontaminate with post-exposure soap and water or hot soap and water. If safe for the boot, consider spraying with alcohol spray of post exposure soap is not available.

First Aid

If skin irritation or other signs of allergic reaction develops contact WorkCare for assistance. Document date and time of exposure, if known, in field notes, field form or H&S app.

Identification Quick Guide

Ticks:

American Dog Tick



Blacklegged (Deer) Tick



Brown Dog Tick



Groundhog Tick



Gulf Coast Tick



Lone Star Tick



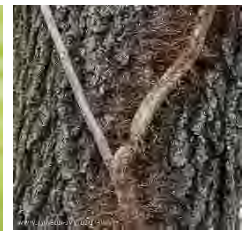
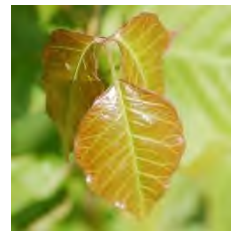
Rocky Mountain Wood Tick



Soft Tick



Poison Ivy:



Poison Oak:



Poison Sumac:



For other biological hazards, address the hazards and controls in the JSA for the work task.

Personal Protective Equipment (PPE)

See JSA or Permit for the task being performed for required PPE. If work is not conducted under a JSA or Permit, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for all tasks during field work (outside of field office trailers and vehicles) not covered by a JSA or Permit on this project:

Minimum PPE required to be worn by all staff on project:

Specify Type:

☒	Hard hat	☐	Snake chaps/guards	☐	Coveralls:	
☒	Safety glasses	☐	Briar chaps	☐	Apron:	
☐	Safety goggles	☐	Chainsaw chaps	☒	Chem. resistant gloves:	Nitrile
☐	Face shield	☐	Sturdy boot	☒	Gloves other:	ANSI Level II
☐	Hearing protection	☒	Steel or comp. toe boot	☐	Chemical boot:	
☐	Rain suit	☐	Metatarsal boot	☐	Boot other:	
☐	Other:			☒	Traffic vest, shirt or coat:	Class II
				☐	Life vest:	

Task specific PPE: See JSAs for additional PPE requirement.

Comments:

See [Tick and Poisonous Plant Hazards](#) section for additional PPE information.

Medical Surveillance

All Arcadis employees performing field work will be required to be current in HAZWOPER medical surveillance.

Hazardous Materials Shipping and Transportation

No samples will be transported or shipped on this project. No supplies containing gaseous, powdered, granulated, and/or liquid materials will be transported or shipped. Additionally, no materials containing explosive, magnetic, or radioactive materials will be transported or shipped. A shipping determination is not required.

Traffic Safety and Traffic Safety Plans (TSPs)

The scope of work on this project will not expose Arcadis workers or subcontractors to vehicular traffic. A traffic safety plan will not be required.

Arcadis Commercial Motor Vehicles (CMVs)

CMVs operated by Arcadis employees on public roadways will not be utilized on this project. Arcadis defines a CMV as any single vehicle with a gross vehicle weight rating (GVWR) $\geq 10,001$ pounds or a truck and trailer combination with a combined GVWR $\geq 10,001$ pounds (GVWR of truck + GVWR of trailer = $\geq 10,001$ pounds).

Site Control

The scope of work on this project does not require use of site control.

Decontamination

Decontamination protocols are addressed in the applicable task JSA(s) for this project. The applicable JSAs are attached to this HASP.

Sanitation

The project scope is a mobile work operation. The project field team will have reasonable access to restroom facilities within 10 minutes of the work area where the mobile work activity is actively taking place. Potable water will be carried by the field team in the vehicle used for the project. Unless alternate requirements are stipulated in a plan supplement (i.e. Heat Injury and Illness Prevention Plan), permit or JSA, bottled or water coolers with potable water will be provided to project workers at 1 gallon/worker/day.

Safety Briefings

Arcadis will lead all safety briefings on this project and will document the safety briefing on a Tailgate Safety Briefing form or logbook. Safety briefings will be conducted once at the beginning of each work day unless the Site Safety Officer deems more frequent safety briefings will be required based on work being conducted. All project workers, including Arcadis subcontractors, will be required to attend the safety briefing. Site visitors and project workers not on duty during the morning safety briefing will receive the safety briefing upon their arrival onto the project site for the day.

Employee Health and Safety Engagement

The CPM or APM is responsible for reviewing and establishing H&S engagement goals for the project. These goals are summarized below.

Hazard Observations (via H&S App or TIP) required at the following frequency on this project:

1 per task

Close Call reporting (via H&S app) goals for this project:

1 per event

Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA or Permit for the task being performed. If work is not performed under a JSA or Permit, the following safety equipment is required to be present on site in good condition unless otherwise noted (Check all that apply):

☒	First aid kit
☐	Bloodborne pathogens kit
☒	Fire extinguisher
☐	Eyewash (ANSI compliant)
☒	Eyewash (bottle)
☒	Drinking water
☒	Other:
	Mobile phone and charger

☒	Insect repellent:
☒	Sunscreen
☐	Air horn
☒	Traffic cones
☐	2-way radios
☐	Heat stress monitor
☒	See Tick and Poisonous Plant Hazards section for additional equipment/supply information.

International Travel

International travel is not required for this project.

Spill Control and Containment

Spill control and containment planning and implementation is not required for this project.

Use of Electronic Devices in Areas of Increased Safety Risk

Electronic device use and distractions to be discussed and documented in the job briefing/safety briefing.

Hazard Communication (HAZCOM)/Global Harmonization System (GHS)

The following chemical(s)/product(s) are subject to the HAZCOM/GHS requirements:

Alconox	Quantity: <5 lbs
Isobutylene/air	Quantity: 1 cyl
	Quantity:
Printed copies of SDSs are attached	

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

[illegible]

Add additional sheets if necessary

You have an absolute right to STOP WORK if unsafe conditions exist!

Attachment A
Job Safety Analysis

Job Safety Analysis

General

JSA ID	19408	Status	(3) Completed
Job Name	Environment-Groundwater Sampling and free product recovery	Created Date	3/2/2023
Task Description	NAPL Gauging and Free Product Recovery	Completed Date	03/24/2023
Template	False	Auto Closed	False

Client / Project

Client	New York State Electric & Gas
Project Number	30178743
Project Name	NYSEG Binghamton Court St. 2023 O & M
PIC	White, Keith
Project Manager	Powlin, Scott

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Foote, Samantha	3/23/2023	3/2/2023	Therriault, Brian	☒
HASP Reviewer	Hover, Elizabeth	3/16/2023	3/24/2023	Hill, Sarah	☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Stage at pre-determined sampling location and set up work zone and sampling equipment	1 Personnel could be hit by vehicular traffic	Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	
		2 Vehicles parked too close to stationary objects may strike them when driving from location.	Park vehicle so first movement is forward. Park in a location that will be free of stationary objects, such as bollards, monitoring wells, fence posts, etc. when the vehicle pulls forward. Avoid backing! At work locations where space is not restricted, leave a minimum of 10 feet between the work vehicle and the nearest stationary object.	
		3 Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
2	Open wells to equilibrate and gauge wells	1 When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2 Pinchpoints on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear leather gloves when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		3 Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		4 Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well	
3	Begin Purging Well and Collecting Parameter Measurements	1 Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	
		2 Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		3 Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	

3	Begin Purging Well and Collecting Parameter Measurements	4	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, leather type.	
		5	Purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
4	Collect GW or Free Product Sample	1	Working with bailer rope can cause rope burns on hands.	Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.	
		2	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.	
5	Recovery of Free Product from well	1	Exposure to free product	Additional chemical protection may be necessary based on the type of product. Additionally, safety goggles, a faceshield, or respiratory protection may be required. Verify in the HASP.	
6	Staging of Well Purge water and/or Free Product	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	Drum handling JSA

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Cut resistant	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Required
Respiratory Protection	dust mask		Recommended

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	alconox, DI water, spray bottle	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)	bottle	Required
	insect repellent		Recommended
	sunscreen		Recommended
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments		
Reviewer		Comments
Employee: Role Review Type Completed Date	Hover, Elizabeth HASP Reviewer Approve 3/24/2023	

Job Safety Analysis

General

JSA ID	19497	Status	(3) Completed
Job Name	General Industry-Site inspection/walkover - undeveloped	Created Date	3/30/2023
Task Description	Site Inspection	Completed Date	04/24/2023
Template	False	Auto Closed	False

Client / Project

Client	New York State Electric & Gas
Project Number	30178743
Project Name	NYSEG Binghamton Court St. 2023 O&M
PIC	White, Keith
Project Manager	Powlin, Scott

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Foote, Samantha	4/20/2023	3/30/2023	Therriault, Brian	☒
HASP Reviewer	Hover, Elizabeth	4/13/2023	4/21/2023	Hill, Sarah	☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Undeveloped Site Walk (Winter Conditions)	1 Slippery/icy conditions	Use caution and proper footwear with traction	
		2 Eye/face injury	Use caution when walking through trees and brush. Wear proper eye protection to avoid eye injury	
		3 Hypothermia/frostbite	Assess weather conditions and wear proper clothing to avoid hypothermia/frostbite and freezing	
		4 Falling ice/snow	Assess the site for falling ice/snow from trees/powerlines. Use caution when walking around trees and powerlines. Wear hard hat	
		5 Stray animals	Make lots of noise while walking through the site. Carry repellent in the event of encountering stray animals. If a dangerous or aggravated animal is spotted, leave the area, return to your vehicle and contact animal control.	
		6 Vehicular traffic	Asses the site and the surrounding area for vehicle traffic. Use caution when walking near busy roadways. Wear type II or III traffic vest.	
2	Undeveloped Site Walk (Summer Conditions)	1 Slips/trips/falls	Use caution when walking on un-even surfaces. Use proper footwear with traction	
		2 Eye injury	Use caution when walking through areas of trees and brush. Wear proper eye protection to avoid eye injury from tree limbs	
		3 Dehydration	Drink plenty of water and avoid long periods of direct sun exposure	
		4 Sunburn	Wear sunscreen. Avoid long periods of direct sun exposure. Work in the shade if possible.	
		5 Vehicular traffic	Assess the site and the surrounding area for vehicular traffic. Use caution when walking near busy roadways. Wear type II or III traffic vest.	
		6 Stray animals, ticks, bugs	Make lots of noise when traveling through the site and carry repellent spray. If a dangerous or aggravated animal is spotted, leave the area and return to your vehicle and contact animal control. Wear long pants/long sleeve shirt and use insect repellent as necessary	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Derma! Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Miscellaneous PPE	traffic vest--Class II or III	Class II	Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)		Required
	insect repellent	Permethrin	Recommended
	sunscreen		Recommended
	water/fluid replacement		Required

Review Comments		
Reviewer		Comments
Employee: Role Review Type Completed Date	Hover, Elizabeth HASP Reviewer Approve 4/21/2023	

Job Safety Analysis

General

JSA ID	19555	Status	(2) Review
Job Name	General Industry-Site clearing (tree/brush/vegetation) removal	Created Date	4/24/2023
Task Description	Biological- Vegetation maintenance, clearing and/or removal using manual methods	Completed Date	
Template	False	Auto Closed	False

Client / Project

Client	New York State Electric & Gas
Project Number	30178743
Project Name	NYSEG Binghamton Court St. 2023
PIC	White, Keith
Project Manager	Powlin, Scott

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Foote, Samantha	5/15/2023	4/24/2023	Therriault, Brian	☒
HASP Reviewer	Bean, Veronica	5/8/2023		Szegedi, Lisa	☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Prepping equipment for clearing activities	1 Improperly maintained tools and equipment increase risk for injury to workers using tools/equipment	Maintain tools and equipment according to manufacturer recommendations, including proper oiling and inspection of tool/equipment. Ensure cutting blades are sharp.	
		2 Cuts to hands, fingers, forearms from sharpening tool/equipment blades	Wear protective gloves suitable for the tool/device being sharpened, use proper sharpening techniques and do not hurry through the sharpening process.	
		3 Exposure to fuel during refueling activities	Wear protective gloves during refueling activities, avoid breathing fuel vapors by standing up wind when practical, promptly wash exposed skin or clothing.	
2	Clearing large brush/trees with hand tools/chainsaws	1 Cuts to arms, legs, hands from cutting tools or chainsaw	Wear protective gloves. When using chainsaw, use chainsaw chaps and helmet equipped with face shield. When using manual tools, cut away from body, maintain large distance between workers using hand tools or chainsaw. When using chainsaws, don't reach over running saw, don't saw over head height, don't use saw in low visibility situations, and don't use chainsaws on ladders or use one handed.	
		2 Physical stresses from repetitive motion or excessive push/pulling during clearing	Use job or task rotation or frequent rest breaks. Don't use excessive force pulling or pushing on vegetation.	
		3 Scrapes, cuts to skin from vegetation	Wear protective gloves, long pants and long sleeve shirt. Wear briar chaps in thorny vegetation.	
		4 Noise form chainsaws	Wear hearing protection, keep unnecessary workers away form sawing activity	

2	Clearing large brush/trees with hand tools/chainsaws	5	Exposure to ticks.	Assess locations for possible tick habitat. When possible, walk over thin, low grasses, dirt or rock paths. Avoid tall grasses, weeds and beds of fallen leaves (likely nest areas). Wear permethrin spray, heavily applied, on clothing (where permitted) and DEET (30% or higher) on exposed skin. Wear light colored clothing to make ticks more visible. Check for ticks on clothing and skin frequently. Tape pant legs to boots if working in potential tick habitat for extended periods. In areas with very high potential for exposure or known infestations, wear disposable coveralls.	
		6	Contact with poison ivy, poison oak or sumac may result in severe skin irritation.	Learn to identify how urushiol-containing plants appear during all seasons. Avoid contact with skin or clothing. Give plants a wide berth as younger plants in the area may be more difficult to recognize and the vines extending from recognized areas also contain urushiol. Consider applying a barrier cream to exposed skin. In areas where the plants are prevalent or in cases where individuals have known allergic responses to urushiol (ie. poison ivy), wear chemically protective disposable coveralls.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots	or equivalent	Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	other	chainsaw chaps if using chainsaw	Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	insect repellent		Required
	sunscreen		Required
	water/fluid replacement		Required

Attachment B
Field Forms

Arcadis Weekly Vehicle Inspection Form (Revised 9/28/2022)



Vehicle # / License Plate #

Lease Plan # / Last 6 of Vin #

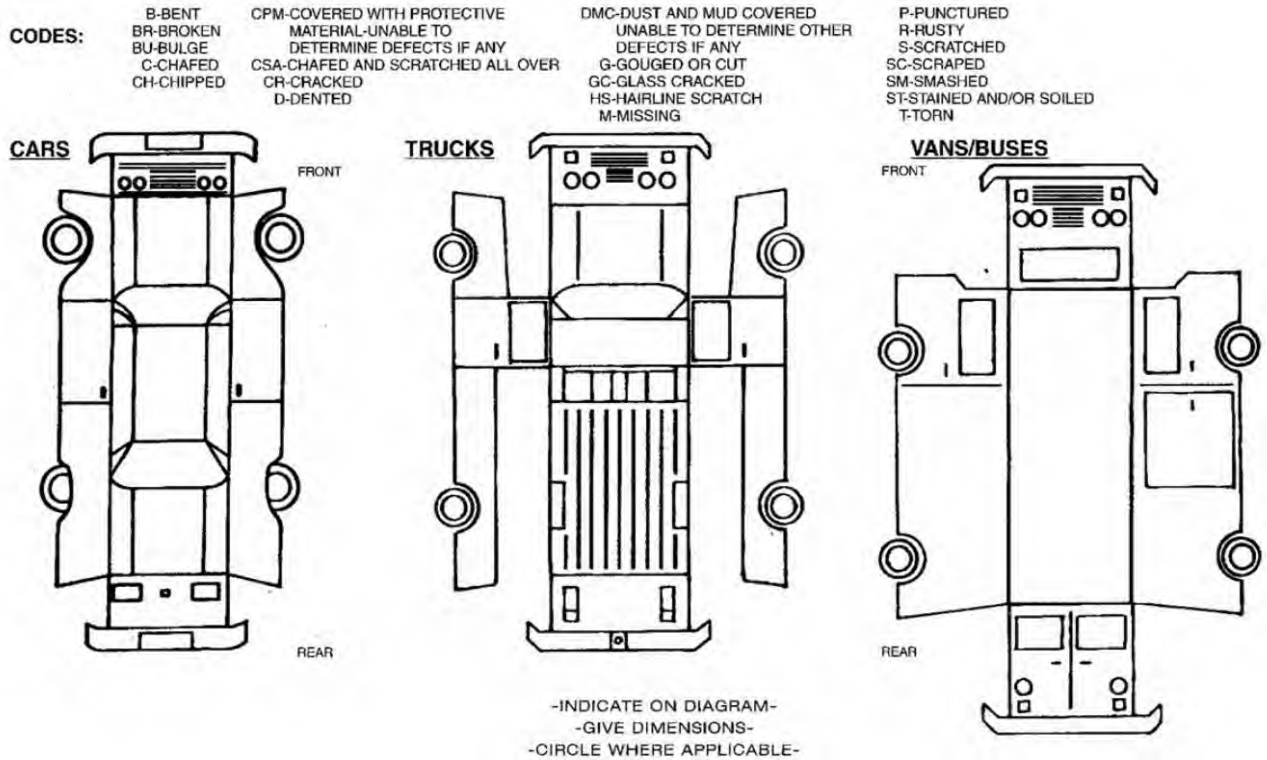
		Inspection Date			Odometer reading			Driver / Inspector Name			Check the appropriate box and enter repair date for identified repairs:		
		OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date
Interior	Horn operational												
	Door Locks operational												
	Seat Belts in good repair												
	Seats and Seating Controls												
	Steering Wheel - No Excessive Play												
	Interior Lights and Light Controls												
	Instrument Panel/Gauges												
	Wiper Controls operational												
	Heat/Defrost/Air Conditioning working												
	Rear View Mirror present												
	Backup Camera/Sensors working												
Exterior ¹	Jack and Lug Wrench present												
	Lights and Signals operational												
	Tires properly inflated/good tread depth												
	Spare Tire properly inflated												
	Doors operational												
	Windows Not Cracked/Damaged												
Engine & Brakes	Side View Mirrors												
	Body Panels and Bumpers												
	Engine Start & Running Smoothly												
	Fluid Levels, No Noticeable Leaks												
Emergency Equipment ²	Belts tight, no cracks												
	Brakes operational, no squeaking												
	First Aid Kit, inspected weekly												
	Fire Extinguisher properly secured												
	Fire Extinguisher inspected weekly												
	Orange/Yellow emergency warning light												
Cargo	Roadside Assistance Information												
	Recommend spotter cones available												
Registration	Cargo Secure and Properly Distributed												
	Securing Devices in Good Condition												
	License Plate /Tags												
	Registration and Insurance												
	City/State Inspection Decal												
	Lease Plan information/Fuel Card												

¹ Note all damages to the vehicle on the back of this page

² Emergency Equipment required per Motor Vehicle Standard ARC HSGE024

Note All Vehicle Damage Below

All Vehicle Damage must be reported to ANA_insuranceinquiries@arcadis.com, Zach Mongan (EF H&S), and Susan Atwood (EF Fleet Manger)



Notes:

Tread guide: If a tread gauge is not available coins may be used to determine remaining tread. 2/32" is the minimum by law in most states (top of Lincoln's head on penny), 4/32" is minimum recommended for wet surfaces (top of Washington's head on quarter), 6/32" is minimum recommended for snowy surfaces (top of Lincoln Memorial on penny). Vehicle tires should be replaced if the tread depth is less than 6/32".



2/32" remaining 4/32" remaining 6/32" remaining

Reference JSA 10907 For Weekly Vehicle Inspection



Arcadis Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release, and discharge the owner of the site and Arcadis and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

[illegible]

Control Number: TSM- 30226870

TSM + project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year

TAILGATE HEALTH & SAFETY MEETING FORM

Project Name:	Project Location:

Date:	Time:	Conducted by:	Signature/Title:

Issues or concerns from previous day's activities:

Task anticipated to be performed today:

☐ Additional permits/checklists attached

USE TRACK! Evaluate the hazards (h) for the tasks being performed today and rank as Low (L), Medium (M) or High (H). Use relevant JSAs, FHSB, permit or other work standard to communicate controls (c) to be used to eliminate or mitigate identified hazards.

☐ Gravity (i.e., ladder, trips) (L M H) h: _____ c: _____	☐ Motion (i.e., traffic, machinery) (L M H) h: _____ c: _____	☐ Mechanical (i.e., augers, motors) (L M H) h: _____ c: _____
☐ Electrical (i.e., utilities) (L M H) h: _____ c: _____	☐ Pressure (i.e., gas cyl., wells) (L M H) h: _____ c: _____	☐ Environment (i.e., heat, cold) (L M H) h: _____ c: _____
☐ Chemical (i.e., fuel, acid, paint) (L M H) h: _____ c: _____	☐ Biological (i.e., ticks, poison ivy) (L M H) h: _____ c: _____	☐ Radiation (i.e., alpha, sun, laser) (L M H) h: _____ c: _____
☐ Sound (i.e., machinery) (L M H) h: _____ c: _____	☐ Personal (i.e. alone, night) (L M H) h: _____ c: _____	☐ Driving (i.e. car, ATV, boat) (L M H) h: _____ c: _____
☐ Refer to the attached Hazard Analysis Sheet(s) or JSA		

Comments:

Signature and Certification: I have read and understand the project specific HASP for this project.

SSE Employee*	Non-Life Threatening Injury or Illness Call WorkCare 1-888-449-7787		
	Printed Name/Signature/Company	Sign In Time	Sign Out Time

I will **STOP** the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I **will be** alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB**, I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I **will not assist** a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call **WorkCare at 1.888.449-7787** and then notify the field supervisor.

Utility strike, motor vehicle accident or 3rd party property damage - field supervisor will immediately notify the Project or Task Manager

*Short Service Employee (SSE) working for Arcadis <1 year.

Site-Wide Inspection Form



Project Name:	Weather Conditions:
Project Number:	Temperature:
Project Location:	Wind Speed:
Date:	Wind Direction (from):
Personnel:	Time onsite: Time offsite:

Inspection Checklist	Yes	No	Comments
Cover System			
Intrusive Activities Being Performed?			
- Trenching?			
- Excavation?			
- Tunneling?			
- Saw cutting?			
Signs of Previous Intrusive Activities Performed?			
- New drainage feature?			
- Evidence of a new underground utility?			
- New grass/vegetation/asphalt?			
- Other (e.g., cracking, potholes, depressions)?			
Monitoring Well Condition			
Groundwater monitoring needs to be performed this year?			
Covers secure?			
Casing in need of repair?			
Concrete surface seal intact?			
Settling in area around well?			
Well obstructed?			
Ponded water above well?			
Well screen silted in?			
Well in need of redevelopment?			

General Comments/Suggested Action Items:

Well Integrity Assessment Form



Project Number: _____

Date: _____

Site Name: _____

Personnel: _____

Well ID: _____

Inspection Checklist				Comments	
Well ID clearly marked?	Yes	No			
Well completion:	Flush mount		Stand-pipe		
Lockable cover?	Yes	No	Damaged	Describe:	
Lock present?	Yes	No	Added	Key brand/number:	
Measuring point marked?	Yes	No	Added		
Well riser diameter:			inches		
Well riser type:	PVC	SS	Other	Describe other:	
Surface Condition					
Cement intact?	Yes	No			
Curb box/well cover present?	Yes	No	Damaged	Describe:	
All bolts present?	Yes	No	Not applicable		
Ground surface slopes away from well?	Yes	No			
Well Condition					
Well Cap:	PVC slip cap		Pressure-fit cap	None	
Well Vent:	Slot cut in riser		Vent hole in cap	None	N/A (flush mount well)
Reported well riser stickup:			feet (use negative number if below grade)		
Measured well riser stickup:			feet (use negative number if below grade)		
Depth to water:			feet -or- DRY		
Reported total depth of well:			feet below grade		
Measured total depth of well:			feet below grade		
Well obstructed?	Yes	No	If yes, list depth in feet from top of well riser:		
Well bottom:	Soft (contains sediment)		Firm (no sediment)		
Recommendations					
Repair concrete/surfae completion?	Yes	No	If yes, list date performed:		
Re-survey well?	Yes	No	If yes, list date performed:		
Remove sediment and re-measure depth?	Yes	No	If yes, list date performed:		
Replace well cap?	Yes	No	If yes, list date performed:		
Replace bolts?	Yes	No	If yes, list date performed:		
Replace lock?	Yes	No	If yes, list date performed:		
Other/Miscellaneous Observations:					

Monitoring Well ID	Constructed Well Depth (ft bgs)	Well Integrity Assessment Form (✓)	PID (ppm)	Depth to Water (feet below TIC)	Depth to Bottom (feet below TIC)	Approximate NAPL Thickness (feet)	Notes/Comments
OU-1 On-Site NAPL Gauging Wells							
RW-1	54.20						
RW-2	52.30						
RW-3	16.75						
RW-4	17.10						
RW-5	48.60						
RW-6	49.10						
RW-7	18.79						
RW-8	18.10						
RW-9	52.95						
RW-10	16.60						
RW-11	49.70						
RW-12	47.96						
RW-13	18.70						
RW-14	17.60						
RW-15	49.20						
RW-16	49.91						
RW-17	24.50						
RW-18	41.98						
RW-19	19.11						
RW-20	15.45						
RW-21	16.00						
RW-22	52.20						
PZ93-1	8.50						
MW93-5D	62.00						
MW93-6D	60.80						
MW-01-03-R	108.10						
Off-Site NAPL Gauging Wells							
MW97-14D	40.00						
MW97-14S	20.00						
MW01-17D	61.30						
MW01-17S	37.00						
Off-Site NAPL Gauging Wells - SE Corner of Thompsons St. & Court St.							
NMW-1	44.00						
NMW-2	44.00						
PZ03-01D	47.00						
MW97-7S	26.50						
PZ03-09A	23.00						
PZ03-09D	48.00						
Tompkins St. Bridge (BM-1)	--						

Acronyms and Abbreviations:

bgs = below ground surface
ft = feet
NAPL = Non-Aqueous Phase Liquid

Attachment C
Safety Data Sheets

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : ALCONOX(R) DETERGENT

Product Number : Z742914
Brand : Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Specific target organ toxicity - repeated exposure (Category 2), Respiratory Tract, H373
Short-term (acute) aquatic hazard (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard statement(s)
H315

Causes skin irritation.



H318	Causes serious eye damage.
H373	May cause damage to organs (Respiratory Tract) through prolonged or repeated exposure.
H402	Harmful to aquatic life.
Precautionary statement(s)	
P260	Do not breathe dust.
P264	Wash skin thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P314	Get medical advice/ attention if you feel unwell.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
n-alkylbenzenesulfonic acid, sodium salts			
CAS-No.	68411-30-3	Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 3; H302, H315, H318, H401, H412	>= 10 - < 20 %
EC-No.	270-115-0		
sodium carbonate			
CAS-No.	497-19-8	Eye Irrit. 2A; H319	>= 10 - < 20 %
EC-No.	207-838-8		
Index-No.	011-005-00-2		
Registration number	01-2119485498-19-XXXX		
tetrasodium diphosphate			
CAS-No.	7722-88-5	Eye Dam. 1; H318	>= 10 - < 20 %
EC-No.	231-767-1		
Registration number	01-2119489794-17-XXXX		
Sulfuric acid, mono-C12-14-alkyl esters, sodium salts			
CAS-No.	85586-07-8	Aquatic Acute 2; Aquatic Chronic 3; H401, H412	>= 1 - < 5 %



Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt			
CAS-No.	64-02-8	Acute Tox. 4; Eye Dam. 1; STOT RE 2; H302, H332, H318, H373	>= 1 - < 5 %
EC-No.	200-573-9		
Index-No.	607-428-00-2		
Registration number	01-2119486762-27- XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO₂) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Nitrogen oxides (NO_x)

Oxides of phosphorus

Sodium oxides

Mixture with combustible ingredients.

Development of hazardous combustion gases or vapours possible in the event of fire.



5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Tightly closed. Dry.

Storage class

Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters



Component	CAS-No.	Value	Control parameters	Basis
tetrasodium diphosphate	7722-88-5	TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Body Protection

protective clothing

Respiratory protection

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.



SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: powder
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	No data available
Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	Not classified as explosive.
t) Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

Aldrich - Z742914

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10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Mixture

Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

Skin corrosion/irritation

Remarks: Mixture causes skin irritation.

Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Mixture may cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract



Aspiration hazard

No data available

11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Components**n-alkylbenzenesulfonic acid, sodium salts****Acute toxicity**

LD50 Oral - Rat - male and female - 1,080 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation

Skin - Rabbit

Result: irritating - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irreversible effects on the eye - 72 h
(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: Does not cause skin sensitization.
(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: In vitro mammalian cell gene mutation test

Result: negative

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Result: Positive results were obtained in some in vitro tests.

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (ECHA)

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available



Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

sodium carbonate

Acute toxicity

LD50 Oral - Rat - male and female - 2,800 mg/kg

Remarks: (ECHA)

Inhalation: No data available

LD50 Dermal - Rabbit - > 2,000 mg/kg

(US-EPA)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

(US-EPA)

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

tetrasodium diphosphate

Acute toxicity

LD50 Oral - Rat - female - > 300 - < 2,000 mg/kg

(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 0.58 mg/l - dust/mist

(OECD Test Guideline 403)

Remarks: (highest concentration to be prepared)

The value is given in analogy to the following substances: Disodium pyrophosphate

LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg

(US-EPA)

No data available



Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irreversible effects on the eye - 4 h
(OECD Test Guideline 405)

Respiratory or skin sensitization

Sensitisation test: - Mouse

Result: Does not cause skin sensitization.
(OECD Test Guideline 429)

Remarks: The value is given in analogy to the following substances: Disodium pyrophosphate

Germ cell mutagenicity

Test Type: Micronucleus test

Test system: lymphocyte

Result: negative

Test Type: gene mutation test

Test system: Mouse lymphoma test

Result: negative

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Sulfuric acid, mono-C12-14-alkyl esters, sodium salts**Acute toxicity**

LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 420)

Inhalation: No data available

LD50 Dermal - Rat - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation

Remarks: No data available

Serious eye damage/eye irritation

Remarks: No data available

Respiratory or skin sensitization

- Rabbit



Does not cause skin sensitization.
(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Ames test
Test system: S. typhimurium
Result: negative

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt

Acute toxicity

LD50 Oral - Rat - female - 1,780 mg/kg
Remarks: (ECHA)
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation

Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: Risk of serious damage to eyes.
(OECD Test Guideline 405)
Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization

Maximization Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: The value is given in analogy to the following substances:
Ethylenedinitrilotetraacetic acid disodium salt

Germ cell mutagenicity

Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Result: negative
Remarks: (in analogy to similar products)
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Result: negative
Remarks: (in analogy to similar products)



(ECHA)

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract

Aspiration hazard

No data available

SECTION 12: Ecological information

12.1 Toxicity

Mixture

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

Components

n-alkylbenzenesulfonic acid, sodium salts

Toxicity to fish static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 1.67

Aldrich - Z742914

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	mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 2.9 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 235 mg/l - 72 h Remarks: (ECHA)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Oncorhynchus tshawytscha (chinook salmon) - 0.23 mg/l - 72 d (OECD Test Guideline 210)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test NOEC - Daphnia magna (Water flea) - 1.18 mg/l - 21 d (OECD Test Guideline 211)

sodium carbonate

Toxicity to fish	static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 300 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	semi-static test EC50 - Ceriodaphnia (water flea) - 220 - 227 mg/l - 48 h Remarks: (ECHA)

tetrasodium diphosphate

Toxicity to fish	semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h (US-EPA)
Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209) Remarks: The value is given in analogy to the following substances: dipotassium hydrogen phosphate

Sulfuric acid, mono-C12-14-alkyl esters, sodium salts

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 2.9 mg/l - 48 h (OECD Test Guideline 202)



Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 29 mg/l - 96 h (US-EPA)
Toxicity to bacteria	static test EC50 - activated sludge - 220 mg/l - 3 h (OECD Test Guideline 209)
Toxicity to fish(Chronic toxicity)	NOEC - Pimephales promelas (fathead minnow) - 0.96 mg/l - 196 d
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test LC50 - Daphnia magna (Water flea) - 1.67 mg/l - 21 d (OECD Test Guideline 211)

Ethylenedinitrilotetraacetic acid,Tetrasodiumsalt

Toxicity to fish	static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 114 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to bacteria	static test EC10 - activated sludge - > 500 mg/l - 30 min (OECD Test Guideline 209) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium saltThe value is given in analogy to the following substances: Sodium feredetate
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Danio rerio (zebra fish) - >= 35.1 mg/l - 35 d (OECD Test Guideline 210) Remarks: The value is given in analogy to the following substances: Sodium calcium edetate hydrate
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 25 mg/l - 21 d Remarks: The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.



SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information

Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
pentasodium triphosphate	7758-29-4	1993-04-24
tetrasodium diphosphate	7722-88-5	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
pentasodium triphosphate	7758-29-4	1993-04-24
tetrasodium diphosphate	7722-88-5	1993-02-16

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See



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Version: 8.2

Revision Date: 02/20/2023

Print Date: 03/04/2023



SAFETY DATA SHEET

Isobutylene

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier	: Isobutylene
Chemical name	: 2-methylpropene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene
Product type	: Gas.
Product use	: Synthetic/Analytical chemistry.
Synonym	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene
SDS #	: 001031
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms



Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention

: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response

: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage

: Protect from sunlight. Store in a well-ventilated place.

Disposal

: Not applicable.

Hazards not otherwise classified

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture	: Substance
Chemical name	: 2-methylpropene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene
Product code	: 001031

CAS number/other identifiers

CAS number : 115-11-7

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Skin contact	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: No known significant effects or critical hazards.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: No known significant effects or critical hazards.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	: No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	ACGIH TLV (United States, 3/2017). TWA: 250 ppm 8 hours.

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -140.7°C (-221.3°F)
- Boiling point** : -6.9°C (19.6°F)
- Critical temperature** : 144.75°C (292.6°F)
- Flash point** : Closed cup: -76.1°C (-105°F)
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Lower and upper explosive (flammable) limits** : Lower: 1.8%
Upper: 9.6%
- Vapor pressure** : 24.3 (psig)
- Vapor density** : 1.94 (Air = 1)
- Specific Volume (ft³/lb)** : 6.6845
- Gas Density (lb/ft³)** : 0.1496 (25°C / 77 to °F)
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : 0.26 g/l
- Partition coefficient: n-octanol/water** : 2.34
- Auto-ignition temperature** : 465°C (869°F)
- Decomposition temperature** : Not available.
- Viscosity** : Not applicable.
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 56.12 g/mole
- Aerosol product**
- Heat of combustion** : -45029034 J/kg

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
- Incompatible materials** : Oxidizers
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m ³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Section 11. Toxicological information

- Inhalation** : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
Inhalation : No specific data.
Skin contact : No specific data.
Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : Not available.
Potential delayed effects : Not available.

Long term exposure

- Potential immediate effects** : Not available.
Potential delayed effects : Not available.

Potential chronic health effects

Not available.

- General** : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Isobutylene	2.34	-	low

Mobility in soil

- Soil/water partition coefficient (K_{oc})** : Not available.

Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Additional information

DOT Classification

: **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 19, T50

TDG Classification

: Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Ship Index Forbidden
Passenger Carrying Road or Rail Index Forbidden
Special provisions 29

IATA

: **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : TSCA 8(a) CDR Exempt/Partial exemption: Not determined
Clean Air Act (CAA) 112 regulated flammable substances: Isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan	: This material is listed or exempted.
Thailand	: Not determined.
Turkey	: Not determined.
United States	: This material is listed or exempted.
Viet Nam	: Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/ 1
Flammability	4
Physical hazards	3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)



Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment

History

Date of printing : 5/10/2018

Date of issue/Date of revision : 5/10/2018

Date of previous issue : 7/11/2016

Version : 0.02

Key to abbreviations

: ATE = Acute Toxicity Estimate
 BCF = Bioconcentration Factor
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals
 IATA = International Air Transport Association
 IBC = Intermediate Bulk Container
 IMDG = International Maritime Dangerous Goods
 LogPow = logarithm of the octanol/water partition coefficient
 MARPOL = International Convention for the Prevention of Pollution From Ships, 1973

Section 16. Other information

as modified by the Protocol of 1978. ("Marpol" = marine pollution)

UN = United Nations

References

: Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Attachment D

Blank TIPs

Task Improvement Process

General

Observed Company: _____

Observation Type: _____

TIP Form: H&S Field Multi-Task (General)

Task Observed: _____

Observee Name: _____

Observer Name: _____

Observation Date: _____

Project Number: 30226870

Project Name: New York State Electric & Gas CorporationBinghamton Court Street293-295 Court Stre

Supervisor: _____

Equipment On Site: _____

Pertinent Information: _____

Observation

Task	Correct	Questionable	Comments
General			
PPE worn according to HASP/JLA specifications and inspected before use?			
STOP work authority used where appropriate?			
Body Use/Positioning			
Proper lifting/pushing/pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable; etc.)?			
Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?			
Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?			
Work Procedures/Environment			
Correct type and number of barricades/warning devices/cones?			

Communication with others when necessary (hand signals, flags, etc.)?			
Right tools and equipment selected for the job and inspected before use?			
Tools and equipment used properly?			
Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?			
Slip/trip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?			
Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?			
Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?			
Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?			
Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?			
Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?			
Any additional safety issues identified:			

Tip Summary Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

☐
☐
☐

Supervisor Led

Peer to Peer

Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

Attachment E
HS Standards

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1. POLICY

Arcadis requires that rented or purchased hand and power tools incorporate safety by design principles to minimize the risk of injury. Exemplary equipment will, by design, implement the highest level of guarding, ergonomic safety, ease of use, etc. All hand and power tools will be used for their designed purpose and in accordance with manufacturer instructions.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this standard is to summarize basic safety procedures and responsibilities associated with the use of hand and power tools for the work Arcadis completes.

2.2 Scope

This Health and Safety Standard (HSS) applies to all Arcadis employees who work with, or have the potential to be exposed to, work involving hand and power tools as described in this HSS.

The requirements herein meet OSHA requirements as set forth in [29 Code of Federal Regulations \(CFR\) 1910 Subpart P](#) - Hand and Portable Powered Tools and Other Hand-Held Equipment (General Industry) in addition to [29 CFR 1926 Subpart I](#) Tools - Hand and Power (Construction). Certain states and clients may require more stringent requirements for hand and power tool operation than what is provided in this HSS.

3. DEFINITIONS

Definitions related to Hand and Power Tools can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

4. RESPONSIBILITIES

4.1 Project Management

The Project Manager is responsible for:

- Aiding in the selection and procurement of the most appropriate tools for the task.
- Verifying and correcting deficiencies identified by the Site Safety Officer (SSO) or employees, as applicable.

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- Using the Arcadis Task Improvement Process (TIP) to evaluate hand and power tool use proficiency and verify each employee's comprehension of the equipment's respective owner's manual.

4.2 All Employees

All employees are responsible for:

- Communicating with their respective project teams when the employee has no or limited experience with any hand tool or power tool associated with the planned work.
- Using Stop Work Authority (SWA) and will seek instruction prior to use of any tool they are unfamiliar with or do not have adequate proficiency.

4.3 Site Safety Officers (SSO)

Site Safety Officers are responsible for:

- Assisting Project Management in the selection of the safest, most appropriate hand and/or power tool.
- Verifying that all hand and power tools being used are in proper working order and are being used for the appropriate purpose.
- Verifying each employee's proficiency and comprehension of the equipment respective owner's manual. The Arcadis TIP is one method SSOs may use to evaluate hand and power tool use proficiency.
- Stopping work if improper use of hand or power tool is observed or if a hazardous situation is encountered. The SSO will instruct employee on proper tool use and PPE requirements prior to commencement of work activities.

4.4 Corporate H&S Staff

Corporate Health & Safety is responsible for:

- Communicating the requirements of this HSS with Arcadis U.S.
- Verifying this standard is being implemented effectively.

5. PROCEDURE

Hand and power tools will be selected based on appropriate use for the task. Selected rented or purchased tools will incorporate safety into the tool design.

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5.1 General Safety Requirements

The following basic safety rules apply to use of most hand and power tools:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job.
- Never modify a tool or remove safety devices intended to protect the worker, regardless of the circumstances.
- Examine each tool and the power source, when applicable, for damage before use.
- Power cords that have damaged insulation must be discarded or professionally repaired.
- When provided, operate tools according to the manufacturers' instructions. In the event the manufacturer does not provide instructions, use the tool for its intended purpose and document tool limitations and hazards in the task specific JSA.
- Use PPE according to manufacturer's recommendations and, as part of a task hazard assessment, incorporate additional PPE as warranted.
- When using a hand or power tool in a location where it could fall to a lower level if dropped, a tool tethering devices must be utilized.

Additional safety procedures include the following:

- Never carry a tool by the cord or hose.
- Never pull power cords or hoses as a means of disconnecting.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits and cutters.
- Keep all people not involved with the work a safe distance from the work area. The safe distance will vary as determined by tool based on the hazard including but not limited to noise levels, cuttings, exhaust, etc.
- Secure working stock with clamps or in a vise, freeing both hands to operate the tool.

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- Avoid accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.
- Workplace floors shall be kept as clean and dry as possible to prevent slips, trips, or falls when working with, or around hand tools.

Employees shall not use tools for any unintended purpose, nor shall an employee use any tool that is damaged. Damaged tools shall be properly tagged and removed from service or disposed of properly in accordance with local regulations.

PPE (e.g., safety goggles, gloves, chaps, hearing protection, etc.) specified by the manufacturer, must be worn while using portable power tools and hand tools. Additionally, a task hazard analysis (THA) and Job Safety Analysis (JSA) must be completed for the task to determine if additional PPE is necessary.

5.2 Power Tools

The types of power tools are determined by their power source: electric, pneumatic, liquid fuel, hydraulic and powder actuated.

5.2.1 Electric Power-Operated Tools

Electric tools are powered by AC or DC (battery) sources. The following general practices should be followed when using electric tools:

- Electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle.
- Operate electric tools within the manufacturer specified design limitations.
- Store electric tools in a dry place when not in use.
- Do not use electric tools in damp or wet locations unless they are approved for that purpose. If utilizing AC power tools in damp locations, a ground fault circuit interrupter (GFCI) must be used as close to the power source as possible.
- Keep work areas well lighted when operating electric tools.
- Maintain good housekeeping so cords from electric tools do not present a tripping hazard.

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5.2.2 Pneumatic power tools

Pneumatic tools are powered by compressed air and include, but are not limited to, chippers, drills, ratchets, hammers, and sanders.

Pneumatic tools must be inspected to verify that the tool is fastened securely to the air hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool (e.g., a “whip check”) must also be used.

Pneumatic power tool hazards include:

- Sudden and forceful disengagement of attachments
- Constant or intermittent hazardous sound levels; and
- Air compressor noise.

Screens may be used to protect workers near flying fragments around chippers, riveting guns, staplers, or air drills.

The manufacturer's safe operating pressure for hoses, pipes, valves, filters and other fittings shall not be exceeded.

5.2.3 Fuel-Powered Tools

Fuel-powered tools are often mid to large size and require petroleum. They operate, primarily, by an internal combustion engine.

Aside from inherent hazards associated with the specific power tool, fuel vapors pose a risk of fire and explosion. Additionally, combustion of fuel produces carbon monoxide, which is an odorless tasteless gas. Ventilation of exhaust is a critical step in planning for fuel-powered tool use.

When a fuel-powered tool is used inside an enclosed area, engineering controls, such as ventilation, must be in place, and continuous breathing zone monitoring is required to verify carbon monoxide levels are safe. If engineering controls are determined to be insufficient in controlling carbon monoxide, atmosphere-supplying respirators must be used to avoid breathing carbon monoxide. Fire extinguishers must also be available in the area.

All fuel powered tools shall be shut off and allowed to cool prior to being refueled or serviced.

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5.2.4 Powder-Actuated Tools

Powder-actuated tools use a small, controlled explosion, similar to the process of discharging a firearm, and must be treated with extreme caution.

When using powder-actuated tools, an employee must wear suitable ear, eye and face protection.

Safety precautions that must be followed when using powder-actuated tools include:

- Do not use in an explosive or flammable atmosphere.
- Inspect the powder-actuated tool before use to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions and has the proper shield, guard and attachments recommended by the manufacturer.
- Inspect the working stock for imperfections prior to operating the powder-actuated tool to ensure the material integrity is sound and able to receive the fastener without shattering.
- Do not load the tool unless it is to be used immediately.
- Do not leave a loaded tool unattended.
- Keep hands clear of the barrel end.
- Never point the tool at anyone.

5.2.5 Hydraulic Power Tools

The fluid used in hydraulic power tools must be approved for use by the manufacturer and must retain its operating characteristics at the most extreme temperatures to which the tool will be exposed.

The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

5.3 Guarding

Guards are a critical type of engineering control incorporated into the equipment specifically to prevent operator injury and injury to surrounding personnel. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise

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create a hazard. Guarding shall meet the requirements as set forth in American National Standards Institute (ANSI), B15.1-1953 (R1958), Safety Code for Mechanical Power-Transmission Apparatus.

One or more methods of machine guarding shall be provided to protect the operator and other personnel in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks.

The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his/her body in the danger zone during the operating cycle.

Safety guards must never be removed when a tool is being used.

Machines which typically require point of operation guarding include but are not limited to:

- Guillotine Cutters
- Shears
- Alligator Shears
- Powered Presses
- Milling Machines
- Power Saws
- Jointers
- Portable Power Tools
- Forming Rolls and Calendars

Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard.

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5.3.1 Bench Grinder Guarding

Bench grinders are commonly used and have specific guarding requirements. The portion of the grinding wheel that is not being used must be guarded, including the sides and an opening of no more than 65 degrees to allow workers access. If the grinding wheel shatters or explodes, the guarding will minimize the risk to the operator and bystanders. Never use the grinder with any covers or guards removed.

5.3.1.1 Tool/Work Rest

Bench grinders must have a horizontal work rest to prevent entanglements. To avoid creating a nip point, adjust the work rest to 1/8-inch of the grinding wheel. Workers must readjust the work rest as the grinding wheel gets smaller due to usage.

5.3.1.2 Tongue Guard / Spark Arrestor

The tongue guard is a simple metal plate adjacent to the work rest that minimizes flying sparks and wheel fragment ejections toward the operator. The distance between the tongue guard and grinder wheel must never exceed ¼-inch. As is the case with the work rest, the tongue guard must also be adjusted as the wheel wears down due to using.

5.3.1.3 Eye Shield

Bench grinders often have a transparent shield in place to prevent projections from the grinder striker the user's eyes and face. OSHA 29 CFR 1910.215 does not mention having eye shields on bench grinders. However, OSHA 1926.303(c)(9) does mention, "All employees using abrasive wheels shall be protected by eye protection equipment." If the eye shield is missing on the bench grinder, the user must wear safety glasses and a face shield.

5.3.2 Additional Equipment-specific Guarding Requirements

OSHA [29 CFR 1910.211-219](#) prescribes specific guarding requirements on equipment used in General Industry, and OSHA [29 CFR 1910.300](#) prescribes specific guarding requirement for equipment used in the Construction Industry.

5.3.3 Anchoring fixed machinery

Machines designed or intended to be used in a fixed location shall be adequately secured to prevent "walking" or movement of the equipment from its intended location.

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5.4 Hand Tools

Hand tools are powered manually instead of with a motor. They include anything from axes to wrenches and are used frequently at Arcadis. The greatest hazards posed by using hand tools result from misuse and improper maintenance.

Always use the tool in accordance with its intended purpose. An example of tool misuse would be using a screwdriver as a chisel, which may cause the tip of the screwdriver to break, becoming a projectile hazard.

General Hand Tool Guidelines:

- Direct all saw blades, knives, or other tools away from the user, other employees working in proximity and any aisle areas.
- Maintain the cutting edge of tools; dull blades often pose a greater hazard.
- Damaged or defective (cracked, chipped, or worn, etc.) saw blades must be removed from service.
- Wrenches must not be used when jaws are spread to the point that slippage occurs.
- Impact tools such as drift pins, wedges, and chisels must be kept free of “mushroomed” heads to prevent injury resulting from bits of metal flying from the tool during use.
- All wooden handles must be inspected prior to use to ensure they are not splintered, cracked or deteriorating. Additionally, wooden handled tools that require a wedge to secure the tool head must be inspected to verify the wedge is secure and the head of the tool is not loose.
- Iron or steel hand tools may produce sparks that can be an ignition source if used around flammable substances. Spark-resistant tools made of non-ferrous materials will be used where flammable gases, highly volatile liquids, and other explosive substances are stored or used.
- Fiberglass and plastic handled tools must be inspected prior to use to verify the handles are in good condition and no cracks, discoloration, notches, burring, flaring, scarring or deterioration is observed that could result in tool failure during use.
- When using hand tools from an elevated work platform, tethering devices shall be used.

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- Appropriate PPE must be worn, e.g., safety glasses/goggles/face shield, ANSI compliant protective work gloves, hard hat, safety toe boots

5.4.1 Sharp and Cutting Hand Tools

Sharp and cutting hand tools can cause cuts and puncture injuries if not handled or used properly.

General Rules for Sharp and Cutting Tool Safety:

- The most important rule to remember when using sharp and cutting tools is to always **cut away from the body** and face.
- Keep blades sharp.
- Secure the object or stock being cut on a stable surface.
- When cutting with one hand, verify the other hand is not within the cutting path.
- If a sharp tool is dropped, do not try to catch it. Allow it to fall, making sure that legs and feet are out of the way.
- Do not carry sharp tools in pockets; use a sheath, belt, holster, or apron. When holding a sharp tool, it should be held at the persons side a safe distance from the body.
- When walking with a sharp tool, it should be carried with the blade down or stored in sheath, belt, or apron.
- When passing a sharp tool to another employee, the tool should be passed with the handle first and blade retracted if possible or otherwise pointing down; never toss or throw a sharp tool.
- When not in use, sharp or cutting tools should be stored in a sturdy toolbox with guards in place or on a tool rack with the sharp edges protected

5.4.2 Fixed Open-Blade Knives (FOBKs)

The use of Fixed Open-Blade Knives (FOBKs) is prohibited. The use of Bladeless Safety Cutters, Concealed Blade Safety Cutters, Fully Automatic Smart Safety Knives is

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recommended. The use of Spring Loaded Semi-Automatic Safety Knives is not recommended. See [Exhibit 3](#) for Safety Knife Recommendations.

When no practical alternative to the use of FOBKs is available, the use of a FOBKs will be permitted if all the following are completed:

- Task Hazard Analysis completed demonstrating no practical alternative is available and documented in the HASP.
- Use of FOBKs is documented in the daily safety tailgate meeting.
- Job Safety Analysis (JSA) completed listing the hazards, controls and correct usage for the use of the FOBK.

Exemption: Scalpels, Machetes, Tubing / Pipe cutters, Shears, Scissors, Clippers, Grass Sickle, Diving Rescue Knife, Geoprobe DT325 Liner Cutter or similar tool. These tools, when used correctly, are exempt from the prohibition of FOBKs

5.4.3 Machete Safety

A machete is often chosen to cut back tall grasses, weeds and similar vegetation because it is cheap and widely available. However, the project team should evaluate whether the machete is the appropriate and safest tool to complete the task. The following apply to machete use:

- The user must push the machete away from the body and not allow the point of the machete to point toward the ground near the user's feet. While this is the easiest motion, especially for long term use, the blade may end dangerously close to the opposite leg at the end of the swing.
- Swing at a 45-degree angle, cutting to the right or left of your body.
- Wear gloves that provide abrasion resistance and have slip-resistant palms.
- Use a tether or lanyard at all times.

5.5 Using Tools in Classified Hazard Areas

Electrically powered tools and the use of some hand tools may be sources of ignition. Special consideration must be made when working around flammable substances or when working in classified hazardous areas. Similarly, the use of some hand tools may result in sparking and similar precautions must be considered. When working around flammable

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substances or when working in classified hazardous areas, non-sparking tools may be required. See [ARC HSCS013](#) Hot Work for information relating to working in classified hazardous areas.

5.6 Specific Tool Requirements

5.6.1 Grounding of equipment

All electrically powered hand tools must be equipped with a grounding system. Portable electrically powered equipment must be connected to an electrical source equipped with a ground fault circuit interrupter (GFCI). See the Electrical Safety H&S Standard [ARC HSFC006](#) for information related to grounding.

5.6.2 Pneumatic powered tools and hose

5.6.2.1 Tool retainer

A tool retainer shall be installed on each piece of utilization equipment which, without such a retainer, may eject the tool.

5.6.2.2 Air hose

Hose and hose connections used for supplying compressed air to equipment shall be designed for the pressure and service to which they are subjected.

5.6.3 Power lawnmowers

5.6.3.1 General requirements

Power lawnmowers including walk-behind, riding-rotary, and reel power lawnmowers shall be guarded in accordance with the machine guarding requirements discussed in [Section 5.3](#).

All power-driven chains, belts, and gears shall be so positioned or otherwise guarded to prevent accidental contact with the operator during normal starting, mounting, and operation.

A shutoff device shall be provided to stop operation of the motor or engine. This device shall require manual and intentional reactivation to restart the motor or engine.

All positions of the operating controls shall be clearly identified.

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The words, "Caution. Be sure the operating control(s) is in neutral before starting the engine," or similar wording shall be clearly visible at an engine starting control point on self-propelled mowers.

5.6.3.2 Walk-behind and riding rotary mowers

The mower blade shall be enclosed except on the bottom and the enclosure shall extend to or below the lowest cutting point of the blade in the lowest blade position.

Warning instructions shall be affixed to the mower near the opening stating that the mower shall not be used without either the catcher assembly or the guard in place.

The word "Caution." or stronger wording, shall be placed on the mower at or near each discharge opening.

Blade(s) shall stop rotating from the manufacturer's specified maximum speed within 15 seconds after declutching or upon shutting off power.

In a multipiece blade, the means of fastening the cutting members to the body of the blade or disc shall be so designed that they will not become worn to a hazardous condition before the cutting members themselves are worn beyond use.

5.6.3.3 Walk-behind rotary mowers

The horizontal angle of the opening(s) in the blade enclosure, intended for the discharge of grass, shall not contact the operator area.

There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

- A minimum unobstructed horizontal distance of 3 inches from the end of the discharge chute to the blade tip circle.
- A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.
- The highest point(s) of the front of the blade enclosure, except discharge openings, shall be such that any line extending a maximum of 15 deg. downward from the horizontal toward the blade shaft axis (axes) shall not intersect the horizontal plane within the blade tip circle. The highest point(s) on the blade enclosure front, except

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discharge-openings, shall not exceed 1^{1/4} inches above the lowest cutting point of the blade in the lowest blade position. The mower handle shall be fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation.

A positive up stop or latch shall be provided for the mower handle in the normal operating position(s). The up stop shall not be subject to unintentional disengagement during normal operation of the mower. The up stop or latch shall not allow the center or the handle grips to come closer than 17 inches horizontally behind the closest path of the mower blade(s) unless manually disengaged. A swing-over handle, which complies with the previous requirements, will be permitted.

Wheel drive disengaging controls, except “Deadman” controls, shall move opposite to the direction of the vehicle motion in order to disengage the drive. Deadman controls shall automatically interrupt power to a drive when the operator's actuating force is removed and may operate in any direction to disengage the drive.

5.6.3.4 Jacks

All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded. Also, the manufacturer's load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded.

A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be supported or “blocked up”. Put a block under the base of the jack when the foundation is not firm and place a block between the jack cap and load if the cap might slip.

6. TRAINING

All employees are trained on basic hazard recognition, TRACK, and Stop Work Authority (SWA) during Health & Safety Orientation training. Specific training on the proper use and handling of tools and equipment will be completed through on-the-job training/instruction, review of manufacturer operating instructions and/or video training on the use of hand/power tool. The TIP process may be used to evaluate hand and power tool use proficiency.

7. REFERENCES

The following H&S standards can be found on the [Policies and Integrity Site](#):

- Arcadis Health and Safety Standard ARC HSFS010– Health and Safety Plan

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- Arcadis Health and Safety Standard ARC HSFS013 – Hot Work
- Arcadis Health and Safety Standard ARC HSFS019 – Short Service Employee

Additional resources regarding process safety management include but are not limited the following:

- [29 CFR 1910 Subpart P \(General Industry\)](#)
- [29 CFR 1926 \(Construction\)](#)
- [DOL/OSHA 3080 – Hand and Power Tools Booklet](#)

8. RECORDS

Training records will be stored in Arcadis' Oracle Learning Cloud so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload certificates to the Oracle Learning Cloud for maintenance by HR Operations (PeopleServices@arcadis.com).

Copies of all HASPs and JSAs that document THAs and tool hazards and use will be kept in the project files and all TIPs will be entered into the 4-Sight database or similar.

9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Corporate H&S Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
30 May 2019	01	Greg Mason/Denis Balcer/Andrew McDonald/Alec MacAdam/Julie Santaniello	Original document
8 February 2023	02	Greg Mason	Entire document updated to new standard format; Hyperlinks updated; Added material relating to tool tethering, section on bench grinders, and machete use.

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Exhibit 1 - Definitions

Explosion-proof apparatus: Apparatus enclosed in a case that can withstand an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes or explosion of the gas or vapor within, and that operates at such an external temperature that it will not ignite a surrounding flammable atmosphere.

Intrinsically safe: An apparatus/equipment in which all the circuits in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions as described in ANSI/UL 913 Edition 8.

Insulated: Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

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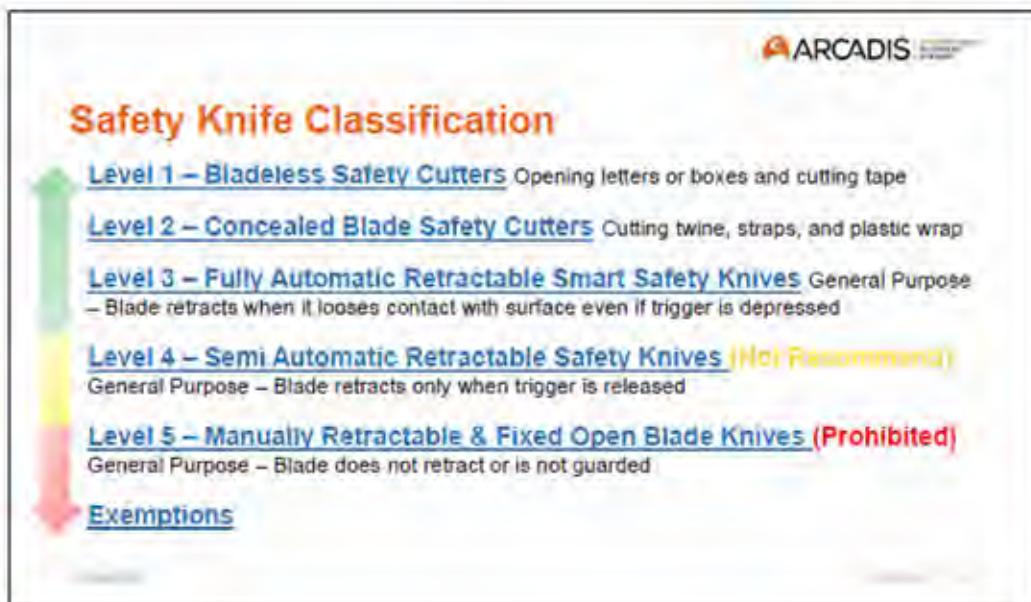
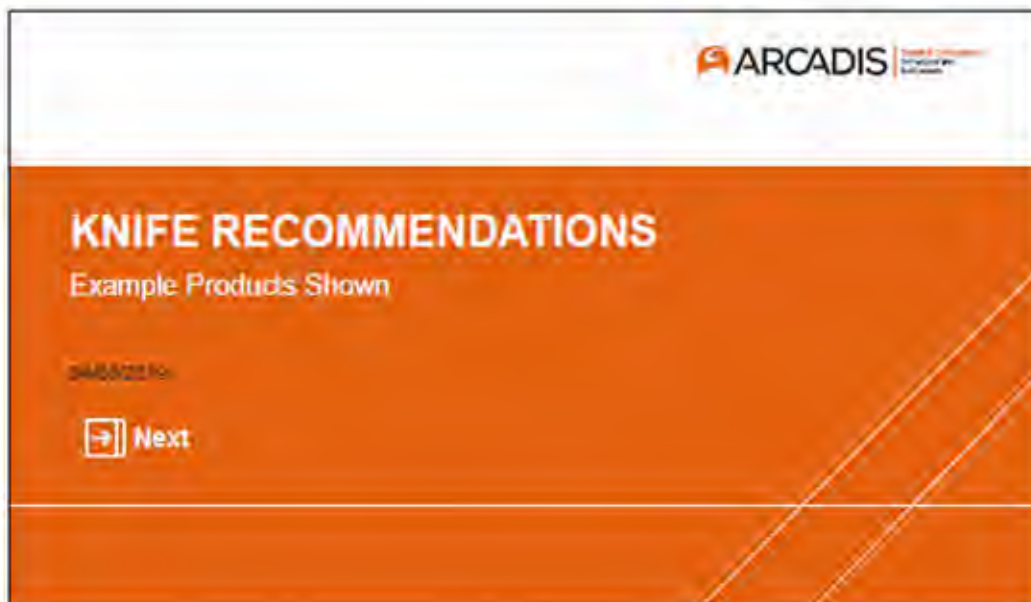
Exhibit 2 – Abbreviations and Acronyms

ANA	Arcadis North America
Arcadis	Arcadis U.S. Inc.
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard
AC	Alternating current
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
DC	Direct current
FOBKS	Fixed Open-Blade Knives
GFCI	Ground fault circuit interrupter
JSA	Job Safety Analysis
OSHA	Occupational Safety and Health Administration
PPE	Personal protective equipment
SSO	Site Safety Officer
SWA	Stop Work Authority
THA	Task hazard analysis
TIP	Task Improvement Process

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Exhibit 3– Knife Recommendations

([Link to Knife Recommendations full slide deck](#))



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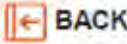
Level 1 - Bladeless Safety Cutters

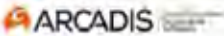
Definition & Use

- No blade cutting
- Scissors
- Good for cutting paper, string, strapping, fabric, and small diameter wire

Tool Examples







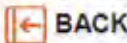
Level 2 – Concealed Blade Safety Cutters

Definition & Use

- Knife blade is recessed and not exposed to the user
- Good for cutting shrink wrap, strapping, banding, box tape, corrugate cardboard, rope, and strapping

Tool Examples





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Level 3 – Fully Automatic Retractable Smart Safety Knives

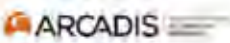
Definition & Use

- Knife blade automatically retracts when contact with the cutting surface is lost
- Replacement for spring loaded semi automatic safety knives and standard fix blade box cutter
- Typically ambidextrous

Tool Examples



 **BACK**



Level 4 – Semi Automatic Retractable Safety Knives

Definition & Use

- **Not Recommend**
- Knife blade only retracts when trigger is released
- Replacement for standard fixed blade box cutter
- Typically ambidextrous

Tool Examples



 **BACK**

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Level 5 – Manually Retractable & Fixed Open Blade Knives

Definition & Use

- **Use Prohibited**
- Knife blade is manually retracted or blade doesn't retract
- Includes integrated pocket knife & multipurpose tool blades




Prohibited Blades Examples









Fixed Open Blade Knife (FOBK) Exemptions

Exempted Tools

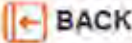
The following tools, when used correctly, are exempt from the prohibition of FOBKs:

Scalpels, Machetes, Tubing / Pipe cutters, Shears, Scissors, Clippers, Grass Sickle, Diving Rescue Knife, Geoprobe DT325 Liner Cutter or similar tool, and paint scrapers. Pocket knives and multi-purpose tool use is not prohibited, however the use of the integrated knives is prohibited.

Exemption Process

When no practical alternative to the use of FOBKs is available, the use of a FOBKs will be permitted if all of the following are completed:

- 1 Task Hazard Analysis completed demonstrating no practical alternative is available and documented in the HASP.
- 2 Job Safety Analysis (JSA) completed listing the hazards, controls and correct usage for the use of the FOBK.
- 3 Use of FOBKs is documented in the daily safety tailgate meeting.



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Exhibit 4 – Personal Noise Monitoring Field Form

E5

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1. POLICY

It is the policy of Arcadis to assess noise hazards resulting from or encountered by our staff during job activities and to control such noise hazards to minimize and eliminate hearing loss among our staff, subcontractors, clients, and the public. Arcadis will make hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour time-weighted average (TWA) of 80 decibels in the A scale (dBA) or a peak sound pressure level of 140 dB C-weighted (dBC) for any amount of time. Where noise exposure cannot be eliminated or minimized by engineering and administrative controls and an Arcadis employee will be exposed to noise at or over an 8-hour TWA of 85 dBA, employees will be required to wear appropriate hearing protection. When in doubt, Arcadis will provide hearing protection.

2. PURPOSE AND SCOPE

2.1 Purpose

This Health & Safety Standard (HSS) sets forth the requirements for providing a standard policy on the health and safety requirements and processes for employees with potential exposure to excessive noise (levels in excess of 80 dBA) and to comply with occupational exposure limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), detailed in [Exhibit 3](#) and the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard (29 CFR 1910.95 and 29 CFR 1926.52).

2.2 Scope

This HSS applies to every project and all operations conducted by Arcadis. Hearing Protection Devices (HPDs) will be supplied and/or approved by Arcadis for use by employees in carrying out their assignments. All employees conducting work where the potential for noise exposure exceeds 85 dBA as an 8-hour TWA are required to have their assigned HPDs available and used as required by the project Health & Safety Plan (HASP), Job Safety Analysis (JSA) and/or client requirements.

3. DEFINITIONS

Definitions related to Hearing Conservation Health & Safety Standard can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

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4. RESPONSIBILITIES

4.1 Project Management

Project Managers (PMs) have the responsibility to know and follow applicable Arcadis and client H&S requirements for ensuring work is conducted in accordance with this HSS, and for implementing the requirements in this HSS at any project site and/or office that pose hazards to Arcadis employees or employees of its subcontractors, clients, and other organizations present in the vicinity of work controlled by Arcadis.

For project related work, PMs responsibilities also include determining and communicating any specific client requirements that are applicable, including:

- Taking appropriate steps to minimize the risk of noise-induced hearing loss that may include implementing noise control measures, as well as the provision of hearing protection devices to employees, as required.
- Communicating with and appropriately managing subcontractors, ensuring that employees have appropriate training and qualifications, and for ensuring all client HS requirements are met.
- Involving the appropriate Arcadis H&S staff and project client staff, as necessary.
- Ensuring that all subcontractors have been communicated with concerning the minimum H&S requirements for the project.
- Providing adequate resources and budget for personal protective equipment (PPE), including HPDs, at no cost to the employee.
- Ensure that Arcadis employees working on their projects are properly using and caring for their HPDs.

In addition, as project and client agents and on behalf of Arcadis, the Project Managers for client-related work shall be responsible for:

- Stewarding H&S and setting expectations that all Arcadis employees working on their projects must comply with H&S rules and requirements.
- Guaranteeing each employee, the absolute right to exercise “Stop Work Authority” in good faith without fear of retribution or disciplinary action; and

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- Using the Arcadis Incident Investigation process for formally resolving a “Stop Work” condition.

Using this “Stop Work Authority” process, the Project Manager and the employee will:

- Discuss and document the condition.
- Identify and document the root cause for the condition.
- Determine and document the solutions.
- Implement the solutions; and
- Confirm and acknowledge the solutions in place are to the satisfaction of the employee(s) involved in the stop work incident.

4.2 All Employees

Employees are required to wear prescribed HPDs during activities where noise levels will exceed 85 dBA as an 8-hour TWA. The requirements for availability, selection, and use of HPDs shall be defined by project HASPs, JSAs and/or client requirements.

In addition, employees have the responsibilities to adhere to this HSS and to communicate H&S concerns, issues and questions to their supervisor or their respective H&S resource. In addition, all employees have the responsibility to:

- Maintain hearing protectors in sanitary condition and proper working order.
- Use the **TRACK** process prior to any activity.
- Follow all Arcadis and client requirements.
- Participate in the medical surveillance program, including annual audiograms and hearing conservation training, as applicable based on their job duties.
- Notify both their Supervisor and Enabling Function Health and Safety if they were exposed to high noise levels and required to wear hearing protection during the previous year and are not already in the medical surveillance program; and
- Understand and appropriately use the “Stop Work Authority” concept as described in the Arcadis Stop Work Authority HSS (ARC HSGE009).

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4.3 Supervisors and Operations Managers

Supervisors and Operations Managers are responsible for:

- Stewarding the H&S program to ensure that staff in their practice are appropriately equipped with the necessary hearing protection and have been provided the appropriate training.
- Knowing and understanding our H&S program, policy, vision, and this HSS in detail enough to be prepared to explain it to a client when required.
- Providing oversight management for the H&S of employees in their respective operations. Each will assure that appropriate time and resources are provided to facilitate the implementation of this HSS.
- Involving themselves in any “Stop Work” issued by an employee, as requested by an Arcadis employee, project manager, or Operations Managers. Supervisors will assist in resolving the issue associated with the “Stop Work Authority” issued by an employee.

4.4 Health & Safety Managers, Specialists and Site Safety Officers

Health and Safety Managers and Specialists and Site Safety Officers (SSOs) are responsible for facilitating the policy and standard requirements in this HSS in their area of responsibility and for providing “hands-on” assistance to Arcadis staff to ensure this standard is appropriately implemented.

4.5 Enabling Function H&S Staff

Enabling Function Health & Safety is responsible for:

- Communicating the requirements of this HSS with Arcadis U.S. project teams and employees.
- Verifying this standard is being implemented effectively via staff feedback, conducting reviews of project site audits, and through participation in incident investigations.
- Ensuring that Operations Management, Supervisors, Project/Task Managers, and staff affected by excessive noise are aware of this HSS.
- Provide technical services and advice regarding control measures, assist employees in the selection of appropriate hearing protective devices and provide instruction on their use, maintenance, and care, as requested.

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- Collaborating with the Arcadis medical surveillance program administrator and Arcadis employees who require audiogram re-testing when a standard threshold shift (STS) in their audiogram results has been detected.
- Provide required training or guidance on approved training options; and
- Review, evaluate and maintain this HSS on a routine basis.

5. PROCEDURE

5.1 Noise Monitoring and Exposure Assessments

When information indicates that an employee's exposure may equal or exceed an 8-hour TWA of 80 dBA, Arcadis shall conduct a noise exposure evaluation (e.g., review of historical exposure monitoring data and/or published sound levels for anticipated activities) and as warranted, develop and implement a monitoring program. The objective assessing whether an excessive noise may be present is to assist project teams in evaluating potential engineering and/or administrative controls and to assist in identifying the necessity for HPDs for the affected staff.

Noise monitoring will be prescribed by H&S professionals during the development of the HASP and/or JSAs in accordance with the Industrial Hygiene HSS (ARC HSIH009). Noise monitoring may also be conducted at the discretion of the SSO or any staff members that have questions or concerns about potential noise exposure that could result in employee exposure above 85 dBA as an 8-hour TWA. If noise monitoring is not feasible, Arcadis staff will assume that noise levels that require elevated speech beyond standard conversation level for staff to be heard are exceeding 85 dbA and will use appropriate hearing protection. Noise monitoring results will be collected in accordance with the OSHA Occupational Noise Exposure Standard (29 CFR 1910.95). Monitoring results will be communicated to staff and used to determine adequate types and effectiveness of hearing protection device.

The measurement of the A-weighted sound pressure level in a workplace shall be performed instantaneously, during normal working conditions, using the slow response setting of a sound level meter. Noise exposure level is determined through the integration of all continuous, intermittent, and impulsive (e.g., a noise event characterized by very short rise time and duration.) sounds between 80 dB and 140 dB.

During this noise hazard investigation, the Personal Noise Monitoring Field Form ([Exhibit 4](#)) will be completed. The following matters shall be considered:

- The sources of sound in the workplace.

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- The A-weighted sound pressure levels to which the employee is likely to be exposed and the duration of such exposure.
- The methods being used to reduce this exposure.
- Whether the exposure of the employee is likely to exceed the 85 dBA as an 8-hour TWA or other limits defined in the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices, and
- Whether the employee is likely to be exposed to a noise exposure level equal to or greater than 85 dBA as an 8-hour TLV-TWA.

On completion of the noise hazard assessment or monitoring, the person appointed to carry out the assessment or monitoring shall document:

- Observations with regards to potential noise exposure.
- Recommendations respecting the measures that should be taken to limit employee exposure to noise.
- Requirements that HPDs will be made available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time.
- Requirements for use of hearing protection by employees who are exposed to a noise exposure level equal to or greater than 85 dBA as an 8-hour TWA.

5.2 Reduction / Control of Noise Exposure

Insofar as is reasonably practicable, Arcadis shall, by engineering controls or physical means other than hearing protectors, reduce the employee's exposure to sound to a level that does not exceed an 8-hour TWA noise exposure level of 85 dBA or other limits defined in the ACGIH TLV – refer to [Exhibit 3](#)

The hierarchy of hazard controls that must be followed:

1. *Eliminating the Noise Source* - The elimination of a source of noise is the most effective way to prevent risks to employees and should always be considered when new work equipment or workplaces are planned.

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2. *Substitution of Noise Source* – In certain scenarios the device or equipment producing the noise may be able to be substituted for an alternative piece of equipment which, because of new technology, new design, or necessary maintenance, can complete the work while producing less noise.

3. *Engineering Controls* – Another method of dealing with noise in the workplace is to reduce the noise at the source using engineering controls. Engineering controls can eliminate the need for hearing protection, audiometric testing, and other elements of a hearing conservation program. Even if noise cannot be reduced to safe levels at the source, reducing noise increases the likelihood that hearing protection will be even more effective in reducing noise exposures below the 85 dBA exposure limit. Some possible options include reduction of noise at source, enclosure of noise source, enclosure of employees, acoustical treatment of room, separating workers from the noise source and a combination of these controls. In addition, substitution controls may be employed, as part of the engineering control measures.

4. *Administrative Controls* - Education and training are the primary administrative controls for hearing protection. Administrative controls also include measures such as work-rest cycles and infrequent work tasks. These controls are aimed at reducing the time a worker is potentially exposed to noise.

5. *Use of Personal Protective Equipment (PPE)* - When engineering controls cannot eliminate the noise hazard, HPDs will be used to lower noise exposures to acceptable levels. Hearing protection in the form of ear plugs and/or earmuffs are examples of hearing protection devices that can help serve to minimize noise exposures.

5.3 Warning Signs

Workplaces in which the noise level exceeds 85 dBA TWA, and where it is feasible to do so, will have signs posted. Signs shall read “**Caution - Hearing Protection Required.**” In extreme noise areas with measured noise levels greater than 105 dBA for any length of time, signs shall read “**Danger – Hearing Protection Required.**” In some cases, the responsibility will fall upon the client and/or contractor to post these warning signs. For temporary work locations, Arcadis will coordinate/discuss required warning sign requirements with the controlling contractor.

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5.4 Audiometric Testing

Arcadis has established and maintains an audiometric testing program by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour TWA of 85 decibels.

Within 6 months of an employee's first exposure meeting or exceeding the action level, Arcadis shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

At least annually after obtaining the baseline audiogram, Arcadis shall obtain a new audiogram for each employee exposed at or above an 8-hour TWA of 85 decibels.

Audiometric tests will be scheduled in conjunction with pre-placement, periodic, and termination medical examinations as required by the Arcadis Medical Surveillance Program (ARC HSGE010). All employees that are not already part of the medical surveillance program must inform their supervisor and Enabling Function Health and Safety if they were exposed to high noise levels as part of their job duties. Employees that were exposed to high noise levels must receive an audiogram as specified by the Medical Surveillance Program. Employees will be informed of the requirement that they avoid both non-occupational and occupational noise exposure for 14 hours prior to audiometric testing.

Audiograms will be compared to baseline and prior tests to determine if a standard threshold shift (STS) has occurred. The TPA for the Arcadis Medical Surveillance Program (currently WorkCare) will directly notify an employee and the Arcadis Enabling Function Health and Safety Medical Surveillance Program Administrator in writing of an STS within 21 days of determination. If an STS is detected, retesting may be done within 30 days of the initial test to determine whether the STS is occupationally related. If an occupational STS is confirmed, the employee will be informed in writing and may need to be refitted and retrained in hearing protection use. If subsequent testing shows that an STS is not determined to be occupational, yet an STS is confirmed to be present, the employee will be informed of the updated determination. Additional audiometric testing may be conducted at the discretion of Arcadis Enabling Function Health and Safety.

The TPA physician or audiologist will determine if further evaluation is needed and, if so, will provide to the specialist all the information that is required. If the physician determines that the medical pathology is unrelated to work exposure or wearing hearing protectors (e.g., "non-occupational"), the employee will be informed by the physician.

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The Audiometric Testing program will be managed by the Arcadis TPA for the medical surveillance program.

5.5 Hearing Protection Devices

HPDs will be available to all workers exposed to noise levels that exceed 80 dBA as an 8-hour TWA and will be required when workers are exposed to noise levels that exceed 85 dBA as an 8-hour TWA, in accordance with the Personal Protective Equipment (PPE) HSS (ARC HSGE015). HPDs will be provided at no cost to the employee. Some types of hearing protection include:

- Earmuffs – fit over the whole ear and seal the ear from noise. The efficiency of the muff type may decrease if the muff is not fitted properly or if glasses are worn with them.
- Ear Plugs – which are worn in the internal part of the ear, and they are made of a variety of materials (rubber, plastic, or other material) that will fit tightly in the ear.

Arcadis shall supply a hearing protector that:

- Has appropriate Environmental Protection Agency (EPA) labeling for hearing protectors (40 CFR 211), which requires manufacturers to identify the noise reduction capability of all hearing protectors on the hearing protector package. This measure is referred to as the noise reduction rating (NRR); and
- Prevents the employee using the hearing protector from being exposed to a level of sound that exceeds the limits detailed in [Exhibit 3](#)

Note: The actual effectiveness of any individual hearing protector cannot be determined under workplace conditions. However, OSHA's noise standards 29 CFR 1910.95(j)(2) and 29 CFR 1926.52(b) require that personal hearing protection be worn to attenuate the occupational noise exposure of employees. Arcadis chooses to implement the ACGIH-TLV for noise exposure. OSHA Occupational Noise Exposure Standard, Appendix B: Methods for Estimating the Adequacy of Hearing Protector Attenuation provides information on how to determine the adequacy of hearing protector attenuation using the NRR of a given hearing protector.

Certain workplace scenarios may involve the exposure to noise sources considered to be “extreme”. An extreme level of noise is defined as “Areas with measured noise levels greater than 105 dBA for any amount of time.” As a Best Management Practice, Arcadis employees working in **extreme** noise areas are directed to wear “dual” hearing protection, consisting of

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earplugs along with earmuffs. Additional engineering and/or administrative controls limiting the exposure time to keep the sound from reaching the worker's ear drum below 85 dBA TWA must also be initiated. Based on current OSHA policy, the wearing of earmuffs over ear plugs will boost the overall attenuation of the earplugs by 5 dB. Employees will be given the opportunity to select their HPDs from a suitable variety. Arcadis shall provide training in the use and care of all HPDs provided to employees.

5.6 Preventing Hearing Loss Caused by Chemical (Ototoxicity) Exposure

The Centers for Disease Control (CDC) in collaboration with OSHA prepared the "Preventing Hearing Loss Caused by Chemical (Ototoxicity) and Noise Exposure" safety and health bulletin. The OSHA bulletin provides details on how worker exposure to certain types of chemicals, ototoxics, may affect how the ear functions including causing hearing loss and/or balance problems, regardless of noise exposure. The group of ototoxic chemicals includes certain pesticides, solvents, and pharmaceuticals. Ototoxic chemicals are classified as neurotoxicants, cochleotoxicants, or vestibulotoxicants based on the part of the ear that is damaged. Ototoxic chemicals can reach the inner ear through the blood stream and cause injury to inner parts of the ear and connected neural pathways. The first step in preventing exposure to ototoxicants is to know if they are present at the worksite. One way to identify if an ototoxic chemical is present is by reviewing the Safety Data Sheet (SDS) Section 11 "Toxicological Information" for ototoxic substances and/or chemicals, and ototoxic health hazards associated with ingredients in the product. Some ototoxic chemicals which may be encountered by Arcadis staff include, but are not limited to, solvents such as carbon disulfide, n-hexane, toluene, p-xylene, ethylbenzene, n-propylbenzene, styrene, methylstyrene, trichloroethylene, carbon monoxide, hydrogen cyanide and related salts, mercury compounds, and lead. Since ototoxic substances can be absorbed through the skin, the effective use of PPE like nitrile gloves, chemical protective aprons, or chemical protective coveralls to prevent dermal contact with such substances.

6. TRAINING

Employees who have potential or actual noise exposure work scenarios which exceed 80 dBA as an 8-hour TWA value, will be required to receive training on noise hazards, the selection, use and care of HPDs. Training can be arranged through the Arcadis Learning Management Platform (LXP) or by contacting People Services (peopleservices@arcadis.com) for support.

Employees required to wear hearing protection will receive training as provided by Enabling Function H&S. The training will be provided at least annually with refresher training as necessary and will include:

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- Information regarding effects of noise on hearing.
- Purpose of hearing protectors.
- Advantages, disadvantages, and attenuation of various types of hearing protectors.
- Selection, fitting, use, and care of hearing protectors; and
- Purpose of audiometric testing and an explanation of the test procedures.

7. REFERENCES

The following H&S standards can be found on the [Policies and Integrity Site](#):

- o Arcadis Health and Safety Standard ARC HSFS010– Health and Safety Plan
- o Arcadis Health and Safety Standard ARC HSIH009– Industrial Hygiene
- o Arcadis Health and Safety Standard ARC HSGE010– Medical Surveillance Program
- o Arcadis Health and Safety Standard ARC HSGE015- Personal Protective Equipment Program
- o Arcadis Health and Safety Standard ARC HSGE009- Stop Work Authority
- OSHA Occupational Noise Exposure Standard [29 CFR 1910.95 \(General Industry\)](#) and [29 CFR 1926.52](#) (Construction Industry)
- ACGIH Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices
- Environmental Protection Agency labeling for hearing protectors [40 CFR 211](#)
- Noise Navigator™ Sound Level Database with over 1700 Sound Level Measurement Values; E-A-R 88-34/HP; 3M Occupational Health & Environmental Safety Division; July 6, 2010; Version 1.5
- OSHA Occupational Noise Exposure Standard, [Appendix B: Methods For Estimating the Adequacy of Hearing Protector Attenuation](#)
- “[Preventing Hearing Loss Caused by Chemical \(Ototoxicity\) and Noise Exposure](#)”; US Occupational safety and Health Administration and Centers for Diseases Control Safety and Health Bulletin, SHIB 03-08-2018 DHHS (NIOSH) Publication No. 2018-124.

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8. RECORDKEEPING

All records regarding noise exposure measurements will be maintained by the offices for two years. All audiometric test records will be maintained by the TPA for the Arcadis Medical Surveillance Program for the duration of the affected employee's employment.

Training records will be stored in the LXP so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload copies of certificates following the instructions for Entering External Training in LXP in the [LXP Guidance](#).

9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Enabling Function H&S Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
1 December 2007	01	Mike Thomas/Tony Tremblay	Original document
30 January 2008	02		Change to new template
5 October 2010	03		Change name from Procedure to Standard; revision of section 5.3

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Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
12 December 2012	04		Executive Summary Added; HSP changed to HSS; Definitions relocated to Exhibit 1 and added Representative Exposure definition; Added BMP regarding use of both ear plugs and ear muffs when noise level exceeds 105 dBA; Requirement for use of HPD aligned with ACGIH Noise TLV; Training Section updated; References hyperlinked; Section 7 Hyperlinks added, including link to Common Noise Level Reference table; NRR to assess hearing protector adequacy calculation added to Exhibit 1 NRR definition
10 June 2013	05	Tony Tremblay	Noise Exposure values clarified in Executive Summary; Section 5 reformatted to include noise monitoring exposure and assessment, reduction/control of noise exposure, warning signs, audiometric testing and HPDs; Section 6 determining when noise exposure Training clarified
01 October 2013	06	Lauren Edwards	Changed the requirement for an audiometric exam within 6 months if an employee is exposed to noise at 85 dBA or higher for an 8-hr TWA. Section 5.4
6 October 2014	07	Amanda Tine/Tony Tremblay	Clarified employee audiometric testing requirements in Section 5.4 based on OSHA 29 CFR 1910.95

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20 April 2017	08	Sharon Lingle, Tony Tremblay/Julie Santaniello	New format. Added TPA will notify the Arcadis employee within 21 days of a threshold shift. Updated requirements include making hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time; and staff are required to wear prescribed HPDs during activities where noise levels will exceed 85 dBA as an 8-hr TWA. Excessive noise definition modified.
8 June 2022	09	Alec MacAdam	Formatting updates. Section 4.5 Corporate H&S staff to assist in STS tracking. Section 5.2 added substitution hazard control examples. Section 5.4 clarification of STS determination. Add section 5.6 detailing ototoxic chemicals. Add STS definition to Exhibit 1. Update Exhibit 2. Update Exhibit 3.
22 Nov 2024	10	Brian Dean Keh	Formatting updates and updated table. Updated values in ACGIH TLV chart. Removed quick sheet. Updated information in section 6 for training. Added personal noise monitoring field form (Exhibit 4).

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Exhibit 1 – Definitions

Decibels – A Weighted – the unit of measure to be used when measuring noise levels on Arcadis work sites and when comparing to occupational exposure standards and limits.

Excessive Noise – noise levels in excess of 80 dBA for any amount of time (noise environment that requires speech levels above those used for normal conversation).

Extreme Noise Areas are defined as areas with measured noise levels greater than 105 dBA for any amount of time.

HSS – Health and Safety Standard

NRR – Noise Reduction Rating is the measure, in decibels, of how well a hearing protector reduces noise, as specified by the Environmental Protection Agency. The higher the number, the greater the noise reduction. When dual protectors are used, the combined NRR provides approximately 5 decibels more than the higher rated of the two products. For example, using ear plugs (NRR of 29 decibels) with earmuffs (NRR 27) would provide a Noise Reduction Rating of 34 decibels. For practical purposes, users should assume they will receive protection that is 5 decibels less than the published value.

When using the NRR to assess hearing protector adequacy and the sound level measurement reported is in the “A” scale, the following method is used to evaluate the adequacy of the hearing protector attenuation:

Step 1: Convert the A-weighted dose to TWA (dBA)

Step 2: Subtract 7 dB from the NRR

Step 3: Subtract the remainder of Step 2 from the A-weighted TWA (Step 1 value) to obtain the estimated A-weighted TWA under the ear protector.

Representative Exposure – Measurements of an employee’s noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.

Standard Threshold Shift – OSHA defines a standard threshold shift as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

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Sound Level Meter – means a device for measuring sound pressure level that meets the performance requirements for a Type 2 instrument as specified in the International Electrotechnical Commission Standard 651 (1979).

Sound Pressure Level – means 20 times the logarithm to the base 10 of the ratio of the root mean square pressure of a sound to the reference sound pressure of 20 µPa, expressed in decibels.

Summary of Noise Trigger Levels:

- 80 dBA – Noise exposure assessment will be conducted if worker is or is likely to be exposed to noise at a workplace in excess of 80 dBA.
- 80 dBA – HPDs will be made available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time. This will also trigger training on the selection, use and care of HPDs.
- 85 dBA – AUS staff will be **required** to use HPDs for noise levels at or exceeding 85 dBA as an 8-hour TWA.
- 85 dBA as 8-hour TWA – If employee exposed at 85 dBA or higher for an 8-hr TWA, then they are required to have audiometric testing included as part of their workplace medical surveillance.
- 85 dBA or higher – noise hazard signs posted.
- 105 dBA or higher – Employee must use both ear plugs and earmuffs together for exposure to noise for any amount of time that exceeds 105 dBA.

TWA – Time Weighted Average; The average exposure to a contaminant or condition (such as noise) to which workers may be exposed without adverse effect over a period of 8 hours a day or a 40-hour work week.

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Exhibit 2 – Abbreviations and Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
Arcadis	Arcadis U.S. Inc.
ARC	Arcadis
HPD	Hearing Protection Devices
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard
IH	Industrial Hygiene
JSA	Job Safety Analysis
NRR	Noise Reduction Rating
OSHA	Occupational Safety and Health Administration
TLV	Threshold Limit Value
TWA	Time Weighted Average
STS	Standard Threshold Shift
TPA	Third Party Administrator

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Exhibit 3 – ACGIH TLV FOR NOISE

	Duration per Day	Sound Level dBA (slow response)
Hours	24	80
	16	82
	8	85
	4	88
	2	91
	1	94
Minutes	30	97
	15	100
	7.5	103
	3.75	106 ¹
	1.99	109
	0.94	112
Seconds	28.12	115
	14.06	118
	7.03	121
	3.52	124
	1.76	127
	0.88	130
	0.44	133
	0.22	136
	0.11	139
	0.08	140 ²

Notes:

1. An extreme level of noise is defined as “Extreme noise areas are defined as areas with measured noise levels greater than 105 dBA for any amount of time.
2. No exposure to continuous, intermittent, or impact noise in excess of a peak C-weighted level of 140 dB. Exhibit 4 – Personal Noise Monitoring Field Form

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Exhibit 4 – Personal Noise Monitoring Field Form

[\(Link to the Personal Noise Monitoring Field Form\)](#)

 **ARCADIS**

PERSONAL NOISE MONITORING FIELD FORM

Company:		Location:	
Sample No.:		Sample Date:	
Noise Type: (circle: Steady, Intermittent, Impact)		Sampled By:	
Operation Status: (circle: Running, Not-Running)		Sampling Strategy: (circle: Typical, Worst Case, Standard)	
Employee Name: (F/L)		Employee Identification No.:	
Employee Job Function:			
Shift Start:		Shift Length (minutes): (circle: 60, 90, 120, 150, 180, 210)	
Shift Stop:			
Work Area(s):			
Job Duties Performed:			
EXAMPLE			
PPE in Use: (circle: No Hearing Protection, Ear Muffs, Ear Plugs (Specify: _____))			
Sampling Instrument Used:		(dB)	
Calibrator No.:		(dB)	
Is Employee exposed during any non-sampled period? (circle: Yes, No)			
Additional Comments:			

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1. POLICY

It is the policy of Arcadis to implement sound defensive driving training and education to employees and provide administrative management that ensures vehicles are well maintained and driven by qualified employees. This Health and Safety Standard (HSS) (referred to as "MVSP") provides requirements that ensure compliance with this of this policy. Employees who fail to follow these MVSP requirements will result in an employee being prohibited from driving on behalf of Arcadis and/or may face additional disciplinary action.

2. PURPOSE AND SCOPE

2.1 Purpose

The MVSP sets forth the requirements for providing a healthy and safe work environment for our employees, subcontractors, clients, and visitors. To this end, Arcadis embraces this MVSP.

This HSS and accompanying requirements provides consistent practices with regards to defensive driving and vehicle administration for Arcadis vehicles.

2.2 Scope

This MVSP applies to Arcadis U.S. employees operating motor vehicles for company business in any country in which Arcadis employees, or temporary agency employees, are working. It applies to every Arcadis driver operating an Arcadis rental, leased (fleet), or personal vehicle used for company business. Employees operating Arcadis owned, leased, or rented vehicles for non-business use must have written supervisor's approval (see [Section 5.4](#) for additional information).

Additional requirements apply to the operation of a commercial motor vehicle (CMV). Refer to the Arcadis Transportation Safety Program for Commercial Motor Vehicles (CMV Program) for additional information.

When client requirements are more restrictive than this MVSP, the more restrictive requirement will apply for all work activities involving driving for that client.

3. DEFINITIONS

Definitions related to MVSP can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

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4. ROLES & RESPONSIBILITIES

4.1 Drivers

Drivers are any Arcadis employee or temporary agency employee who drives an Arcadis vehicle, leased vehicle, rental vehicle, or personal vehicle for business reasons whether the use of the vehicle includes operation from the local office or for travel while away from the local office. Drivers will:

- Adhere to this MVSP.
- Communicate health and safety (H&S) concerns, issues, and questions to their Line Manager or to H&S staff.
- Complete a hazard assessment (TRACK) prior to any driving activity.
- Follow all applicable Arcadis, federal, state, provincial, and local jurisdiction regulatory requirements.
- Follow client driving requirements when driving an Arcadis owned, leased, or rented vehicle for the project.

4.1.1 Drivers without an Assigned Driving Function for Arcadis

Drivers without an assigned driving function for Arcadis are still subject to the requirements of [Section 5.1](#), [Section 5.2](#) and [Section 5.4](#) of this HSS.

4.1.2 Joint Venture and Temporary Agency Employees

Use of joint venture and temporary agency employees working with or for Arcadis to operate Arcadis vehicles requires pre- approval of the Business Area (BA) Director, EF Legal, and must also satisfy training requirements set by Enabling Function (EF) Health and Safety. If authorized to drive an Arcadis vehicle, in addition to [Section 5.1](#):

- The employee's MVR must be clear of any violation for the prior three (3) years and list no prior critical violations. Critical violations include:
 - o Alcohol-related offenses.
 - o Driving while impaired or under the influence of alcohol or drugs.
 - o Homicide, negligent homicide, or manslaughter by vehicle.
 - o Fleeing or attempting to elude police officer.

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- o Hit and run.
- If the employee receives a ticket for a violation, is convicted of a violation, or has an accident while driving on Arcadis business, they are immediately prohibited from driving Arcadis vehicles, rental vehicles, or a personal vehicle for Arcadis business unless otherwise permitted by the applicable Arcadis BA Director in consultation with the applicable EF Health and Safety Director, regardless of fault or preventability.

4.2 Project Management

Project Management is responsible for:

- Providing stewardship concerning the requirements of this HSS to lower tier managers and employees.
- Assuring that appropriate time is provided to ensure implementation of MVSP requirements and facilitate maintenance request approvals.

4.3 Line Managers

Line Managers are responsible for:

- Providing stewardship concerning the requirements of this HSS to their direct reports.
- Assuring that appropriate time is provided to ensure implementation of MVSP requirements by their direct reports.
- Tracking and ensuring their direct reports complete any assigned defensive driving training or completing any other corrective actions prescribed by this standard.

4.4 Health and Safety MVSP Specialist (MVSP Specialist)

The MVSP Specialist is the primary contact for all issues related to implementation of this MVSP, including reporting of all accidents and incidents involving a motor vehicle. The MVSP Specialist will coordinate with other EF departments, as required, related to MVSP implementation requirements.

4.5 Enabling Function People Department

EF People has the responsibility to review applicable portions of this HSS for the purposes of ensuring consistency with EF People's communication policies and procedures regarding motor vehicle operation. EF People have a primary focus of ensuring administrative procedures concerning vehicle use are followed by employees. EF People has the authority to request and evaluate MVRs on Arcadis drivers at any time.

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4.6 Enabling Function Legal Department

EF Legal has the responsibility to provide oversight of the requirements stipulated in this HSS to ensure Arcadis risks are properly managed. Legal has the authority to request and evaluate MVRs on Arcadis drivers at any time.

4.7 Enabling Function Procurement

EF Procurement has the responsibility to oversee leasing and maintenance management vendors and facilitate maintenance issues associated with Arcadis owned or leased vehicles. Procurement will also work with EF H&S on safety equipment upfitting for owned or leased vehicles.

4.8 Enabling Function and Operations Health and Safety Staff

EF H&S and staff Operations Health and Safety staff are responsible for:

- Communicating the requirements of this HSS with Arcadis.
- Verifying this HSS is being implemented effectively.
- Ensuring this MVSP is being implemented effectively. EF H&S has a primary focus of identifying defensive driving education and training resources.
- Identifying defensive driving education and training resources.
- Requesting and evaluating MVRs on Arcadis drivers at any time.
- Stewarding programs involving vehicle inspections and maintenance requirements.

5. PROCEDURE

5.1 General Driver Requirements

Only Arcadis Drivers, as defined in [Section 4.1](#) and [Exhibit 1](#), are permitted to drive Arcadis vehicles. Exceptions to this policy are limited only to individuals authorized by the Arcadis Driver or fleet administrator to perform short-term driving and parking activities involving Arcadis vehicles such as maintenance employees and valets. Use of joint venture and temporary agency employees working with or for Arcadis to operate Arcadis vehicles requires pre- approval of the BA Director, EF Legal, and must also satisfy training requirements set by EF H&S.

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Arcadis Drivers who drive Arcadis vehicles or personal vehicles used for Arcadis business will maintain a valid driver's license, appropriate for the vehicle they are operating, that is free from any driving restrictions or suspension (with the exception of corrective lenses). All Arcadis drivers with an assigned driving function for Arcadis may have their Motor Vehicle Record (MVR) reviewed by approved representatives of EF People, EF Health and Safety and/or EF Legal Departments ([Exhibit 3](#)). An Arcadis Driver who is asked to drive for business purposes in any type of vehicle, shall notify their supervisor or designated Arcadis contact and the MVSP Specialist in writing by the next business day if:

- Their license is suspended, revoked, or restricted in any state.
- They receive a moving violation while driving for Arcadis-related business.
- Receive a moving violation or conviction related to non-business driving in any type of motor vehicle that might affect their driving status with Arcadis.

The MVSP Specialist (or designate), in cooperation with EF People and EF Legal, as deemed necessary, will evaluate the employee's driving status (especially in instances of license suspension, revocation or restriction) and, as appropriate, corrective action and/or restriction recommendations will be made. Evaluations will consider the date of any citations and any corrective action and/or restriction recommendations will remain in effect until adjudicated by a court.

Employees who fail to report a driving violation to their supervisor that might affect their driving status for Arcadis purposes (a restricted driver) will face disciplinary action which may include termination if the conviction is discovered through routine MVR pulls ([Exhibit 3](#)), criminal background checks or other official documentation transmitted or made available to Arcadis. Arcadis will work to the extent practical with employees who report driving violations that might affect their driving status for Arcadis purposes if Arcadis operations management can accommodate a driving restriction for the driver or other suitable arrangement is made consistent with EF People and Legal policies.

All Arcadis Drivers driving an Arcadis motor vehicle or personal vehicle for Arcadis business will:

- Always wear seat belts in any vehicle with seat belts (this includes taxis and shuttle buses equipped with seat belts).

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- Have a valid unrestricted operator's license appropriate for the vehicle being driven.
- Wear corrective lenses if required by the driver's license.
- Operate and license the vehicle in accordance with applicable laws.
- Operate the vehicle consistent with client driving rules, and speed limits when operating the vehicle on project sites.
- Drive defensively as learned through training, education, and experience.
- Ensure that the start of each shift begins with a thorough pre-trip inspection to evaluate the health of the vehicle.
- Exercise caution when taking any prescription or over-the-counter medication that may cause drowsiness or an altered mental state.
- Not use controlled substances, illegal drugs, or be under the influence of alcohol or marijuana (where legal) while driving on Arcadis business.
- Not drive in a manner that could be deemed reckless or aggressive by other drivers.
- Not use radar/laser-type detectors.
- Not pick up hitchhikers.
- Not smoke in company vehicles.
- For drivers with an assigned driving function for Arcadis, if permanently assigned an Arcadis motor vehicle will ensure the vehicle is maintained as directed by the Arcadis maintenance vendor.

Use of headlights, even during daylight hours, is recommended. Additionally, Arcadis expects all drivers to use pull through parking or back into parking places consistent with their defensive driving training specified in this HSS and as permitted by local laws.

5.2 General Driving Safety

5.2.1 Driving Distractions and Electronic Device Use While Operating a Motor Vehicle

Arcadis strictly prohibits employee use of personal or company-provided electronic devices (as defined in [Exhibit 1](#)) while the vehicle is in motion or stopped in traffic. This includes use

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of these devices in hands-on mode or hands-free mode while the employee is operating any motor vehicle for Arcadis purposes.

Electronic devices used for navigation must be secured in the vehicle with a mount designed for such purpose.

Guidance for vehicle controls and settings: If the driver needs to do more than push a button or flip a switch one time to complete the desired action, then the driver should not be performing the function while the vehicle is in operation or stopped in traffic. For example, the driver should not be repeatedly pushing the “seek” button on the radio to find a radio station they like or adjust the seat while simultaneously driving the vehicle. Vehicles mirrors should also be adjusted during pre-trip inspections to avoid adjusting while driving. This includes both side mirrors, and rear-view mirror.

To avoid distractions that could result in an accident, reading, grooming, eating, and drinking should be avoided while operating a motor vehicle.

5.2.2 Additional Defensive Driving Procedures

Arcadis promotes additional defensive driving techniques to assist in the elimination or minimization of MVAs and VLEs. These techniques include:

- When a second Arcadis employee is available, and where it is safe to do so, all vehicle backing operations should use a spotter to assist with the backing operation.
- When an employee is not available to assist, we should preform G.O.A.L. (Get Out And Look). Before backing without a spotter, we will get out of our cars, and do a full lap around the vehicle to help us get the big picture and scan our environment.
- G.O.A.L. should also be used anytime that we have left our vehicle for an extended amount of time, our environment is always changing, and there could be new hazards that were not in front of or behind us previously.
 - o As a best practice in conjunction with GOAL or as required by a client, use the Cone Program (or similar program) to promote awareness of hazards around parked vehicles.
- To assist drivers in their potential lack of familiarity with the location in which they are driving, one of the following should be utilized by drivers traveling to unfamiliar locations:

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- o The use of Global Positioning Systems (GPS) systems programmed prior to operating the vehicle, and/or
- o Pre-Trip Route Planning using software such as Google® Maps or MapQuest®, and/or
- o Preparation of a Journey Management Plan (JMP) using the template provided in the Excel Standard Health and Safety Plan (HASP) Template

When the driver is the only occupant of the vehicle, use of a GPS device is preferred. Drivers are prohibited from using hard copy versions of maps and JMPs while the vehicle is in motion or stopped in traffic. These navigational aids should be used by passengers in the vehicle to assist the driver in navigating to the desired destination.

5.2.3 Special Considerations for Rental Vehicles

Rental vehicles will be treated and driven in a manner equivalent to an Arcadis owned or leased vehicle. Additionally, Arcadis employees renting vehicles will plan and select a vehicle appropriate for the conditions anticipated when driving. Careful planning is required to preferentially use Arcadis owned or leased vehicles for off road use instead of using rental vehicles when reasonable, practical, and permitted under contract (client or rental company) terms. Due to operating unfamiliarity typically encountered when renting vehicles, use of TRACK to identify and mitigate atypical or unfamiliar vehicle functionality or performance is required.

Guidance: Avoid free upgrades to larger vehicles if you are not familiar with driving the larger vehicle being offered.

Performing proper pre-trip inspections when driving a rental vehicle is especially important. This will help the driver to become familiar with the layout of the vehicle and spot any potential hazards. In addition to [Section 5.3.1](#) inspection criteria, some additional things to look for prior to leaving the rental car facility:

- Ice scaper/brush during wintertime.
- Check under seats and in glove boxes/console compartments for possible presence of weapons/drugs left behind from a previous renter.

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5.2.4 Special Considerations for Ridesharing Services

Arcadis prohibits the use of “Uber POOL” and “Lyft Shared” services, or other vendor equivalent offering pool rideshare services. Arcadis also prohibits sharing taxis with other passengers not known to the employee using the taxi.

Guidance: Use of standard Uber or Lyft services not listed above is not prohibited. Use of shuttle services to and from the airport (such as Super Shuttle, rental car shuttles or hotel shuttles) is not prohibited. Use of bike share services is not prohibited if a hazard assessment (TRACK) is performed prior to use of the bike and appropriate personal protective equipment is used. Use of carshare services such as Zip Car is not prohibited.

5.2.5 Special Considerations for Atypical Methods of Transportation

Arcadis prohibits using Segway’s, kick scooters (provided by scooter share services), hoverboards, rideable luggage, and similar means of battery powered personal transport as a means of business travel or business commute.

Guidance: Use of Segway’s for recreational networking or team building activities related to Arcadis work is not prohibited if a hazard assessment (TRACK) is performed prior to use of the Segway.

Section 5.2.5 prohibitions do not apply to battery powered bicycles; battery powered scooters equipped with a seat nor does it apply to electric golf carts used on golf courses. However, use of “kick scooters” such as those offered by Bird, Bolt, Lyme, Scoot Networks, etc. is prohibited in all instances affiliated with Arcadis.

Gasoline powered bikes, scooters equipped with a seat, mopeds, and motorcycles are not prohibited if a hazard assessment (TRACK) is performed and proper personal protective equipment is used.

5.2.6 Insurance

Arcadis has vehicle insurance coverage for Arcadis Vehicles and Rental Vehicles. If an accident occurs or damage is sustained, there is a \$2,000 deductible for damage to the Arcadis Vehicle (“collision”) and a \$10,000 deductible for damage to another vehicle, property damage or injury to another party (“liability”). These deductibles are paid by the relevant Arcadis employee overhead.

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If an accident should occur during non-business hours while an employee is driving an Arcadis Vehicle or Rental Vehicle, in accordance with state law, the Arcadis employee could be personally liable for injuries and damages associated with such an accident.

5.2.6.1 *Vehicle Rental in the United States*

As stated above, Arcadis has insurance for all Arcadis Vehicles. When renting for business in the United States, the rental must be arranged through the Arcadis approved travel agency, and there is no need to accept the insurance coverage offered by Arcadis preferred rental car vendors.

5.2.6.2 *Vehicle Rental Outside of the United States*

If renting a vehicle for business purposes **outside of the United States or Canada**, the **employee must accept the insurance offered by the local rental car company in order to be fully covered under the company's Foreign Package policy**. In addition, check with EF Legal about any additional coverage that may be needed for the country in which you are renting.

5.2.6.3 *Personal Vehicles*

Employees who drive their own vehicle for company business, as a condition for performance of their duties, shall comply with all minimum state requirements for auto insurance as required by their state. This requirement includes auto liability insurance with the minimum amounts of coverage meeting or exceeding that state's requirements. If requested, employees shall provide a current insurance card which indicates the amount of coverage as adequate proof of insurance coverage.

If a personal vehicle is damaged or involved in an accident while being driven for company business, the insurance covering that personal vehicle is primary. Arcadis does not reimburse employees for personal auto insurance deductibles.

5.3 **Vehicle Safety**

5.3.1 **Vehicle Inspections and Maintenance**

All company owned or leased vehicles will be maintained in safe operating condition. To ensure vehicles are properly maintained, a daily pre-trip visual inspection must be informed prior to operating the vehicle. The pre-trip inspection should include, but is not limited to:

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- Seat belts
- Doors and door locks
- Lights
- Mirrors
- Horn
- Back up alarms, if equipped
- Back up cameras, if equipped
- Parking brake
- Instrument panel
- Steering
- Windows
- Windshield wipers
- Tires; and
- Emergency equipment.

A more comprehensive weekly documented inspection (daily if required by the client, manager, or supervisor or if vehicle is operated in harsh environments) is also required.

Rental vehicles operated by Arcadis for more than one week also must also use the documented weekly inspection process. Inspections are required to be documented on the Weekly Vehicle Inspection Checklist, in Arcadis approved software, or client approved equivalent form or software.

Note: Staff working on project sites subject to Mine Safety and Health Administration (MSHA) regulations must use a vehicle inspection checklist designed for mining projects. Contact EF Health and Safety for assistance.

Deficiencies identified in inspections or at any other time will be managed through the Arcadis vehicle leasing company vendor or maintenance provider specified by EF Procurement.

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Routine maintenance (gasoline, oil, car washes, etc.) will also be managed through these vendor(s) using approved fuel cards. Use of assigned fuel cards is critical to help ensure maintenance schedules are maintained for the vehicle. Records of vehicle inspections should be maintained at the office or project location where the vehicle is assigned.

Guidance: Fuel cards are assigned to the vehicle (not drivers) and must remain with their assigned vehicle

Employees operating company owned or leased vehicles (including qualifying rental vehicles) required to be maintained under the commercial motor vehicle (CMV) program will follow inspection and maintenance requirements specified in the CMV Program. Use of Weekly Vehicle Inspection checklist (hardcopy or non-CMV Program approved software) for CMV operation is not permitted.

5.3.2 Safety Equipment for Arcadis Vehicles

All Arcadis owned or leased vehicles are expected to have, at a minimum, a 2.5 lb. A, B, C fire extinguisher (permanently mounted), a flashlight, first aid kit and an orange strobe or oscillating light. The amber warning light may be permanently affixed or removable. Rental vehicles will be subject to equivalent requirements, if used for field work unless otherwise excepted from a specific safety equipment requirement by the project specific HASP or Job Safety Analysis. Rental vehicles are not required to have fire extinguishers and amber warning light permanently mounted.

All Arcadis owned or leased vehicles obtained after June 1, 2012, are equipped with back up alarms. All Arcadis owned or leased pickup trucks with an open bed obtained after April 4, 2016, are equipped with a rear window protector.

Refer to MVSP Guide-010 for additional recommendations for safety and emergency equipment that may be required for specific project needs.

All Arcadis vehicles managed under the Arcadis approved vendor maintenance program have Emergency Roadside Assistance. Documentation, including the phone number for the vendor providing assistance must be maintained in the glove box of the vehicle.

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5.3.3 Securing Loads in Vehicles

All luggage, equipment and supplies loaded into a vehicle operated by Arcadis will be stowed in a manner that will prevent appreciable movement. Luggage, equipment, and supplies placed in the passenger compartment of vehicles will be placed in a manner that will prevent rapid forward movement in the event of a hard stop or frontal collision. Objects will not be placed on the dashboard of vehicles unless they are secured in place by friction mats, suction cups, or similar securing device.

Securing straps, tiedowns (all types) and securing nets used to secure loads on trucks must be inspected prior to each use. Damaged, worn or frayed securing straps or tiedowns must not be used.

Chemicals transported in Arcadis vehicles must conform to the requirements of the Arcadis Transportation Safety Program for Hazardous Material Shipping and Transportation. Compressed gas cylinders not enclosed in a case or similar packaging should be transported in a vertical secured position.

Arcadis CMVs are subject to additional load securement requirements specified by the Arcadis CMV Program.

5.3.4 Vehicle Modification

Arcadis employees are prohibited from modifying Arcadis owned or leased vehicles unless the modification is approved in writing by EF Health and Safety and/or EF Procurement.

5.3.5 Electronic Logging Devices

Some Arcadis vehicles designated by EF Health and Safety are equipped with an Electronic Logging Device (ELD). Arcadis employees are prohibited from tampering with any of these devices or rendering these devices inoperable. ELD use is currently restricted to specific Arcadis CMV drivers.

5.3.6 Telematics and Vehicle Cameras

Arcadis may apply telematics equipment to any leased, owned or rented vehicle. Arcadis vehicles equipped with telematics capable of generating driving behavior data (including camera observations) will be reviewed against established Arcadis criteria presented in MVSP Guide-001. Drivers operating telematic equipped vehicles are required to assign themselves to the vehicle prior to driving. Drivers identified as not meeting established criteria may be subject additional training to improve driving skills. In the case of low telematic scores or

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defined speed violations prescribed in MVSP Guide-001, Driver Improvement Plan prescribed by MVSP Guide-001 will be implemented. Arcadis reserves the right to restrict any vehicle, asset, or driver during the telematics data review process.

Arcadis owned or leased vehicles may have a forward / road facing and driver facing camera(s) installed. Additionally, vehicles only equipped with forward facing cameras may be upgraded with a driver facing camera as part of a driver improvement plan for drivers with a low driver score (a defined in MVSP Guide-001) or in the event of a preventable MVA or VLE. When a forward and/or driver facing camera is installed as a result of a listed event above, the driver will be only be permitted to operate a vehicle that is camera equipped and will not be permitted to drive any other vehicle on behalf of Arcadis. After 180-days, for upgraded cameras installed as part of a Driver Improvement Plan or a corrective action, the driver may file an appeal in accordance with MVSP Guide-008 to have the forward and/or driver facing camera removed. For vehicles equipped with cameras, placing objects that obstruct the cameras field of view is prohibited.

Supervisors and Project Managers may request in writing access to telematics data to review for their direct reports and projects.

5.4 Non-Business, Business Development and Marketing Use of Company Vehicles

Personal use of an Arcadis Vehicle or Rental Vehicle during business hours and/or having non-business-related passengers in an Arcadis Vehicle or Rental Vehicle during such business use is restricted and requires supervisor or project manager approval. Utilizing an Arcadis owned or leased vehicle for non-business-related Goodwill functions will require written supervisor approval.

If an accident should occur while driving in a non-business related activity, the employee is personally liable for injuries and damages associated with such an accident and the employee, not Arcadis, will be responsible for all rental charges. Operating an Arcadis Vehicle or Rental Vehicle for strictly personal use on weekends, evenings and holidays is prohibited, unless prior approval by the employee's supervisor or project manager is given, the vehicle possession is necessary due to remote location and assignment, and the employee has all required personal automobile liability insurance. Supervisors and project managers should assess the requirement and may place any other appropriate limitations on such use (see MVSP Guide-009).

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Use of an Arcadis Vehicle or Rental Vehicle to commute to and from work is also considered personal use and should be limited to those situations where there is a sound business reason to do so and must be authorized by the employee's supervisor.

Cost allocation associated with an Arcadis Vehicle or Rental Vehicle that relates to the authorized personal use of the vehicle by employees (including transportation to and from work) as described in this section is not permitted to be billed to projects. Personal use mileage and other vehicle charges related to personal use must be logged separately from business use charges during vehicle billing to clearly identify personal use charges.

Use of an Arcadis Vehicle for business development, marketing, or non-billable purposes (except when used in an approved personal use situation described above) is prohibited unless approval is granted by the BA Director.

6. TRAINING

6.1 Defensive Driving Training, Evaluation, and Education Requirements

6.1.1 New Hire Defensive Driving Training

All new hires (regardless of driving assignment) with an active driver's license will complete on-line defensive driving training prescribed by Health and Safety and assigned by EF Human Resources within 30 days of employment.

New hires with conditional driving status may be required to complete additional on-line defensive driving training prior to operating a vehicle for Arcadis as directed by EF Health and Safety.

6.1.2 Existing Employee Defensive Driving Training

On a frequency defined by EF Health and Safety, in cooperation with operations senior management, employees who have an assigned driving function for Arcadis shall complete an on-line defensive driving training course designated by EF Health and Safety or an equivalent course approved by EF Health and Safety.

In furtherance of Arcadis' goal of promoting safe driving, employees who do not have an assigned driving function for Arcadis are also eligible to voluntarily participate in the same on-line defensive driving training concurrent with prescribed timeframes for any assigned Arcadis driver training.

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If a client requires classroom or hands-on defensive driver's training, EF People will arrange for the required classroom training. The Arcadis required on-line training will not be required for those driving employees who attend classroom training (hands-on or subject matter training) consistent with a EF Health and Safety recognized defensive driving system during the same calendar year.

All Arcadis drivers are expected to review and be familiar with the contents of the Operator's Manual(s) for the vehicles they will be operating. Additional training may be provided or required at the request of an employee's supervisor, EF Health and Safety, or as required by a client.

6.1.3 Inexperienced Drivers

New hires or existing employees having an assigned driving function for Arcadis and known to have only possessed a valid driver's license for less one year, possesses a driver's license issued outside of the United States or Canada and/or experienced drivers that are unfamiliar with driving large vehicles may warrant additional evaluation and training in the operation of the vehicle(s) they are expected to drive while working for Arcadis. Supervisors are encouraged to review with their direct reports their license and driving history to ensure the driver is comfortable and knowledgeable of expected vehicle operation. If determined by the supervisor that additional evaluation is warranted, a Commentary Drive (see [Section 6.3](#)) should be considered. The supervisor may schedule an additional TIP later to ensure safe driving of larger vehicles is being performed.

Supervisors may opt to enroll drivers in additional defensive driving on-line training or hands-on defensive driver training if the driver expresses concerns about their ability to safely drive a vehicle.

New employees or transferring employees possessing a driver's license issued by a country outside of the United States or Canada must obtain a driver's license within the United States or Canada prior to operating a motor vehicle for Arcadis. Use of an International Driving Permit in conjunction with a valid Non-United States or Canadian driver's license is only permitted when approved by the Country or BA Director when driving a motor vehicle for Arcadis.

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6.1.4 Drivers Requiring Training or Evaluation due to Corrective Action from MVR Review

Any driver subject to Corrective Action arising from an MVR review will be trained or evaluated as prescribed in the MVR evaluation process (MVSP Guide-005).

6.1.5 Additional Defensive Driving Training and Education Requirements for Employees Involved in a Vehicle Loss Event

Corrective actions associated with an employee involved in a preventable or non-preventable VLE will be determined by the supervisor based on the severity and circumstances of the incident as determined by the Incident Reporting and Investigation HSS (ARC HSMS010).

6.2 Sources for On-Line and Video Based Defensive Driving Training

The on-line defensive driving training or equivalent training will be provided by, or based on, a nationally recognized defensive driving training company such as Smith System or other recognized provider as approved by EF Health and Safety, assigned by EF People and arranged through the Arcadis Learning Management System (Arcadis LMS). Video based defensive driving training modules, when assigned, will be arranged through the Arcadis LMS or as available on the ANA Health and Safety SharePoint site.

6.3 Commentary Drive Program

The Commentary Drive evaluates driver understanding of safe driving behaviors by having the driver verbalize their observations to the Commentary Drive observer when operating the vehicle. The observer will use a standard Driving Task Improvement Process (TIP) form or Commentary Drive form to document driver understanding of safe driving principles such as the Smith System “5 Keys”. The observer will also provide real time feedback on questionable driving behaviors. Commentary Drives are expected to last a minimum of 1 hour behind the wheel driving time.

Employees performing observer functions for Commentary Drives must be current on Health and Safety defensive driving on-line training obligations as described in [Section 6.1.1](#) and meet additional criteria in MVSP-Guide 002. Instructions for properly conducting Commentary Drives are provided in MVSP Guide-002.

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6.4 The Driving Task Improvement Process

The driving TIP may be used to evaluate driver performance and provide solutions related to questionable driving behaviors for routine driving evaluations under the Arcadis Behavior Based Safety (BBS) Program. Solutions generated using the TIP process will be consistent with the expectations of the Arcadis BBS Program.

6.5 Sources of Hands-On Defensive Driving Training

When used, hands-on defensive driving training will be provided by, or based on, a nationally recognized defensive driving training course such as Smith System or other provider approved by EF Health and Safety. The trainer must be certified in the program upon which they are instructing and can be either internal or external to Arcadis. Arrangements for hands-on defensive driving courses are handled by the Arcadis LMS.

6.6 Additional Training and Education for Other Driving Conditions

Working together, supervisors, managers, and EF Health and Safety have the responsibility of determining additional training for employees driving under special conditions such as CMVs, towing trailers, riding in or driving all-terrain vehicles or other non-routine driving conditions. Training approved by EF Health and Safety will be arranged through the Arcadis LMS.

7. REFERENCES

- Arcadis Transportation Safety Program for Commercial Motor Vehicles
- The following [MVSP Guides](#):
 - o MVSP Guide-001, Telematics
 - o MVSP Guide-002, Guidelines for Conducting Commentary Drives
 - o MVSP Guide-003, Automated Enforcement Conviction Evaluation Criteria
 - o MVSP Guide-004, Criteria for Defining a Motor Vehicle Accident
 - o MVSP Guide-005, Guide for MVR Corrective Actions
 - o MVSP Guide-006, Rental Vehicle Safety Requirements and Best Practices
 - o MVSP Guide-007, Spotter and Cone Program Best Practices

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- o MVSP Guide-008, MVSP Restricted Driving Appeal Process
- o MVSP Guide-009, *Reserved*
- o MVSP Guide-010, Safety Requirements for Arcadis Vehicles
- o MVSP Guide-011, Reporting Requirements for all Vehicle Damage

The following H&S standards can be found on the [Policies and Integrity Site](#):

- Incident Reporting and Investigation HSS (ARC HSMS010)
- Specialty Vehicle HSS (ARC HSFS001)

8. RECORDS

Records will be maintained as follows:

- MVRs pulled as required under this MVSP and associated notifications, approvals, releases, and findings information will be maintained by EF People.
- TIP results and near miss reports related to MVSP activities will be maintained in the 4-Sight database.
- Motor vehicle incident reports will be maintained in the Cority.
- When performed, Commentary Drive documentation will be provided to the employee unless otherwise specified by the MVSP Specialist or project management. Commentary Drive findings may be entered into 4-Sight as a Driving TIP for employees wishing to receive a driving TIP credit.
- Any training certificates or documentation arranged through the Arcadis LMS (hands-on defensive driving, defensive driving on-line, defensive driving videos, etc.) will be maintained by the Arcadis LMS.

Training records will be stored in Arcadis' LMS so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload copies of their training records from external vendors the Arcadis LMS.

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9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Corporate H&S Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
26 March 2007	01		Original document
18 August 2007	02		Change in required on-line defensive drivers training
22 October 2007	03		Changing over to new template format and addition of the "Comments on My Driving?" program
21 January 2008	04		Change to new template; change to 2008 organization job titles; change to prohibit texting/emailing while driving
13 June 2008	05		Addition of Sections 5.10 and 5.11 on other defensive driving techniques and cone placement.
6 October 2008	06		Clarified who is required to complete online training in Section 5.3 and modified section on when hands-on defensive driving is required after an accident.
8 April 2009	07		Incorporated references to the CMV program and vehicle inspection requirements. Incorporated Vehicle Use Policy. Added fatigue management requirements. Deleted references to the Commentary Drive which is obsolete.

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3 November 2009	08		Incorporated Smith System videos as a corrective action, Commentary Drive Program and revised Exhibit 2 and added new Exhibit 4.
1 November 2010	09		Deleted Comments on my driving section as program was discontinued.
25 May 2011	10		Revised content and restructured selected exhibits and standard sections. Most content duplicated in the Vehicle Use policy removed. Vehicle Use policy incorporated by reference
August 16, 2011	11		Replaced section 5.7, added new definitions and guide references, clarified fatigue management recommendations, modified terminology for BBS program, provided MVR report clarifications.
May 2, 2012	12		Comprehensive restructuring, Revisions to training and MVR processes, expanded rental vehicle safety, inclusion of additional MVSP guidance documents, roles and responsibilities clarification. Inclusion of vehicle safety equipment information. Formalization of the ARC process.
14 March 2013	13		Clarified MVR review and training for new hires. Clarified standard conflict with other corporate department policies. Restructuring of section 5.2. Removal of assigned driving function. Revision to headlight use. Section 4.2 MVSP Specialist e-mail link address updated

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8 December 2013	14		Added definition for assigned driving function, Restructured MVR review requirements, newly licensed driver requirements, and add references to new MVSP Guides. Title changes and minor editing throughout.
29 January 2014	15	Sam Moyers	Addition of new section 5.13 addressing load securement to harmonize with other H&S standards and guidance. Addition of pre trip visual inspection information to harmonize with other H&S standards and guidance. Clarification of expectations in the cone and spotter program. Revised header and footer to current standard and modified revision history table.
4 February 2014	16	Sam Moyers	Section 5.1 was modified to clarify Arcadis parking expectations
22 September 2015	17	Sam Moyers	Revised appeal process and relinked revised MVSP Guide-005. Rebranding. Revised signature block
6 May 2016	18	Sam Moyers	Revised with new section 6 dealing with insurance issues. New section 5.3.6 dealing with temporary agency employees. Both were included from integrated Human Resources Vehicle Use Policy. Revised sections 5.3.5, 5.9 and 5.12 to clarify current policy. Added a definition for field work in Exhibit 1. Added additional references concerning cell phone prohibition.

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27 March 2018	19	Sam Moyers/Julie Santaniello	Revised Executive Summary and Exhibit 1 concerning electronic devices, Revised sections 5.9, 5.10, and 5.13 to reflect current policies. New section 5.15 for ELDs and telematics. Added definition of "electronic device" in Exhibit 1. Minor editorial corrections throughout. Fixed broken links. Combined MVSP guides into one document.
4 October 2018	20	Sam Moyers	New section 2.2.2 concerning non-business driving. New section 5.3 addressing telematic data review. Revised sections 5.4.1 and 5.4.3 for protocols associated with employees with foreign driver's licensing. Section 5.10 revised to clarify use of maps and JMPs. Section 5.11 modified to permit use of software to record vehicle inspections. Minor editorial corrections throughout. Updated all hyperlinks.
30 May 2019	21	Sam Moyers	Insertion of MVSP Guide-001 reference in section 5.3. New sections 5.18 and 5.19
15 August 2019	22	Sam Moyers	Revision to section 6.1 dealing with personal use vehicle charges and harmonization of terminology used in section 6.1 and use of vehicle for marketing, and business development prohibited. Updated Executive Summary to reflect revisions in section 6.1.

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Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
12 October 2020	23	Sam Moyers / Andrew McDonald	Revised MVSP Guide-001, 005, and 008. Revised section 5.1 to require drivers to notify a supervisor and the MVSP Specialist in writing. Revised section 5.1 to require drivers of telematic vehicles to assign themselves to the vehicle. Revised section 5.2.5 and 5.4.6 replacing BL President with COO. Minor editorial corrections throughout.
15 October 2020	24	Sam Moyers	Revised Table and FAQ 2 in Guide 001.
7 February 2023	25	Julie Santaniello/Zach Mongan/Sam Moyers	Updated standard to new standard template, reorganized Sections 5 and 6, update hyperlinks, harmonize language, add telematics data review information, conviction language, camera language, corrective actions, and goodwill functions
2 July 2024	26	Jacob MacDuffie/ Sam Moyers	Revised sections 5.1, 5.2.1-5.2.3,, 5.3.2, numerous editorial corrections and terminology updates, Additional guidance notes added in sections 5.2.3 and 5.3.1

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Exhibit 1 - Definitions

Arcadis vehicle or Arcadis motor vehicle: Any motor vehicle owned or leased by Arcadis employee.

Note: ATV/UTV/Snowmobile operation is addressed in Arcadis Specialty Vehicle HSS ARC HSFS001

Arcadis driver or driver: Any Arcadis employee or temporary agency employee who drives an Arcadis vehicle, leased vehicle, rental vehicle, or personal vehicle for business reasons whether the use of the vehicle includes operation from the local office or for travel while away from the local office.

Arcadis employee: Any full-time, part-time, temporary, as needed employee, and interns employed by Arcadis.

Assigned Driving Function for Arcadis: Any Arcadis driver who drives on average 5 or more days per month in the interest of Arcadis.

Business use of Arcadis owned, leased, rented, or personal motor vehicle: For the purposes of this HSS, business use of an Arcadis, rental, leased or personal vehicle including but not limited to attending meetings; driving to and from a client location; driving to dinner while out of town on business; and driving to an office supply store to pick up office supplies. Use of the vehicle for business would not include personal use as described below.

Electronic Device: Any portable electronic device not required for safe operation of a motor vehicle including, but not limited to, cell phones, computer tablets, laptops, watches (iWatch, etc.) and GPS.

Enabling Function: As used in this HSS and materials incorporated by reference, the term "Enabling Function" means EF Health and Safety, EF People, EF Procurement, and/or EF Legal departments unless otherwise specified.

Field Work: As used in this HSS means any Arcadis work activity outside of an office environment.

Goodwill Function: A non-business-related action that is performed by a representative of the company to benefit the community (i.e., community flood cleanup response).

Manager: The employee's administrative supervisor, Line Manager, or an Operations Manager.

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Motor vehicle accident: Any incident on a reasonably work-related anticipated route where an Arcadis owned, leased, or rented motor vehicle is:

- On a public or established private roadway or parking area involving a third-party motor vehicle, excluding load securement failures by a third-party motor vehicle.
- On a public roadway involving damage to public or private property, excluding road debris damage.
- Involved in any type of pedestrian impact resulting in injury or property damage.
- Involved in an Arcadis load securement failure or mechanical component failure on a public or established private roadway involving a third-party motor vehicle or public property damage.
- On a public roadway involving damage or injury associated with another Arcadis operated vehicle, including load securement failures.

Personal use of Arcadis vehicle, leased vehicle or rented motor vehicle: For the purposes of this HSS, personal use of an Arcadis vehicle, leased vehicle or rental vehicle include but are not limited to supervisor approved: driving to dinner with a non-business-related person(s) in the vehicle; driving for the purposes of personal entertainment or personal business; using an Arcadis vehicle or rental vehicle for staying over period of time not required for business (e.g., staying over a weekend to visit friends, etc.).

Potential New Hire or Candidate: To this HSS, means an individual who has had a written offer made and accepted for employment with Arcadis.

Preventable MVA: A MVA where the Arcadis driver was at fault or was determined through the Arcadis Investigation process failed to exercise reasonable care while driving an Arcadis vehicle. The classification of Preventable MVA is assigned by EF Health and Safety.

Rental vehicle: For the purposes of this policy, any motor vehicle rented from an established rental car company for Arcadis business whether the use of the vehicle is operated from the local office or for travel while away from the local office.

Supervisor: The employee's administrative supervisor (project supervisor if approved by the administrative supervisor).

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Temporary agency employee: A temporary agency employee utilized by Arcadis for temporary work. Temporary Employee Agency agreements shall provide for standard automobile insurance and other terms consistent with this policy.

Vehicle loss event: Any incident involving a motor vehicle that does not meet the definition of a MVA. A VLE may be preventable or non-preventable based on findings of the Arcadis Investigation process and is assigned by EF Health and Safety.

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Exhibit 2 – Abbreviations and Acronyms

Arcadis	Arcadis North America
ARC	Accident Review Committee
BA	Business Area
BBS	Behavior Based Safety
CMV	Commercial Motor Vehicle
EF	Enabling Function
ELD	Electronic Logging Device
GPS	Global Positioning Systems
HASP	Health and Safety Plan
HR	Human Resources
HSS	Health and Safety Standard
JMP	Journey Management Plan
MVA	Motor Vehicle Accident
MVSP	Motor Vehicle Safety Program
MVR	Motor Vehicle Report
MSHA	Mine Safety and Health Administration
OLC	Oracle Learning Cloud
TIP	Task Improvement Process
TRACK	Hazard Assessment Tool – Think, Recognize, Assess, Control, Keep H&S First
VLE	Vehicle Loss Event

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Exhibit 3 – Motor Vehicle Records

New Hire MVR Review

EF People will perform an MVR review on potential new hires of positions that have an assigned driving function for Arcadis. The MVR review process for potential new hires follows an established review process that will result in a Pass, Conditional, or Restricted status. EF People will communicate the MVR review results for Pass or Conditional status to the employee and their supervisor and will notify the employee and their supervisor for need to complete prescribed corrective actions in the case of Conditional status. An MVR review resulting in Restricted status will prevent hiring of the candidate unless excepted as specified in the Appeals section of Exhibit 3. EF People will communicate the MVR review results to the new hire candidate and hiring manager prior to finalizing the new hire process.

Existing Employee MVR Review

Health and Safety or EF People may perform a MVR review on existing employees with an assigned driving function for Arcadis at a frequency stipulated by EF Health and Safety. The MVR review process for existing employees follows an established review process that will either result in a Pass, Conditional, or Restricted status. EF Health and Safety or EF People will communicate the MVR review results for Pass or Conditional status to the employee and their supervisor and will notify the employee and their supervisor for need to complete prescribed corrective actions in the case of Conditional status. Health and Safety will coordinate with EF People in instances where a MVR review for an existing employee results in Restricted status. EF People will communicate the MVR review results to the employee and their administrative supervisor when a Restricted status is identified from the MVR review.

Post-Accident MVR Review

Any vehicle related accident classed as a preventable Motor Vehicle Accident (MVA) will require a MVR review for the employee involved in the MVA. A Preventable Vehicle Loss Event (VLE) is not generally subject to the MVR review process; however, EF Health and Safety reserves the right to perform a MVR review on any employee involved in a vehicle related accident regardless of accident classification. The MVSP Specialist will report the need to run a MVR to EF People upon determination of a preventable MVA. Health and Safety working with EF People will communicate the MVR results to the employee and their supervisor using the process described the Existing Employee MVR Review section of Exhibit 3.

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Commercial Motor Vehicle MVR Reviews

Detailed requirements concerning MVR review and evaluation for drivers participating in the Arcadis CMV Program are not addressed in this HSS. MVR reviews related to CMV drivers are performed by Arcadis Director of Transportation Safety or approved designate. MVRs with corrective actions identified during the MVR process will follow the process described in the Existing Employee MVR Review section of Exhibit 3.

Appeals

MVR reviews that result in Restricted driving status for a potential new hire or existing employee may be appealed to the potential new hire's or employee's applicable BA Health and Safety Director, BA Operations Director, BA Director, and may include the Accident Review Committee (ARC) consisting of members from EF Health and Safety, People and Legal in accordance with MVSP Guide-008. The BA Director may elect to maintain the restriction or overturn the restriction. An overturned restriction may be referred by the BA Director to the Accident Review Committee (ARC) for additional corrective action based on the circumstances of the restriction.

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Exhibit 3 – If Not Me, Then Who? Guidance Document

3

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1. POLICY

It is Arcadis policy that during the conduct of their work, Arcadis and subcontractor employees have the authority and responsibility to Stop Work immediately in any situation when the Health, Safety, Security and Environment hazards and associated risks associated with work being performed is not clearly understood, established or controlled. This standard presents the requirements to be observed if and when this situation occurs.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard describes the authority, obligation and responsibility to stop potentially unsafe work at the earliest stage possible. Every Arcadis and subcontractor employee is responsible for prevention of unsafe acts, behaviors or conditions, consequently preventing harm to people, the environment or property.

Every Arcadis and subcontractor employee has the authority and obligation to stop work that he or she considers to be unsafe. The Arcadis leadership team is committed to support anyone who exercises his or her 'Stop Work' authority. There will be no negative consequences as a result of 'Stop Work' actions.

2.2 Scope

This standard applies to all activities performed by Arcadis or on behalf of Arcadis. A stop work process will include the participation of all Arcadis, Arcadis subcontractors and other involved personnel as appropriate.

3. DEFINITIONS

Definitions related to Stop Work Authority can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

4. RESPONSIBILITIES

4.1 Project Management

The Project Manager is responsible for:

- Confirming that 'Stop Work' requirements and obligations are understood thoroughly by Arcadis and subcontractor employees.
- Creating a culture where 'Stop Work' is exercised freely, honoring and responding promptly to requests to stop work and working to resolve issues to the satisfaction of all involved parties before operations resume.
- Recognizing proactive participation and verifying that all 'Stop Work' actions are properly reported with required follow-up, as necessary.

4.2 All Employees

All employees are responsible for:

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- Understanding their authority and obligations under 'Stop Work,' initiating a 'Stop Work' intervention when warranted, supporting the intervention of others and properly reporting all 'Stop Work' actions as described in this standard.
- Understanding the hazards of their activities, implementing the controls for the hazards and using 'Stop Work' authority if they don't understand the hazards, their job tasks, or if they do not feel safe for any reason.
- In addition, employees will participate in determining and implementing the solutions for mitigating the unsafe issue.

4.3 Corporate H&S Staff

Corporate Health & Safety is responsible for:

- Communicating the requirements of this HSS with Arcadis U.S.
- Verifying this standard is being implemented effectively.
- Establishing the clear expectation for Arcadis employees and subcontractors to exercise 'Stop Work Authority', create a culture where 'Stop Work' is exercised freely, resolve 'Stop Work' conflicts when they arise, and hold those accountable who do not to comply with established 'Stop Work' policies.

5. PROCEDURE

5.1 General Safety Requirements

Arcadis and subcontractor employees shall be made aware of their obligation to 'Stop Work' for issues that they consider to be unsafe.

Employees have the authority, obligation and responsibility to stop any task or operation where there are concerns or questions regarding the control of the hazards or risks associated with a task or operation that is being performed.

No work will resume until all 'Stop Work' concerns or questions have been adequately addressed and associated risks have been eliminated or mitigated to acceptable levels to the satisfaction of all parties involved.

All employees are made aware of the actions they shall take, including reporting, when stopping unsafe work.

All indications from personnel that the work is unsafe must be properly investigated as deemed appropriate for the situation. All instances of work being stopped for reasons of health and safety shall be recorded and appropriately investigated. This documentation may be completed using the Tailgate Meeting form or using the Arcadis Incident Investigation process.

Any form of retaliation or intimidation directed at any individual or company for exercising their authority as outlined in this standard will not be tolerated. Disregard for the requirements in this standard shall be addressed with disciplinary actions in accordance with Arcadis policy.

Before work begins, a responsible person shall be defined by the Project Manager for coordination of any 'Stop Work' activities, including hazard and risk assessment and mitigation actions following a 'Stop Work' intervention (refer to the Tailgate Meetings H&S Standard – ARC HSGE001).

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5.2 Stop Work Process

In general terms, 'Stop Work' involves:

- Initiating a 'Stop Work.'
- Notifying affected employees, other personnel (including client staff) and supervision.
- Assessing hazards and associated risks.
- Identifying and implementing controls.
- Resuming work once a hazard assessment and controls implementation (if applicable) are approved by a competent person and are satisfactory to all parties involved.
- Communicating the results of the hazard and risk assessment and controls identification resulting from the 'Stop Work.'

5.2.1 Initiate a 'Stop Work'

When a person identifies a perceived or actual unsafe condition, act, error, omission, confusion or lack of understanding that could result in harm to persons, the environment or property, he or she shall immediately initiate a 'Stop Work' intervention.

This intervention shall:

- Be initiated in a positive manner.
- Result in a stop of associated work activities, if there is an immediate risk of injury or accident; removal of all person(s) (also persons not directly related to the Arcadis Work Team) from the area; as appropriate to the issue; stabilization of the situation and making the area as safe as possible, until more permanent solutions can be developed and implemented as appropriate to the situation.
- If there is no immediate risk, address the potentially unsafe issue with the person(s) potentially at risk and/or the person(s) causing the risk. This includes all affected employees of Arcadis, subcontractor, client and other parties.

5.2.2 Notifying the Affected Parties

All personnel affected by the 'Stop Work' situation shall be notified as soon as possible.

5.2.3 Assessing Hazards and Associated Risks

A competent person (e.g., task manager, field supervisor, subject matter expert, H&S resource) shall guide the assessment for potential hazards and risks by involving the affected parties to determine the hazards and assess the associated risks, so that appropriate controls can be identified. This information will be documented on the Tailgate Meeting form or an incident investigation form in 4-Sight.

5.2.4 Identifying Controls

To identify controls that eliminate risk or mitigate it to an acceptable level and to decide on an appropriate course of action, the following questions and others shall be considered:

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- How can the risk be controlled or otherwise mitigated to an acceptable level and to the reasonable satisfaction of the parties involved?
- Is a competent person approving the hazard and risk assessment and the identified controls in order to prepare to re- start work?

All affected parties should be in agreement with the hazard and risk assessment and controls identification.

The results of the hazard and risk assessment and controls identification resulting from the 'Stop Work' shall be reported, documented and maintained on either Tailgate Meeting form or the incident investigation form as appropriate for the issue.

5.2.5 Qualifiers for Stopping/Resuming Work

The following should be considered when stopping or resuming work as the result of a 'Stop Work' intervention:

- If the 'Stop Work' intervention is based on a perceived (but not an actual) risk as determined from the hazard and risk assessment, the affected person(s), as appropriate, should:
 - o Show appreciation to the initiator for his or her awareness and concern.
 - o Proceed with work.
 - o Share the learnings with the initiator and involved parties.
- If the 'Stop Work' intervention is based on an actual risk that cannot be immediately assessed and/or controlled on site by the present employees and available resources, work shall be suspended. If the identified controls that mitigate the risk in the 'Stop Work' situation are not within the original scope of work, the change will be managed appropriately, and the Job Safety Analysis (JSA) and Health & Safety Plan (HASP) should be reviewed to include a hazard and risk assessment and identify subsequent controls.
- If the work is in the scope of a permit, the permit issuer shall review/reissue the permit with the necessary changes or modifications.

Work can be resumed only once a competent person with the appropriate level of authority approves the hazard and risk assessment and the implemented controls and all parties are satisfied with the controls.

5.3 Stop Work ("If Not Me, Then Who?") Involving Parties Outside of Arcadis Control

The Arcadis H&S Vision and Policy and our culture of TRACK to Zero puts H&S first in all things. Yet, stopping work or intervening under the Arcadis "If Not Me, Then Who?" concepts when it involves parties outside of Arcadis control must be implemented in such a way to protect the health and safety of our staff members, but also to protect the company from any undue risk and liability. Consequently, a separate guidance document has been developed and included as [Exhibit 3](#).

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5.4 Reporting

All planned and unplanned 'Stop Work' interventions shall be documented on the Tailgate Meeting form, in the H&S App as a close call and/or in 4-Sight as a near miss report or incident investigation report, as appropriate to the issue.

Adequate descriptions shall be given of the act, behavior or condition that caused the 'Stop Work' intervention, its hazard and risk assessment and implemented risk mitigations.

Near miss and incident reports shall be reviewed by H&S personnel and reported to senior leaders to:

- Measure participation.
- Determine the quality of interventions and follow-up.
- Track common issues and identify trends and opportunities for improvement.
- Facilitate the sharing of learnings.
- Provide feedback from recognition programs.

The H&S team shall regularly communicate incident details reported by Business Line as well as details regarding common trends and learnings.

6. TRAINING

The "Stop Work" process will be included in H&S Orientation training, in ongoing company communications and reinforced during daily Tailgate meetings.

7. REFERENCES

The following Arcadis H&S Standards are located on the [ANA H&S Policies & Integrity intranet page](#):

Arcadis Health and Safety Plan Standard – ARC HSFS010

Arcadis Incident Investigation H&S Standard – ARC HSMS010

Arcadis Tailgate Meetings H&S Standard – ARC HSGE001

8. RECORDS

Stop Work actions shall be documented in:

- Tailgate Meeting forms;
- Health & Safety App and/or
- 4-Sight

Training records will be stored in Arcadis' Learning Management System so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload copies of their training records from external vendors to the Arcadis Learning Management System.

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9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Corporate H&S Director of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 February 2010	01	Mike Thomas	Original document
17 April 2012	02	Camille Carollo/Tony Tremblay	Executive Summary added
16 January 2013	03	Pat Vollertsen/Tony Tremblay	Revised section 6.0 and Executive summary in regard to training
22 October 2015	04	Tony Tremblay/Julie Santaniello	Section 3 Definitions moved to Exhibit 1; Section 5.3 Stop Work ("If Not Me, Then Who?") Involving Parties Outside of Arcadis Control added and existing section 5.3 renumbered to Section 5.4; text updated in Section 5.4; Document template updated; Exhibit 2 If Not Me, Then Who guidance document added
2 September 2021	05	Anirudh K J/ Julie Santaniello	Template update; hyperlink update; added communication to the Stop Work process in Section 5.2; updated HR Operations email address in Section 8.
11 August 2023	06	Julie Santaniello	Removed Quick Sheet; added reference to the H&S App in Section 5.4 and 8; updated certificate upload process in Section 8.

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Exhibit 1 - Definitions

Planned 'Stop Work' is a 'Stop Work' situation previously identified in a Job Safety Analysis, HASP or other standard (e.g., 'Stop Work' trigger)

'Stop Work' is the stopping of all activities associated with a task, condition, situation, action or activity (issue) that anyone views as potentially or is actually unsafe or has the potential to cause loss. 'Stop Work' can be applied to the single issue, a group of issues, or an entire job project or site as applicable.

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Exhibit 2 – Abbreviations and Acronyms

ANA	Arcadis North America
Arcadis	Arcadis U.S. Inc.
HASP	Health & Safety Plan
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard

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Exhibit 3 – [If Not Me, Then Who? Guidance Document](#)



Appendix F

Generic Community Air Monitoring Plan

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

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

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

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

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM₁₀) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

Appendix G

Site Inspection Form

Binghamton (Court Street) Former MGP Site

Binghamton, Broome County, New York

Site-Wide Inspection Form

Date: _____

Personnel: _____

Time of Arrival: _____

Time of Departure: _____

Weather Conditions: _____

Temperature: _____

Wind Speed: _____

Wind Direction (from): _____

Inspection Checklist	Yes	No	Comments
Cover System			
Intrusive Activities Being Performed?			
- Trenching?			
- Excavation?			
- Tunneling?			
- Saw cutting?			
Signs of Previous Intrusive Activities Performed?			
- New drainage feature?			
- Evidence of a new underground utility?			
- New grass/vegetation/asphalt?			
- Other (e.g., cracking, potholes, depressions)			
Monitoring Well Condition			
Groundwater monitoring needs to be performed this year?			
Covers secure?			
Casing in need of repair?			
Concrete surface seal intact?			
Settling in area around well?			
Well obstructed?			
Ponded water above well?			
Well screen silted in?			
Well in need of redevelopment?			

General Comments/Suggested Action Items:

Appendix H

Field Sampling Plan

New York State Electric & Gas

Field Sampling Plan

**Binghamton Court Street Former Manufactured Gas
Plant Site, Operable Unit No. 1 & No. 2
Broome County, Binghamton, New York
NYSDEC Site No. 7-04-031**

July 2026

Field Sampling Plan

Binghamton Court Street Former Manufactured Gas Plant Site, Operable Unit No. 1 & No. 2

July 2026

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- B Well Integrity Assessment Form**
- C TGI for Low-Flow Groundwater Purging and Sampling**
- D TGI for Indoor or Ambient Air Sampling**
- E TGI for Building Survey**
- F TGI for Sub-Slab Vapor and Soil Vapor Sampling**
- G PID Calibration Log**

1 Introduction

This Field Sampling Plan (FSP) was prepared on behalf of NYSEG to support the Site Management Plan (SMP) for the New York State Electric & Gas Corporation (NYSEG) Binghamton Court Street Former Manufactured Gas Plant (MGP) Site located in Binghamton, New York (the Site).

This FSP contains field procedures and sample collection methods to be used to characterize environmental media as needed for future site redevelopment and utility installation and maintenance. The FSP includes procedures to: (1) collect, visually characterize, and analyze soil samples; (2) evaluate subsurface conditions and structures; (3) monitor groundwater; (4) collect non-aqueous phase liquid (NAPL); and (5) collect and analyze indoor air (IA), and sub-slab soil-gas samples.

Site background information, including a summary of the remedial investigation results and the remedial actions, are included in the SMP. The FSP should be used in conjunction with the Excavation Work Plan (EWP), the Quality Assurance Project Plan (QAPP), the Health and Safety Plan (HASP), and the Generic Community Air Monitoring Plan (GCAMP) included as Appendices to the SMP.

The EWP outlines actions to be performed for any intrusive work. The QAPP outlines the procedures that will be used to ensure that data collected, and subsequent reports are of high enough quality to meet project objectives, as well as a description of general field and laboratory procedures. The HASP presents the procedures and practices to be followed during ground-intrusive activities to promote the safety of workers and is designed to prevent occupational injuries and worker exposures to chemical, physical and biological hazards. The CAMP provides a measure of protection for the downwind communities from potential airborne release of residual impacts during intrusive work activities.

1.1 Overview of Anticipated Characterization Field Activities

The following field characterization activities will potentially be performed in connection with future site maintenance:

- Groundwater monitoring
- NAPL collection
- Sub-slab soil gas (vapor) sampling (if necessary)
- Indoor air and ambient air sampling (if necessary)

2 Field Activities

This section describes field procedures and potential methods for site monitoring activities.

2.1 General Field Guidelines

Field logbooks will be maintained by the Field Manager/Site Supervisor and other team members to provide a daily record of significant events, observations, and measurements during the field investigation.

Information pertinent to the field investigation and/or sampling activities will also be recorded in the logbooks. The books will be bound with consecutively numbered pages. Entries in the logbook will include, at a minimum, the following information:

- Name of author, date of entry, and physical/environmental conditions during field activity
- Purpose of sampling activity
- Location of sampling activity
- Name of field crew members
- Name of any site visitors
- Sample media (soil, groundwater, etc.)
- Sample collection method
- Number and volume of sample(s) taken
- Description of sampling point(s)
- Volume of groundwater removed before sampling (where appropriate)
- Preservatives used
- Date and time of collection
- Sample identification number(s)
- Field observations
- Any field measurements made, such as pH, temperature, conductivity, water-level, etc.

All original data recorded in field logbooks and Chain-of-Custody (COC) records will be written with indelible ink. If an error is made in these documents, the individual entering the data will make all corrections simply by crossing a single line through the error and entering the correct information. The erroneous information will not be erased or made illegible. Any subsequent error discovered on an accountable document will be corrected by the person who made the entry. All subsequent corrections will be initialed and dated.

2.2 Sampling, Labeling, Packing, and Shipping

Each sample will be given a unique identification. With this type of identification, no two samples will have the same label.

Samples will be promptly labeled upon collection with the following information:

- Project number and site

- Unique sample identification
- Analysis required
- Date and time sampled
- Sample type (composite or grab)
- Preservative, if applicable

Clear tape will be secured over the sample label, and the COC will be initiated. A sample COC form is included as Attachment A.

Appropriate sample containers, preservation methods, and laboratory holding times for each sample type will be applied as identified in the QAPP.

If samples are to be shipped by commercial carrier (e.g., UPS), sample bottles/jars will be packed in coolers containing the following:

- 1-2 inches of vermiculite or bubble wrap on the bottom of the cooler
- Water/ice packaged in re-sealable plastic bags
- Sufficient vermiculite or bubble wrap to fill in the remaining area
- The completed COC in a re-sealable plastic bag, taped in place on the inside cover of the cooler

The cooler will then be sealed with tape. If the cooler contains a drain plug, it must be sealed with duct tape. Appropriate shipping labels, such as "this-end-up" and "fragile" stickers will be affixed to the cooler. Samples will be hand-delivered or delivered by an express carrier within 48 hours of sample collection. The express carrier will not be required to sign the COC form; however, the shipping receipt should be retained by the sampler and forwarded to the project files.

All samples, whether solids, liquids or gases, being shipped by air or ground transport will be evaluated using a Shipping Determination process to determine if the material or equipment being shipped is hazardous for transport. All materials identified as HazMat will be shipped according to applicable United States Department of Transportation (DOT) and International Air Transport Association regulations and requirements. All employees collecting samples, preparing HazMat packages, or offering HazMat to a third-party carrier such as FedEx will have current HazMat training.

2.3 Equipment Decontamination

Equipment decontamination is performed to ensure that sampling equipment that contacts a sample, or monitoring equipment that is brought into contact with environmental media to be sampled, is free from constituents that would interfere with laboratory analysis for analytes of interest. Equipment must be cleaned prior to use onsite for sampling or contact with environmental media, and prior to shipment or storage.

Non-disposable equipment will be cleaned before collecting each sample, between sampling events, and prior to leaving the Site. Dedicated and/or disposable (not to be re-used) sampling equipment will not require decontamination.

2.3.1 Sampling Equipment Decontamination

The following equipment will be required for use during sampling equipment cleaning procedures:

- Appropriate personal protective equipment (PPE), as required in the site HASP
- Distilled water
- Non-phosphate detergent such as Alconox (or equivalent)
- Tap water
- Rinsate collection plastic containers
- DOT-approved waste shipping container(s),
- Brushes
- Large heavy-duty garbage bags
- Spray bottles
- (Optional) – “pesticide grade” Methanol
- (Optional) – “ultra-pure grade” Nitric Acid
- (Optional) – Hexane
- Ziploc-type bags
- Plastic sheeting

All non-dedicated bowls, spoons, hand augers, bailers, and filtering equipment will be washed with potable water and a detergent (such as Alconox). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc. The sampling equipment will then be rinsed with potable water, followed by a 10% “pesticide-grade” methanol rinse, and finally a distilled water rinse. When sampling for inorganic constituents in an aqueous phase, an additional rinse step will be added prior to the rinse with methanol. The rinse step will entail a rinse with a 10% “ultra-pure grade” nitric acid followed by a distilled water rinse. In addition, when sampling for polychlorinated biphenyl in an aqueous phase, an additional rinse step using 10% hexane (followed by a distilled water rinse will be completed prior to the methanol rinse. Between rinses, equipment will be placed on polyethylene sheets or aluminum foil, if necessary. At no time, will washed equipment be placed directly on the ground. Equipment will either be used immediately or wrapped in plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

Equipment decontamination rinsate will be managed in conjunction with all other waste produced during the field sampling effort. Waste management procedures are outlined in the EWP.

2.4 Monitoring Well Redevelopment

A minimum of 7 days before collecting groundwater samples, the monitoring wells may be redeveloped (as needed) by surging/bailing, using a centrifugal pump and dedicated polyethylene tubing, or by Waterra positive displacement pumps and dedicated polyethylene tubing, or other methods at the discretion of the Field Manager/Site Supervisor. The development water will be contained in a tank on site or in drums. The wells may be redeveloped until the water removed from the well is reasonably free of visible sediment (50 nephelometric turbidity units [NTUs]), if possible, or until the turbidity levels stabilize, assuming a minimum of 10 well volumes of water have been removed from the monitoring well during redevelopment. Monitoring well redevelopment will be

overseen by a field geologist and the duration, method of development, and approximate volume of water removed will be recorded in the field book.

2.5 Monitoring Well Integrity Survey

Monitoring well inventories will be conducted to assess the integrity of existing monitoring wells and to identify the need for repairs, replacement of parts, or replacement of wells that are determined to no longer be usable. A well inventory involves an inspection of the overall condition of the well, comparison of measurable quantities (e.g., riser stickup relative to grade and total depth), measurement of depth to water in the well, and measurement of sediment accumulations in the well.

The typical procedure for assessing the integrity of a monitoring well is outlined below.

1. Prior to mobilizing in the field, obtain a list of wells/piezometers to be inventoried and available information concerning their location and physical characteristics.
2. Identify site and well identification number on the Well Integrity Assessment Form (Attachment B). Record all observations on this form, supplemented by notes in the field notebook if necessary.
3. Examine the well for the presence of an identification label. If absent, label the well with the appropriate well number after measuring the total depth of the well to verify that the depth matches the well number.
4. Examine the surface condition of the well. Record the type of well (i.e., flush mount or above-grade stickup), condition of the well cover and surface seal. Confirm the protective casing is not bent, the PVC casing is not broken or chipped, and there is no evidence of frost heaving.
5. Unlock and open the well. Record the type (e.g., PVC or stainless steel), dimensions (i.e., casing diameter and stickup relative to grade), condition of the well casing, and type of well cap. If the well cap is missing, replace with available parts or record the type of cap required.
6. Measure the above-grade portion of the well riser stickup and compare to the known length of the stickup measured during well installation (surveyed top of inner casing elevation minus ground surface elevation).
7. Locate the marked measuring point along the top of the well casing. If no mark is visible, add a mark at the highest point of the casing using an indelible pen.
8. Measure the depth to water and total depth of the well. For total depth measurements, account for any difference in calibration of the measuring tape on the probe (i.e., distance from part of probe that measures depth to water and the physical bottom of the probe which will measure total depth of the well). Record any obstructions encountered and a description of the feel of the well bottom (i.e., soft due to sediment or hard).
9. Compare all observations concerning the measured dimensions of the well with the constructed values presented on the well construction log. Perform any recommended maintenance activities that can be accomplished with available equipment.
10. Demobilize from the well.

Depending on the results of the well inventory, several additional activities may be warranted prior to future usage of the well. Typical follow-up activities include replacement of missing parts, removal of sediment from the base of the well, resurveying of the well, or complete replacement if the well is determined to be unusable. If sediment accumulation is greater than 10 percent of the wetted screen interval activities will be taken to remove the sediment by pumping or bailing the well. The removed sediment should be inspected for the presence of filter

pack materials which may indicate that the well screen has been damaged. If initial efforts are unsuccessful in clearing the sediment accumulations, the well may need to be re-developed or replaced.

Replacement or decommissioning of a well may be warranted if the well is broken, obstructed, or otherwise compromised. If the well cannot be adequately repaired and is required for future monitoring purposes, a replacement well should be installed if no suitable alternate wells are located in the vicinity.

2.6 Water Level Measurements

Water levels may be measured using an electronic water-level probe, oil-water level indicator, or a pressure transducer from established reference points (e.g. top of casing). Reference points will be surveyed to evaluate fluid elevations relative to mean sea level (msl).

The following procedure will be used to measure water-level depths at monitoring wells and surface water gauges:

- Decontaminate the water level probe or oil/water interface probe (for wells expected to contain NAPLs).
- Measure the static water-level, fluid interfaces (i.e., NAPL/water interface), and sound the bottom of the well (if applicable) with reference to the surveyed elevation mark on the top of the PVC casing or surface water gauge. Record all measurements to nearest 0.01 foot and record in the field book.

The measurements will be made in as short a timeframe as practical to minimize temporal fluctuations in hydraulic conditions.

2.7 Low-Flow Groundwater Purging and Sampling

Groundwater samples will be collected from monitoring wells to evaluate groundwater quality. Procedures to be used to collect groundwater samples were developed in accordance with the United States Environmental Protection Agency (USEPA) Region I Low Stress (Low Flow) Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells (USEPA SOP No. GW0001; July 30, 1996) and are provided in the TGI – Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells included in Attachment C.

2.8 NAPL Collection and Recovery

NAPL will be measured and collected from the NAPL monitoring wells, if observed. LNAPL thickness will be measured using an oil-water interface probe and confirmed using a clear bailer. DNAPL presence and thickness will be measured using a weighted tape. Any NAPL that accumulates in a well will be periodically removed to prevent NAPL from overflowing out of the well sump. The recovered volumes of NAPL will be recorded. This section outlines standard procedures for measuring and collecting NAPL.

Personnel overseeing, directing, or supervising NAPL collection shall have previous related experience (minimum of 2 years) collecting fluid samples from wells and shall be trained in shipping of hazardous materials.

The following equipment and materials will be available, as required, during NAPL collection:

- Appropriate PPE, as required in the site HASP
- Site map, well construction records, prior NAPL collection records (if available)

- Dual-phase interface probe
- Bailer, rope, and bailer retrieval device
- Cleaning equipment/supplies, including deionized (DI) water and Alconox or equivalent
- Indelible ink pens
- Weighted tape
- Plastic sheeting
- Buckets
- Keys to wells

The following steps detail the NAPL collection procedures:

1. Measuring the static water level: Proper PPE must be worn (i.e. gloves, safety glasses, steel-toed boots, etc.). Remove cap from well and deploy the dual NAPL and water interface probe into the well. Measure the static LNAPL and water levels in each well before collection. Decontaminate the dual interface probe using Alconox (or equivalent) and DI water between well measurements. Read fluid level measurements to the nearest 0.01 foot on the north side, top of casing. Use the same electronic NAPL and water interface probe for all wells. Make sure to record all depths to product (DTP) and depths to water (DTW) in the field book. Depending on the probe, it will make different sounds for water and NAPL.
2. Monitoring and measuring DNAPL: Lower a weighted tape to the bottom of each well. Make sure the tape stays taut and do not let the tape bunch at the well bottom. Once the bottom is encountered, carefully pull-up the tape measure. When pulling up the tape measure observe it for evidence of DNAPL, and decontaminate it as it's pulled from the well. Record the DTP and the thickness of produce in the field book.
3. Collecting DNAPL: Dedicated bailer and rope must be used for each well. Make sure to sample in the same order that water and NAPL levels were collected to avoid any cross contamination. Collect the LNAPL by slowly lowering the bailer into the LNAPL, but not into the water. Pull the bailer out of the well. Collect the DNAPL by lowering the bailer to the bottom of the well or using an appropriate pump with dedicated tubing. During bailing of DNAPL, sediment will also be removed from the bottom of the sump to maintain sump capacity.
4. Label waste disposal drums with the project number, site name, date and time collected, media type, hazardous label (if needed), and other DOT required labels.
5. Once NAPL collection is completed, put the cap back on the well, close, and secure it, as necessary. PPE (such as gloves and disposable clothing) and other disposable equipment resulting from cleaning procedures and NAPL and water handling activities (such as paper towels, rope, and bailers) will be placed in plastic garbage bags. Disposable PPE and equipment should not be re-used.

2.9 Indoor Air and Ambient Air Sampling

Indoor air and ambient air samples may be collected and analyzed for VOCs using United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15). The TO-15 method uses SUMMA® passivated stainless-steel canisters (typically 1- to 6-liter in size). For purposes of this FSP, indoor air and ambient air samples are assumed be collected using a 6-liter SUMMA® canister.

The procedures for collecting indoor or ambient air samples are provided in the Technical Guidance Instruction (TGI) – Indoor or Ambient Air Sampling and Analysis via USEPA Method TO-15 included in Attachment D.

Prior to collecting indoor air samples an initial building survey will be conducted following the procedures provided in the TGI – Building Surveying Prior to Vapor Intrusion Indoor Air Sampling included in Attachment E. Required information will be documented on the Structure Sampling Questionnaire and Building Inventory form included in Attachment E.

2.10 Sub-Slab Soil-Gas Sampling

Sub-slab soil-gas samples will be collected and analyzed for VOCs using USEPA Method TO-15. The TO-15 method uses SUMMA[®] passivated stainless-steel canisters (typically 1- to 6-liter in size). Depending on circumstances, sub-slab soil-gas samples will be collected via either a temporary or permanent vapor port. If the vapor port will be used for sampling more than once, a permanent sampling port is recommended.

Sub-slab vapor port installation should be completed 24 hours in advance or after any indoor air sampling to avoid cross-contamination of indoor air samples.

Procedures for sub-slab soil-gas vapor port installation are provided in the TGI – Sub-Slab Vapor Port Installation Using Vapor PIN[®] Approach included in Attachment F. Following the sub-slab vapor port installation, each port will be evaluated for leaks using helium as a tracer gas. The helium tracer gas will be administered according to the methods established in the TGI – Administering Helium Tracer Gas Leak Test included in Attachment F.

The procedures for the actual sub-slab soil-gas collection are provided in the TGI – Sub-Slab Vapor and Soil Vapor Sampling Using Whole Air Canisters included in Attachment F.

2.11 Investigation Derived Waste and Storage

Investigation-derived wastes (IDW) will be generated during site activities, which include, but are not limited to groundwater sampling, NAPL purging, and decontamination. IDW may include decontamination liquids, PPE, sorbent materials, purge water, recovered NAPLs and disposable sampling materials that may have come in contact with potentially impacted materials. IDW will be collected and staged at the point of generation. Waste materials will be analyzed for constituents of concern to evaluate proper disposal methods. Anticipated IDW will be labeled and stored in 55-gallon drums with bolt-sealed lids. Disposable equipment (PPE and disposable sampling equipment) typically does not require laboratory analysis.

Minimization of IDW will be considered by the Project Manager and may include techniques such as replacing solvent based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be decontaminated), and sampling techniques that generate little waste.

The procedures for handling IDW are based on the USEPA's *Guide to Management of Investigation Derived Wastes* (USEPA, 1992). IDW is assumed to be contaminated with the site residuals until analytical evidence indicates otherwise. IDW will be managed to ensure the protection of human health and the environment and will comply with all applicable or relevant and appropriate requirements (ARARs). The following Laws and Regulations on Hazardous Waste Management are possible ARARs for this Site.

- 6 New York Codes, Rules, and Regulations (6 NYCRR) Part 364 “Waste Transporter Permits”, Part 371 “Identification and Listing of Hazardous Wastes”, and Part 372 “Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities”.
- Resource Conservation and Recovery Act 42 USC Part 6901-6987

- Comprehensive Environmental Response, Compensation and Liability Act 42 USC Part 9601-9675
- Superfund Amendments and Reauthorization Act
- DOT Hazardous Materials Transportation

Waste characterization will be conducted in accordance with waste hauler, waste handling facility, and state/federal requirements following the laboratory requirements and methodologies outlined in the QAPP. For purposes of this Site, IDW will be analyzed by methods appropriate for the known constituents that have been historically detected in the monitoring wells.

In the unexpected event that IDW is characterized as a hazardous waste (as defined in 6 NYCRR Part 371), RCRA and DOT requirements must be followed for packaging, labeling, transporting, storing, and record keeping as described in Title 40 of the Code of Federal Regulations Part (40 CFR) Part 262 and 49 CFR Part 171-178. Waste material classified as RCRA non-hazardous may be handled and disposed of as an industrial waste.

These procedures may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the project work plans or reports. If changes to the sampling procedures are required due to unanticipated field conditions, the changes will be discussed with the Project Manager and NYSEG as soon as practicable and documented in the Periodic Review Report.

The following materials, as required, shall be available for IDW handling and storage:

- Appropriate PPE as specified by the HASP
- 55-gallon steel drums, DOT 1A2 or equivalent
- ¾-inch socket wrench
- Hammer
- Leather gloves
- Drum dolly
- Appropriate drum labels (outdoor waterproof self-adhesive)
- Polyethylene storage tank
- Appropriate labeling, packing, chain-of-custody forms, and shipping materials
- Indelible ink and/or permanent marking pens
- Plastic sheeting
- Digital camera
- Field Logbook

2.11.1 Drum Storage

All 55-gallon drums will be stored at a secure, centralized onsite location that is readily accessible for vehicular pick-up. Drums confirmed as or believed to contain hazardous waste will be stored over an impervious surface provided with secondary containment. The storage location will, for drums containing liquid, have a containment system that can contain at least the larger of 10% of the aggregate volume of staged materials or 100% of the volume of the largest container. Drums will be closed during storage and be in good condition in accordance with the USEPA's 1992 Guide to Management of Investigation-Derived Wastes.

2.11.2 Drum Container Labelling

Drums will be labeled on both the side and lid of the drum using a permanent marking pen. Old drum labels must be removed to the extent possible, descriptions crossed out should any information remain, and new labels affixed on top of the old labels. Other containers used to store various types of waste (polyethylene tanks, roll-off boxes, end-dump trailers, etc.) will be labeled with an appropriate "Waste Container" or "Testing in Progress" label pending characterization. Drums and containers will be labeled as follows:

- Appropriate waste characterization label (Testing In Progress, Hazardous, or Non-Hazardous)
- Waste generator's name (e.g., client name)
- Project name
- Name and telephone number of Arcadis project manager
- Composition of contents (e.g., used oil, acetone 40%, toluene 60%)
- Media (e.g., solid, liquid)
- Accumulation date (i.e., date the waste is first placed in the container)
- Drum number of total drums as reconciled with the Drum Inventory maintained in the field logbook

Immediately upon beginning to place waste into the drum/container, an appropriate waste label will be filled out to include the information specified above and affixed to the container. Containers with waste determined to be non-hazardous will be labeled with a green and white "Non-Hazardous Waste" label over the "Waste Container" label. Containers with waste determined to be hazardous will be stored in an onsite storage area and will be labeled with the "Hazardous Waste" label and affixed over the "Waste Container" label. DOT hazardous class labels must be applied to all hazardous waste containers for shipment offsite to an approved disposal or recycling facility. In addition, a DOT proper shipping name shall be included on the hazardous waste label. The transporter should be equipped with the appropriate DOT placards. However, placarding or offering placards to the initial transporter is the responsibility of the generator per 40 CFR Part 262.33.

2.11.3 Inspection and Documentation

All IDW will be documented as generated on a Drum Inventory Log maintained in the field log book. The Drum Inventory will record the generation date, type, quantity, matrix and origin (e.g. RW-1 through RW-10, MW-97-7S) of materials in every drum, as well as a unique identification number for each drum. The drum inventory will be used during drum pickup to assist with labeling of drums. Digital photographs will be taken upon the initial generation and drumming/staging of waste, and final labeling after characterization to document compliance with labeling and storage protocols, and condition of the container. Evidence of damage, tampering or other discrepancy should be documented photographically.

2.11.4 Preparing Waste Shipment Documentation (Hazardous and Non-Hazardous)

Waste profiles will be prepared by Arcadis and forwarded, along with laboratory analytical data to the NYSEG for approval/signature. NYSEG will then return the profile to Arcadis who will then forward to the waste removal contractor for preparation of a manifest. The manifest will be reviewed by Arcadis prior to forwarding to NYSEG

for approval. Upon approval of the manifest, NYSEG will return the original signed manifest directly to the waste contractor.

Different profile numbers will be generated for different matrices or materials in the drums. For example, the profile number for disposable equipment will be different than the profile number for purge water. When there are multiple profiles it is critical that the proper label, with the profile number appropriate to a specific material be affixed to the proper drums. A copy of the Arcadis drum inventory will be provided to the waste transporter during drum pickup and to the facility receiving the waste.

2.11.5 Emergency Response and Notifications

Specific procedures for responding to site emergencies will be detailed in the HASP. In the event of a fire, explosion, or other release which could threaten human health outside of the site or when NYSEG or Arcadis has knowledge of a spill that has reached surface water, NYSEG or Arcadis must immediately notify the National Response Center (800-424-8802) in accordance with 40 CFR Part 262.34. Other notifications to state agencies may also be necessary.

2.11.6 Satellite Accumulation of Hazardous Waste

Satellite accumulation (SAA) shall mean the accumulation of as much as fifty-five (55) gallons of hazardous waste, or the accumulation of as much as one quart of acutely hazardous waste, in containers at or near any point of generation where the waste initially accumulates, which is under the control of the operator of the process generating the waste, without a permit or interim status and without complying with the requirements of 40 CFR Part 262.34(a) and without any storage time limit, provided that the generator complies with 40 CFR Part 262.34(c)(1)(i).

If more than 55 gallons of hazardous waste accumulates in SAA, the generator has three days to move this waste into storage.

Storage recommendations for hazardous waste include:

- Hazardous waste must be stored on a concrete slab (asphalt is acceptable if there are no free liquids in the waste) per 40 CFR Part 265.176.
- Drainage must be directed away from the accumulation area.
- Area must be properly vented.

Area must be secure.

3 Field Instruments

At a minimum, all field screening equipment will be calibrated immediately prior to each day's use. Additional calibration may be required if measurements appear erroneous. The calibration procedures will conform to the manufacturer's standard instructions. Records of all instrument calibration will be maintained by the field personnel. Copies of all of the instrument manuals will be maintained on site by the field personnel.

3.1 Water Level Meter

The water-level cable will be checked once to a standard to assess if the meter has been correctly calibrated by the manufacturer or vendor. If the markers are incorrect, the meter will be sent back to the manufacturer or vendor.

3.2 Water Quality Meter

The water-quality (temperature/pH/specific conductivity/ORP/turbidity/dissolved oxygen) meter and flow-through measurement cell will be one of the following or equivalent:

- YSI 6-Series Multi-Parameter Instrument;
- Hydrolab Series 3 or Series 4a Multiprobe and Display; and/or
- Horiba U-10 or U-22 Water Quality Monitoring System.

Water quality meters will be calibrated daily prior to use, and after very high or low readings. Calibration and maintenance will be conducted in accordance with the manufacturer's specifications. Calibration and maintenance information will be recorded in the field notebook.

3.3 Turbidity Meter

The turbidity meter will be a LaMotte 2020 (or equivalent) and will be calibrated daily prior to use. Calibration and maintenance will be conducted in accordance with the manufacturer's specifications. Calibration and maintenance information will be recorded in the field notebook.

3.4 Flow Controller and SUMMA[®] Canister

The flow controller and the SUMMA[®] canister will be provided by the laboratory and are frequently susceptible to failure. It is recommended that extra canisters and flow controllers are requested from the laboratory to ensure that there is sufficient onsite equipment in case of an equipment failure. If possible, the equipment should be shipped two to three days before the scheduled start of the sampling event so that all materials can be checked and replacements can be ordered as needed.

Ensure that the flow controllers are pre-calibrated to the proper sample collection duration (confirm with laboratory). Sample integrity can be compromised if sample collection is extended to the point that the canister reaches atmospheric pressure. Sample integrity is maintained if sample collection is terminated prior to the target duration and a measurable vacuum (e.g., 3 -7 – inches Hg) remains in the canister when sample collection is terminated. Ensure that there is still measureable vacuum in the SUMMA[®] after sampling. Sometimes the gauges

sent from labs have offset errors, or they stick. It is a good practice to lightly tap the pressure gauge with your finger before reading it to make sure it is not stuck.

Many times the pressure gauges sent from labs have large offset errors, or the gauge needle does not move freely in response to changes in vacuum. For the most precise pressure readings, consider using a separate, more sensitive, device to check pressure at the beginning of the sampling period in a clean atmosphere. This should be done without moving a significant flow into the canister – for example using a pressure gauge on a dead-end leg. If used, this device must be tested beforehand to confirm that it does not introduce contaminants to the SUMMA® canister during pressure checks

3.5 Portable Photoionization Analyzer

The photoionization analyzer (PID) will be a MiniRAE 3000 (or equivalent), equipped with a 10.6 electron volt (eV) lamp. The MiniRAE is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73 percent of the VOCs on the Target Compound List. Calibration will be performed according to the following procedures:

1. Turn on the MiniRAE 3000 and monitor the ambient air. If there is any doubt of the air quality, then zero grade gas will be obtained.
2. Connect the regulator to the span gas cylinder. Hand-tighten the fittings.
3. Open the valve on the gas bag by turning the valve stem fully counterclockwise.
4. Attach the gas bag to the regulator. Hand-tighten the fittings.
5. Turn the regulator knob counterclockwise half a turn to start the gas flow.
6. Fill the gas bag half full and then close the regulator fully clockwise to turn off the flow of gas.
7. Fill the gas bag and then turn the valve clockwise.
8. Press “MODE” and “N” at the same time to enter the set-up screens. To cycle through the screens press “MODE.” Press “Y” for span cal and “Y” again for zero point. Press “Y” to set the zero point.
9. When screen displays “CAL GAS” press “Y” and calibrate the unit with isobutylene calibration gas.
10. Press and hold “MODE” for a few seconds and the display will return to normal screening mode.
11. After 7 hours of use, recharge the battery pack. Record the time the battery pack was charged.

Record the date, time, your initials, calibration gas, and concentration on the PID calibration log in Attachment G.

3.6 pH Meter

The pH meter will be calibrated at the start of each day of use and after very high or low readings, as required by this FSP. National Institute of Standards and Technology traceable standard buffer solutions that bracket the expected pH range will be used. The standards will most likely be a pH of 7.0 and 10.0 standard units.

3.7 Specific Conductivity Meter

Calibration checks using the appropriate conductivity standard for the meter will be performed at the start of each day of use and after very high or low readings, as required by this FSP. Readings must be within 5 percent to be acceptable.

3.8 Dissolved Oxygen Meter

The DO meter will be calibrated, and the condition of the DO sensor will be checked at the start of each day of use. Calibration and maintenance of the DO meter will be conducted in accordance with the manufacturer's specifications. The calibration data will be recorded in field notebooks.

3.9 Oxidation-Reduction Potential Meter

The ORP meter will be calibrated at the start of each day of use. Calibration and maintenance of the ORP meter will be conducted in accordance with the manufacturer's specifications. The calibration data will be recorded in the field notebook.

Attachment A

Sample Chain of Custody

Attachment B

Well Integrity Assessment Form

WELL INTEGRITY ASSESSMENT FORM

Site Name: _____

Well I.D.: _____

Date: _____

(For each item, circle the appropriate response or fill in the blank)

Well I.D. Clearly Marked: YES NO

Well Completion: FLUSH MOUNT ABOVE-GRADE STANDPIPE

Lockable Cover: YES NO DAMAGED (Describe below)

Lock Present: YES NO ADDED Key Brand/Number: _____

Measuring Point Marked: YES NO ADDED

Well Riser Diameter (inches): _____

Well Riser Type: PVC Stainless Steel Other (Describe) _____

Surface Condition

Cement Intact: YES NO (Describe below)

Curb Box/Well Cover Present: YES NO DAMAGED (Describe below)

All Bolts Present: YES NO (Describe below) NOT APPLICABLE

Ground Surface Slopes

Away from Well YES NO (Describe below)

Well Condition

Well Cap: PVC Slip Cap Pressure-fit Cap None

Well Vent: Slot Cut in Riser Vent Hole in Cap None Not Applicable (Flush Mount Well)

Reported Well Riser Stickup (feet): _____ (use negative number if below grade)

Measured Well Riser Stickup (feet): _____ (use negative number if below grade)

Depth to Water (feet from Top of Well Riser): _____ -or- DRY

Reported Total Depth of Well (feet below grade): _____

Measured Total Depth of Well (feet below grade): _____

Well Obstructed: YES NO If yes, list depth in feet from Top of Well Riser: _____

Well Bottom: SOFT (contains sediment) FIRM (no sediment)

Recommendations

Repair Concrete/Surface Completion: YES NO If yes, list date performed: _____

Re-Survey Well: YES NO If yes, list date performed: _____

Remove Sediment and Re-Measure Depth: YES NO If yes, list date performed: _____

Replace Well Cap: YES NO If yes, list date performed: _____

Replace Bolts: YES NO If yes, list date performed: _____

Replace Lock: YES NO If yes, list date performed: _____

Other/Miscellaneous Observations:

Inspector(s): _____

Attachment C

TGI for Low-Flow Groundwater Purging and Sampling

TGI – Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells

Rev: 3

Rev Date: April 5, 2023

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	0	October 12, 2018	All	Updated and re-written as TGI with new branding and content	Marc Killingstad
	1	May 8, 2020	Pages 5, 10-11	Added clarification/details for equipment requirements and procedure steps based on USEPA guidance	Marc Killingstad
	2	April 5, 2022	All	Updated to new branding template and minor edits	Marc Killingstad
	3	April 5, 2023	All	Annual review completed by SME. Document version number and document date updated.	Marc Killingstad

Approval Signatures

Prepared by:

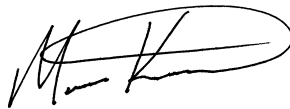
4/5/2023



Xuan Xu (Preparer)

Date

Reviewed by:



4/5/2023

Marc Killingstad (Subject Matter Expert)

Date

1 Introduction

Groundwater samples are collected from monitoring wells to evaluate groundwater quality. The protocol presented in this Technical Guidance Instruction (TGI) describes the procedures to purge monitoring wells and collect groundwater samples using the low flow purging/sampling methodology. This protocol has been developed in accordance with the United States Environmental Protection Agency (USEPA) Region I *Low Stress (Low Flow) Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells* (EQASOP-GW4; September 19, 2017).

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

3 Scope and Application

Both filtered and unfiltered groundwater samples may be collected using this low-flow sampling method. Filtered samples will be obtained using a 0.45-micron disposable filter. Project teams will evaluate the last time the monitoring wells were developed and determine if additional development might be necessary. Water samples will not be taken immediately following well development. Sufficient time will be allowed for the groundwater flow regime in the vicinity of the monitoring well to stabilize and to approach chemical equilibrium with the well

construction materials. This lag time will depend on site conditions and methods of installation but often exceeds one week.

4 Personnel Qualifications

Arcadis field sampling personnel will have completed or are in the process of completing site-specific training as well as having current health and safety training as required by Arcadis, client, or regulations, such as 40-hour HAZWOPER training and/or OSHA HAZWOPER site supervisor training. Arcadis personnel will also have current training as identified in the site-specific Health and Safety Plan (HASP) which may include first aid, cardiopulmonary resuscitation (CPR), Blood Borne Pathogens (BBP) as needed. The HASP will also identify any access control requirements.

Prior to mobilizing to the field, the groundwater sampling team will review and be thoroughly familiar with relevant site-specific documents including but not limited to the task-specific work plan or field implementation plan (FIP)/field sampling plan, Quality Assurance Project Plan (QAPP), HASP, historical information, and other relevant site documents.

Arcadis field sampling personnel will be knowledgeable in the relevant processes, procedures, and TGIs and possess the demonstrated required skills and experience necessary to successfully complete the desired field work. Additionally, the groundwater sampling team will review and be thoroughly familiar with documentation provided by equipment manufacturers and become familiar with the operation of (i.e., hands-on experience) all equipment that will be used in the field prior to mobilization.

5 Equipment List

Specific to this activity, the following materials (or equivalent) will be used:

- Site-specific HASP and health and safety documents identified in the HASP
- Field Implementation Plan (FIP) that includes site map, well construction records, sampling plan (sample analyses, sample volume required, and sample holding time), and prior groundwater sampling records (if available)
- Field notebook and/or smart device (phone or tablet)
- Low-flow sampling field forms (**Attachment A**)
- Appropriate personal protective equipment (PPE) (e.g., latex or nitrile gloves, safety glasses, etc.) as specified in the HASP
- Well keys and other tools to remove manhole covers (manual torque wrench with 9/16" socket and flat head screwdriver typical)
- Photoionization detector (PID) or Flame ionization detector (FID) (as appropriate, depending on site-specific constituents of concern)
- Electronic water-level indicator (e.g., Solinst Model 101) or oil/water interface probe with 0.01- foot accuracy (oil/water as appropriate, note that sampling will not be performed when sheen or light non-aqueous phase liquid [LNAPL] is present)
- Down-hole multi-parameter water-quality sonde (temperature/pH/specific conductivity/oxidation reduction [ORP]/turbidity/dissolved oxygen) meter coupled with flow-through-cell for measurements, for example:

- YSI 6-Series Multi-Parameter Instrument
- Horiba U-22 Multi-Parameter Instrument.
- Hydrolab Series 3 or Series 4a Multiprobe and Display.

NOTE: *Transparent, small volume flow-through-cells (e.g., 250 milliliters or less) are preferred as they allow for easy detection of air bubbles and sediment buildup in the cell, which can interfere with the monitoring instrument probes. A small volume cell also allows for quick turnover of water in the cell between measurements of the indicator field parameters. It is recommended to use a flow-through-cell and monitoring probes from the same manufacturer and model to avoid incompatibility between the probes and flow-through-cell.*

- Plastic sheeting (e.g., Weatherall Visqueen) to protect all down-hole sampling equipment from contact with potential sources of contamination.
- Decontamination equipment
 - Non-phosphate laboratory soap (Alconox or equivalent), brushes, and clean buckets, and/or clean wash tubs—new buckets or tubs will be purchased if it cannot be determined if the present items are clean
 - Distilled or de-ionized water for equipment decontamination
- Indelible ink pen
- 150-foot measuring tape (or sufficient length for the maximum site depth requirement)
- Sampling pump, which may consist of one or more of the following:
 - Submersible pump (e.g., Grundfos Redi-Flo 2)
 - Peristaltic pump (e.g., ISCO Model 150)
 - Bladder pump (e.g., Marschalk System 1, QED Micropurge, Geotech)
- Appropriate controller and power source for pump:
 - Submersible and peristaltic pumps require electric power from either a generator or a deep cell battery
 - Submersible pumps such as Grundfos require a pump controller to run the pump
 - Bladder pumps require a pump controller and a gas source (e.g., air compressor or compressed N₂ or CO₂ gas cylinders)
- Teflon® tubing or Teflon®-lined polyethylene tubing of an appropriate size for the pump being used
 - For peristaltic pumps, dedicated Tygon® tubing (or other type as specified by the manufacturer) will be used through the pump apparatus
 - Teflon® will not be used when sampling for per- and polyfluoroalkyl substances (PFAS)
- Graduated cylinder and stopwatch or other device to measure time to determine pumping rate
- Appropriate water sample containers (supplied by the laboratory)
- Appropriate blanks (trip blank supplied by the laboratory)
- Sample labels and Chain-of-Custody forms (COC)
- 0.45-micron disposable filters (if field filtering is required)

- A supplemental turbidity meter (e.g., Horiba U-10, Hach 2100P, LaMotte 2020) may be required for specific projects and will be specified in the project FIP/ work plan and the kick-off notes.
 - If used, in-line 'T' and valve allows for collection of water for turbidity measurements before the pump discharge enters the flow-through cell

NOTE: The maintenance requirements for the above equipment generally involve decontamination or periodic cleaning, battery charging, and proper storage, as specified by the manufacturer. For operational difficulties, the equipment will be serviced by a qualified technician.

6 Cautions

Different USEPA regions and/or state regulatory agencies may stipulate deviations from this document. It is the responsibility of the Project Team (Project Manager and Technical Lead) to be fully aware of the requirements from the applicable regulatory framework.

Weather

- If heavy precipitation occurs, and no cover over the sampling area and monitoring well can be erected, sampling may be discontinued until adequate cover is provided. Rainwater could compromise groundwater samples.
- Avoid extreme weather situations. Be aware that thermal currents and vertical mixing of cold and warm water inside the well casing could create a convection cell within the well and compromise data collection (e.g., biological mechanisms).
 - Direct sunlight and hot ambient temperatures may cause the groundwater in the tubing or flow-through-cell to heat up and de-gas. This may result in the loss of volatile organic compounds (VOCs) and dissolved gases. Shade the equipment from direct sunlight, keep the tubing as short as possible and avoid the hottest times of the day.
 - Sampling during freezing conditions may adversely impact the data quality objectives. USEPA recommends low-flow sampling be conducted at air temperatures above 32°F (0°C) or taking special precautions to prevent groundwater from freezing in the equipment.

Cross-Contamination

- To mitigate potential cross-contamination, groundwater samples are to be collected in a pre-determined order from least impacted to impacted based on previous analytical data. If no analytical data are available, collect samples in order of up-gradient, then furthest down-gradient to source area locations.
- Note that permanent markers could introduce volatile constituents into the samples; *therefore, indelible ink is recommended* to be used for labels on sample containers or sample coolers.
- When using a gasoline generator, this power source will be set-up at least 30 feet downwind from the well to avoid exhaust fumes to contaminate samples.

Pumps

- Preferred methods of extracting groundwater are adjustable rate, submersible pumps - such as centrifugal pumps or bladder pumps – constructed of stainless steel or polytetrafluoroethylene (PTFE, i.e., Teflon®). However, *PTFE will not be used when sampling for per- and polyfluoroalkyl substances (PFAS). PTFE could contain PFAS.*

- When using a bladder pump for collecting VOCs and dissolved gases, “best practice” is to set-up the pump to deliver sufficient water to fill a 40 mL VOC vial.
- The use of peristaltic pumps will be based on the type of data to be collected. *Because the use of a peristaltic pump can result in de-gassing of VOC and / or dissolved gases from groundwater, a different type of pump will be considered if these compounds are of concern.*
- *Manual or motor driven inertial pumping devices are not recommended because they cause greater disturbance during purging and pumping than regular pumps and are less easily controlled. This could cause a higher degree of data variability.*

Tubing

- When sampling for VOCs, SVOCs, pesticides, PCBs and inorganics, use of PTFE (Teflon®) or PTFE-lined tubing is preferred. However, PTFE tubing will not be used when sampling for PFAS.
- PVC, polypropylene or polyethylene tubing may be used when sampling for metals or other inorganics.
- Tubing with inside diameters of 1/4 or 3/8 inch is recommended because this will help ensure tubing remains water filled when operating at very low pumping rates.

General Precautions

- Store and/or stage empty and full sample containers and coolers out of direct sunlight.
- It may be necessary to field filter the groundwater for some parameters (e.g., metals) during collection, depending on preservation, analytical method, and project quality objectives. The task-kick-off notes and the FIP/work plan will list the samples that require field filtering.
- Be careful not to overtighten lids with Teflon® liners or septa (e.g., 40 mL vials). Over-tightening can cause the glass to shatter or impair the integrity of the Teflon® seal.

7 Health and Safety Considerations

The HASP will be followed, as appropriate, to ensure the safety of field personnel.

Appropriate personal protective equipment (PPE) will be always worn in line with the task and the site-specific HASP.

Review all site-specific and procedural hazards as they are provided in the HASP, and review Job Safety Analysis (JSA) documents in the field each day prior to beginning work.

Access to wells may expose field personnel to hazardous materials such as contaminated groundwater or non-aqueous phase liquid (NAPL) (e.g., oil). Other potential hazards include pressurized wells, stinging insects that may inhabit well heads, other biologic hazards (e.g. ticks in long grass/weeds around well head), and potentially the use of sharp cutting tools (scissors, knife)—open well caps slowly and keep face and body away to allow to vent any built-up pressure; only use non-toxic peppermint oil spray for stinging insect nests; review client-specific health and safety requirements, which may preclude the use of fixed/folding-blade knives, and use appropriate hand protection.

Generators and cord and plug equipment will employ an overcurrent protection device such as an integrated ground fault circuit interrupter (GFCI) cord. Grundfos pump controllers will not run properly with a GFCI, so the power source will be equipped with other overcurrent protection means.

Overtightening of lids with Teflon® liners can cause the glass to shatter and create a risk for hand injuries.

8 Procedure

Field personnel will set up and perform low-flow sampling in accordance with the following procedures.

1. Review FIP and groundwater sampling records from previous sampling events (if available) prior to mobilization to estimate the optimum pumping rate and anticipated drawdown for each well to perform sampling as efficiently as possible (i.e., reach a stabilized pumping condition).
2. Calibrate field instruments according to manufacturer procedures for calibration and record calibration procedure and results in field log.
3. All equipment will either be new or decontaminated in accordance with appropriate guidance document (*TGI – Groundwater and Soil Sampling Equipment Decontamination*) prior to use.
4. Visually inspect the well to ensure that it is undamaged, properly labeled and secured
 - a. Damage or other conditions that may affect the integrity of the well will be recorded in the Field Activity Daily Log and brought to the attention of the designated Field Manager and/or Project Manager
 - b. Record well construction and conditions on the Low-Flow Sampling Field Form (**Attachment A**).
5. Place clean plastic sheeting on the ground near the well to keep monitoring and sampling equipment off the surface unless the equipment is elevated above the ground (e.g., on a table).
6. Open the well cover while standing upwind of the well. Remove the well cap and place it on the plastic sheeting. If appropriate or required for site-specific conditions, insert the photoionization detector (PID) probe approximately 4 to 6 inches into the casing or the well headspace and cover it with a gloved hand. Record the PID reading in the field log. Perform air monitoring in the breathing zone according to the HASP and/or JSA.
7. Measure and record the initial depth to groundwater prior to placing the pumps.
8. Prepare and install the pump in the well.

NOTE: Groundwater will be purged from the wells using an appropriate pump. If the depth to water is below the sampling range of a peristaltic pump (approximately 25 feet below ground surface), a submersible or bladder pump will be used, provided that the well is constructed with a casing diameter of at least two (2) inches (the minimum well diameter capable of accommodating such pumps). For smaller diameter wells, where the depth to water is below the sampling range of a peristaltic pump, alternative sampling methods (i.e., bailing or small diameter bladder pumps) will be used to purge and sample the groundwater. Bladder pumps are preferred over peristaltic and submersible pumps to prevent volatilization if sampling of VOCs and/or dissolved gasses is required. Purge water will be collected and containerized according to the direction of the project team.

- a. For submersible and non-dedicated bladder pumps, decontaminate the pump according to site decontamination procedures. Non-dedicated bladder pumps will require a new bladder and attachment of an air-line, sample discharge line, and safety cable prior to placement in the well. Attach the air-line tubing to the air-port on the top of the bladder pump. Attach the sample discharge tubing to the water port on the top of the bladder pump. Take care not to reverse the air and discharge tubing lines during bladder pump setup, as this could result in bladder failure or rupture. Attach and secure a safety cable to the eyebolt on the top of pump (if present, depending on pump model used). Slowly lower the pump, safety cable, tubing, and electrical lines into the well to a depth corresponding to the approximate center of the saturated screen section of the well. Avoid twisting

and tangling of safety cable, tubing, and electrical lines while lowering the pump into the well; twisted and tangled lines could result in the pump becoming stuck in the well casing. Also, make sure to keep tubing and lines from touching the ground or other surfaces while introducing them into the well, as this could lead to unintended contamination.

- b. If using a bladder pump, connect the air-line to the pump controller output port. The pump controller will be connected to a supply line from an air compressor or compressed gas cylinder using an appropriate regulator and air hose. Tighten the regulator connector onto the gas cylinder (if used) to prevent leaks. Teflon® tape may be used on the threads of the cylinder to provide a tighter seal. Once the air compressor or gas cylinder is connected to the pump controller, turn on the compressor or open the valve on the cylinder to begin the gas flow. Turn on the pump controller power (if an on/off switch is present) and verify that all batteries are charged and fully functioning before starting the pump.
 - c. If a peristaltic pump is being used, slowly lower the sampling tubing into the well to a depth corresponding to the approximate center of the saturated screen section of the well. The pump intake or sampling tube must be kept at least two (2) feet above the bottom of the well to prevent mobilization of any sediment present in the bottom of the well.
 - d. If using an in-line 'T' and valve, install between pump discharge water line and the bottom inlet port of the flow-through cell. Attach a short piece of tubing to the outlet. This set-up will be used to collect samples for turbidity readings.
9. Connect the pump discharge water line to the bottom inlet port on the flow-through cell connected to the multi-parameter water-quality sonde and make sure to record equipment/instrument identification (manufacturer and model number).
 10. Before starting the pump, ensure that the water level inside the well has stabilized (i.e., measure the water level multiple times after deploying the pump in the well).
 11. Start pumping the well at 200 to 500 milliliters (mL) per minute (or at lower site-specific rate if specified) and adjust the pumping rate to cause little or no water level drawdown in the well (less than 0.3 feet below the initial static depth to water measurement): the water level should stabilize, however, this is not always possible.
 12. If the well diameter is of sufficient size, measure the water level every 3 to 5 minutes (or as appropriate, lower flow rates may require longer time between readings) during pumping.
 13. Maintain a steady flow rate to the extent practicable and do not break pump suction or cause entrainment of air in the sample.
 14. Record pumping rate adjustments and depths to water.

If necessary, reduce pumping rates to the minimum capabilities of the pump to avoid pumping the well dry and/or to stabilize indicator parameters; if the recharge rate of the well is very low, use alternative purging techniques, which will vary based on the well construction and screen position.

For wells screened across the water table, the well may be pumped dry, and sampling can commence as soon as the volume in the well has recovered sufficiently to permit collection of samples.

For wells screened entirely below the water table, the well can be pumped until a stabilized level (which may be greater than the maximum displacement goal of 0.3 feet) is maintained and monitoring for stabilization of field indicator parameters can commence; if a lower stabilization level cannot be

maintained, the well may be pumped until the drawdown is at a level slightly higher than top of the well screen.

15. After water levels have stabilized and a sufficient volume has been purged (see note below), continue pumping and begin monitoring field indicator parameters using a multi-parameter water-quality sonde coupled with a flow-through-cell.

NOTE: The final purge volume must be greater than the stabilized drawdown volume plus the pump's tubing volume. If the drawdown has exceeded 0.3 feet and stabilizes, calculate the volume of water between the initial water level and the stabilized water level. Add the volume of the water which occupies the pump's tubing to this calculation. This combined volume of water needs to be purged from the well after the water level has stabilized before samples are collected.

16. Use the flow to measure all indicator field parameters, except for turbidity, every 3 to 5 minutes (or after each volume of the flow-through cell has been purged or other appropriate interval); turbidity samples will be collected before the flow-through-cell using the T-valve and a clean container such as a glass beaker.
17. Record field indicator parameters on the groundwater sampling log.
18. The well is considered stabilized and ready for sample collection when three consecutive readings are within the following limits:
- **Turbidity** within $\pm 10\%$ for values greater than 5 nephelometric turbidity units [NTUs] or if three turbidity values are less than 5 NTUs, consider the values stabilized
 - **Dissolved Oxygen (DO)** within $\pm 10\%$ for values greater than 0.5 mg/L or if three DO values are less than 0.5 mg/L, consider the values stabilized
 - **Specific Conductance** within $\pm 3\%$
 - **Temperature** within $\pm 3\%$
 - **pH** within ± 0.1 unit
 - **Oxidation/Reduction Potential (ORP)** within ± 10 millivolts (mV)

NOTE: Alternate stabilization goals may exist in different geographic regions, consult the site-specific FIP/work plan for stabilization criteria).

NOTE: While achieving turbidity levels less than 5 NTU and a stable drawdown of less than 0.3 feet is desirable, sample collection may still take place provided the indicator field parameter criteria in this procedure are met.

19. If the parameters have stabilized but turbidity remains relatively high (e.g., greater than 50 NTUs), the pump flow rate may be decreased to a minimum rate of 100 mL/min to reduce turbidity levels as low as possible. If groundwater turbidity has been minimized (i.e., consecutive readings within $\pm 10\%$) and the values for all other parameters have stabilized, the well may be sampled; however, consult specifications in the FIP/work plan and/or the project technical lead prior to sampling.
20. If after one (1) hour of purging indicator field parameters have not stabilized, consult specifications in the FIP/work plan and/or the project technical lead prior to sampling.
- In general, three potential options are available if stabilization criteria are not met:
- a. Continue purging until stabilization is achieved.
 - b. Discontinue purging, do not collect any samples, and record in field logbook/on the sampling form that stabilization could not be achieved (documentation must describe attempts to achieve stabilization).

- c. Discontinue purging, collect samples, and provide full explanation of attempts to achieve stabilization. There is a risk that the analytical data obtained under these conditions, particularly metals and hydrophobic organic analytes, may reflect a sampling bias and, as a result, the data may not meet the data quality objectives of the sampling event.

NOTE: DO is extremely susceptible to various external influences (including temperature or the presence of bubbles on the DO meter); therefore, great care will be taken to minimize the agitation or other disturbance of water within the flow-through cell while collecting these measurements. If air bubbles are present on the DO probe or in the discharge tubing, remove them before taking a measurement. If DO values are not within acceptable range for the temperature of groundwater, again check for and remove air bubbles on the probe before re-measuring. The table below may be used as a general guide for DO values under various temperatures; however, understand that the table corresponds to freshwater solubility and groundwater contaminants may affect oxygen solubility. If DO value is 0.00 or less, then the meter will be serviced and re-calibrated. If DO values are above possible results, then the meter will be serviced and re-calibrated.

NOTE: During extreme weather conditions, stabilization of field indicator parameters may be difficult to attain. Modifications to the sampling procedures to alleviate these conditions (e.g., measuring the water temperature in the well adjacent to the pump intake) will be documented in the field logbook/on the sampling form.

NOTE: If other field conditions are suspected of preventing stabilization of certain parameters, detailed observations will be documented in the field logbook/on the sampling form.

Oxygen Solubility in Fresh Water

Temperature (degrees C)	Dissolved Oxygen (mg/L)
0	14.6
1	14.19
2	13.81
3	13.44
4	13.09
5	12.75
6	12.43
7	12.12
8	11.83
9	11.55
10	11.27
11	11.01
12	10.76
13	10.52
14	10.29
15	10.07
16	9.85
17	9.65
18	9.45
19	9.26
20	9.07
21	8.9
22	8.72
23	8.56
24	8.4
25	8.24
26	8.09
27	7.95
28	7.81
29	7.67
30	7.54
31	7.41
32	7.28
33	7.16
34	7.05
35	6.93

*Reference: Vesilind, P.A., Introduction to
Environmental Engineering, PWS Publishing
Company, Boston, 468 pages (1996)*

21. Complete the sample label(s) and cover the label(s) with clear packing tape to secure the label onto the container.
22. After the indicator parameters have stabilized, collect groundwater samples by diverting flow out of the unfiltered discharge tubing into the appropriate labeled sample container.
 - a. If a flow-through analytical cell is being used to measure field parameters, the flow-through cell will be disconnected after stabilization of the field indicator parameters and prior to groundwater sample collection.
 - b. Under no circumstances will analytical samples be collected from the discharge of the flow- through cell.
 - c. If an in-line 'T' and valve are used, the valve needs to be removed as well.

- d. Samples will be collected in the following order: VOCs, total organic carbon (TOC), semi-volatile organic compounds (SVOCs), metals and cyanide, and others (or other order as defined in the site-specific FIP/work plan).
 - e. When the container is full, tightly screw on the cap.
23. If sampling for total and filtered metals and/or polychlorinated biphenyls (PCBs), a filtered and unfiltered sample will be collected.
- a. Install an in-line, disposable 0.45-micron particle filter on the discharge tubing after the appropriate unfiltered groundwater sample has been collected.
 - b. Continue to run the pump until an initial volume of “flush” water has been run through the filter in accordance with the manufacturer’s directions (generally 100 to 300 mL).
 - c. Collect the filtered groundwater sample by diverting flow out of the filter into the appropriately labeled sample container.
 - d. When the container is full, tightly screw on the cap.
24. Secure with packing material and store the samples on ice in an insulated transport container provided by the laboratory and include a temperature blank in each container to be shipped.
25. Record on the Low-Flow Sampling Field Form (and bound field logbook) the time at which sampling procedures were completed, any pertinent observations of the sample (e.g., physical appearance and the presence or lack of odors or sheens), and the values of the stabilized field indicator parameters as measured during the final reading during purging (**see Attachment A**).
26. Turn off the pump and air compressor or close the gas cylinder valve if using a bladder pump setup.
27. Slowly remove the pump, tubing, lines, and safety cable from the well.
- a. If using dedicated tubing, do not allow the tubing or lines to touch the ground or any other surfaces which could contaminate them.
 - b. If using dedicated tubing, it will be folded - without pinching it - to a length that will allow the well to be capped and also facilitate retrieval of the tubing during later sampling events.
 - c. Use a length of rope or string to tie the tubing to the well cap.
 - d. Alternatively, if tubing and safety line are to be saved and reused for sampling the well at a later date, coil the tubing neatly and placed in a clean plastic bag that is clearly labeled with the well ID ensuring the bag is tightly sealed before placing it in storage.
28. Secure the well and properly dispose of personal protective equipment (PPE) and disposable equipment.
29. Complete the procedures for packaging, shipping, and handling with the associated Chain-of-Custody.
30. Complete decontamination for flow-through analytical cell and submersible or bladder pump, as appropriate (*TGI – Groundwater and Soil Sampling Equipment Decontamination*).
31. At the end of each day of the sampling event, perform calibration check of field instruments and record procedure and results in field log.

9 Waste Management

Materials generated during groundwater sampling activities, including disposable equipment and excess purge water, will be stored on site in appropriately labeled containers and disposed of properly. Waste will be managed in accordance with the *TGI – Investigation-Derived Waste Handling and Storage*, the procedures identified in the

FIP or QAPP as well as state-, federal- or client-specific requirements. Be certain that waste containers are properly labeled and documented in the field logbook.

10 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

Management of the original documents from the field will be completed in accordance with the site- specific QAPP.

In general, forms (e.g., Low-Flow Sampling Field Forms), logs/notes (including daily field and calibration logs), digital records, and Chain-of-Custody records will be maintained by the field team lead.

Field logs and Chain-of-Custody records will be transmitted to the Arcadis Project Manager and/or Task Manager, as appropriate, at the end of each day unless otherwise directed. Electronic data files will be sent to the project team and uploaded to the electronic project folder daily.

Records generated as a result of this TGI will be controlled and maintained in the project record files in accordance with project requirements.

11 Quality Assurance

Quality assurance procedures shall be conducted in accordance with the Arcadis Quality Management System or the site-specific QAPP.

Unless described otherwise in the project-specific FIP/work plan, QAPP, or Sampling and Analysis Plan, quality assurance/quality control samples will be collected as follows:

- One duplicate for every 10 samples
- One laboratory matrix/matrix spike sample for every 20 samples
- In addition to the quality control samples to be collected in accordance with this TGI, the following quality control procedures will be observed in the field:
- Collect samples from monitoring wells, in order of increasing concentration, to the extent known based on review of historical site information if available
- Equipment blanks will include the pump and tubing (if using disposable tubing) or the pump only (if using tubing dedicated to each well)
- Collect equipment blanks after wells with higher concentrations (if known) have been sampled

- Operate all monitoring instrumentation in accordance with manufacturer's instructions and calibration procedures—calibrate instruments at the beginning of each day, verify the calibration at the end of each day, and record all calibration activities in the field notebook
- Clean all groundwater sampling equipment prior to use in the first well and after each subsequent well following the procedure for equipment decontamination

12 References

USEPA. 1986. *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (September 1986).

USEPA. 1991. *Handbook Groundwater, Volume II Methodology*, Office of Research and Development, Washington, DC. USEPN62S, /6-90/016b (July 1991).

USEPA Region I. 2017. *Low Stress (Low Flow) Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells* (EQASOP-GW4; September 19, 2017).

U.S. Geological Survey (USGS). 1977. *National Handbook of Recommended Methods for Water-Data Acquisition: USGS Office of Water Data Coordination*. Reston, Virginia.

13 Attachments

Attachment A – Low Flow Sampling Field Form

Attachment A

Low-Flow Sampling Field Form

GROUNDWATER SAMPLING FORM



Project No. _____

Well ID _____

Date _____

Project Name/Location _____

Weather _____

Measuring Pt. Description _____

Screen Setting (ft-bmp) _____

Casing Diameter (in.) _____

Well Material _____ PVC
_____ SS

Static Water Level (ft-bmp) _____

Total Depth (ft-bmp) _____

Water Column (ft) _____

Gallons in Well _____

MP Elevation _____

Pump Intake (ft-bmp) _____

Purge Method: _____
Centrifugal _____
Submersible _____
Other _____

Sample Method _____

Pump On/Off _____

Sample Time: _____

Volume Purged _____

Purge Start _____

Gallons Purged _____

Sample ID _____

Replicate/Code No. _____

Sampled by _____

Purge End _____

Time	Minutes Elapsed	Rate (gpm)/(mL/min) 200mL/min +	Depth to Water (ft) -0.3	Gallons Purged	pH ± 0.1	Cond. (µMhos)/(mS/cm) ± 3%	Turbidity (NTU) ± 10%	DO (mg/L) ± 10%	Temp. (°C)/(°F) ± 3%	Redox (mV) ± 10mV	Appearance	
											Color	Odor
Stabilization Calculations (±)												
Stabilization Criteria					± 0.1 s.u.	±3%	± 10% or within 1 NTU ⁽¹⁾	± 10%	±3%	±10 mV		

(1) Turbidity < 50 NTU and ±10% or within 1 NTU of a previous reading when <10 NTU

Constituents Sampled	Container	Number	Preservative

Comments _____

Well Casing Volumes					
Gallons/Foot	1" = 0.04	1.5" = 0.09	2.5" = 0.26	3.5" = 0.50	6" = 1.47
	1.25" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	

Well Information

Well Location: _____	Well Locked at Arrival: Yes / No
Condition of Well: _____	Well Locked at Departure: Yes / No
Well Completion: Flush Mount / Stick Up	Key Number To Well: _____

GW Samp Form
6/17/2022

Attachment D

TGI for Indoor or Ambient Air Sampling

TGI - Indoor or Ambient Air Sampling Using Whole Air Canisters Analyzed via USEPA Method TO-15

Rev: 4

Rev Date: May 6, 2025

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	1	August 19, 2016	All	Update Rev 0	Margaret Bartee Mitch Wacksman
	2	December 30, 2021	All	Updated Rev 1 and for QMS Relaunch	Sarah Jonker Robert Uppencamp
	3	August 22, 2023	All	Updated Rev 2	Megan Hamilton
	4	May 6, 2025	All	Annual Review; several revisions throughout / complete rewrite	Brittany Fagin Sarah Jonker Eric Eppe

Approval Signatures

Prepared by:

4/24/2025

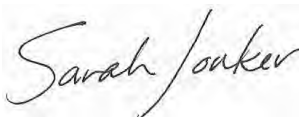


Brittany Fagin (Preparer)

Date

Reviewed by:

4/24/2025



Sarah Jonker (Subject Matter Expert)

Date

1 Introduction

This document describes specific procedures and considerations to be used by Arcadis staff to collect indoor air or ambient air samples in stainless-steel whole air canisters typically for the analysis of volatile organic compounds (VOCs) using United States Environmental Protection Agency (USEPA) Compendium Method TO-15 (USEPA 1999).

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

3 Scope and Application

This Technical Guidance Instruction (TGI) document describes the methods and procedures for collecting indoor air or ambient air samples with stainless-steel whole air canisters and the subsequent typical analysis of volatile organic compounds (VOCs) using USEPA TO-15.

Prior to sampling, it is recommended that a building survey and chemical inventory be completed to identify potential background sources (chemical products) and preferential pathways (cracks, drains, floor joints, etc.). Background sources should be catalogued and removed, and preferential pathways should be sealed prior to sample collection, if feasible. Refer to Arcadis TGI – Building Surveying Prior to Vapor Intrusion Indoor Air Sampling for specific guidance on the completion of the building survey and chemical inventory prior to sampling.

4 Personnel Qualifications

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be competent in the relevant procedures and possess the required skills and experience necessary to successfully collect indoor air and ambient air samples and the desired field work. Arcadis personnel responsible for directing indoor air and/or ambient air sample collection activities must have previous indoor air sampling experience and be able to complete the field work without direct supervision.

5 Equipment List

The equipment required for indoor air and ambient air collection is presented below:

- 6-liter, stainless steel whole air canisters. Request one canister for each sampling location, plus duplicate canisters per project-specific requirements. If feasible, order extra canisters as a precaution at a rate of 10 to 20% of the total number of sampling canisters.
- Flow controllers with in-line particulate filters and vacuum gauges. Flow controllers are pre-calibrated by the laboratory to the sampling duration [typically 8-hours in commercial/industrial settings and 24-hours in residential settings] specified by the project team. Analogue vacuum gauges are also generally supplied by the laboratory. Typically, flow controllers are connected to the canister via compression or quick-connect fittings.
- Open-end wrench. Typical canister caps require 9/16-inch wrenches. However, multiple size wrenches are recommended in the field and adjustable wrenches, if necessary.
- Chain-of-custody (COC) form.
- Hard copy sample collection log or digital application.
- Box, chair, tripod, or similar to ensure sample intake is above the ground surface at approximate breathing height (3-5 feet).
- Hand-held weather meter (optional) and/or access to online weather app.
- Nitrile gloves.
- Camera (if photography is permitted at sampling locations).
- Chain and padlock or bike lock for securing canisters as needed.
- Zip ties.
- Outdoor Air Sampling Tag noting: "Environmental Testing – Do Not Disturb"

For abnormal situations (i.e., sumps, crawlspaces with no access, where canisters must be hidden, etc.), Teflon tubing may be used to collect an air sample. In these situations, 1/4-inch Swagelok fittings (including nut, front sleeve, and back sleeve) or other methods may be appropriate to affix tubing to canister. Teflon tubing may be connected to various lengths of electrical fish rods with zip ties (do not use tape) to direct the end of the tubing into a crawlspace or other area.

6 Cautions

Care must be taken to minimize the potential for introducing interferences during the sampling event. As such, keep canisters away from heavy pedestrian traffic areas (e.g., main entranceways, walkways), if possible.

Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens (Sharpies), wear/apply fragrances, use hand sanitizer, or smoke cigarettes before and/or during the sampling event.

Specify sample collection duration with the laboratory when ordering equipment and confirm with the laboratory upon equipment receipt. Sample integrity can be compromised if sample collection is extended to the point that the canister reaches atmospheric pressure. Sample integrity is maintained if sample collection is terminated prior to the target sample duration and a measurable vacuum (e.g., 5 inches Hg) remains in the canister when sample collection is terminated.

Considerations for extreme temperature or atmospheric pressure changes should be considered. Discussion with the analytical laboratory on precautions for sampling should be considered. Digital gauges can be used as a quality control check of analogue gauges, if possible.

7 Health and Safety Considerations

All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task.

8 Procedure

Canister Preparation and Collection of Sample

1. Record the following information on the sampling form (use a hand-held weather meter, contact the local airport or other suitable information source [e.g., weatherunderground.com] to obtain the following information):
 - Ambient temperature
 - Barometric pressure
 - Wind speed
 - Relative humidity
 - Significant recent precipitation
 - Snow/ice cover
2. For indoor air sampling, note whether the heating, ventilation, and air conditioning (HVAC) system is operational and record settings.
3. For outdoor air sampling, canisters should be initiated at least 30 minutes prior to initiating the first indoor air sample and should be placed upwind of the structure(s) being sampled.
4. Attach an outdoor air tag to each outdoor air canister using a zip tie as applicable. Outdoor air tags are usually only required for off-site locations where disturbance of the canister may occur. The outdoor air tag should include the words, “Environmental Testing – Do Not Disturb”. If possible, place the outdoor air canister(s) in areas with less foot traffic.
5. Choose the sampling location in accordance with the project sampling plan. If a breathing zone sample is required, place the canister on a box, chair, tripod, or other similar stand to locate the canister orifice 3 to 5 feet above the ground or floor surface. The canister may be affixed to wall/ceiling support with nylon rope or placed on a stable surface. In general, areas near windows, doors, air supply vents, and/or other potential sources of “drafts” shall be avoided.

6. Record canister serial number and flow controller number on the sampling log or FieldNow® application and COC form. Assign sample identification (ID) and record on canister ID tag on the sample collection log or FieldNow® application and COC form.
7. Connect canister and flow controller via laboratory provided connections and fittings.
8. Conduct a pressure “shut-in” test to verify the fitting connections are airtight. Attach the brass dust cap on the end of the flow controller. Tighten the brass cap with your fingers first, then tighten gently using a 9/16-inch open end wrench. Use caution not to over tighten fittings. Open the canister valve for approximately 15 to 30 seconds, note the gauge reading (between -25 inches of Hg to -30 inches of Hg), then close the canister valve. After the valve is closed, observe the vacuum gauge for at least 1 minute. If the vacuum gauge shows more than approximately 1 inches Hg change in pressure, then there is a loose fitting. Re-tighten all fittings and repeat the shut-in test. If the canister retains vacuum, it passed the shut-in test.
9. Remove the brass dust cap from the canister with the wrench. Note, canisters and flow controllers with quick-connect style fittings will begin to collect once connected.
10. To start sample collection, open the canister valve and record the initial vacuum on the sampling log or FieldNow® application and COC form. The initial pressure reading should be evaluated with respect to project-specific and regulatory jurisdictional requirements. If the initial pressure registers less than -25 inches of Hg is not sufficient for sampling, and another canister should be used.
11. Collection of duplicate samples will include collecting two samples side by side at the same time or by using a duplicate tee. Duplicate tees can be requested from the laboratory and/or made from tubing and fittings.
12. Photograph the canister and surrounding area within the FieldNow® application; if photography is permitted at sampling locations. Also photograph the completed sample tag.
13. If feasible, check the canister approximately half-way through the sample duration and note progress on sample logs.

Termination of Sample Collection

1. Arrive at the sampling location at least 1 to 2 hours prior to the end of the sampling interval (e.g., 6 hours following sample initiation for an 8-hour sampling duration).
2. The appropriate canister pressure for termination of sampling is between -2 and -10 inches of Hg with the optimal ending pressure of -5 inches of Hg. Leaving some vacuum in the canister provides a way to ensure that the sample was collected over the appropriate duration and to evaluate whether the canister leaks before it reaches the laboratory. Stop collecting the sample by turning the valve on the canister when the canister pressure reaches approximately -5 inches of Hg and when the desired sample time has elapsed. If the canister pressure is outside of the appropriate range at the end of the sampling duration, consult with the project manager before ending the sample.
3. Record the final canister pressure. Record the date and local time (24-hour format) of valve closing on the sample collection log or FieldNow® application and COC form.
4. Remove the flow controller from the canister. Connect the independent gauge, if available, to confirm the final canister pressure using the procedure as described above. Restore caps as need per laboratory instructions.
5. Package the canister and flow controller in accordance with Department of Transportation regulations available on the Transportation Health and Safety’s Team Site on the Source for return shipment to the laboratory. Canisters should not be preserved with ice.
6. Complete the forms and sample labels provided by the laboratory as directed (e.g., affix card with string).

7. Complete the COC form; copy, photograph, or scan a version for the project file (if possible); and place the form in the shipping container. Close the shipping container and affix the custody seal to the container closure. Transmit canisters via courier delivery service (e.g., Federal Express or UPS) to laboratory for analysis.

9 Waste Management

No specific waste management procedures are required.

10 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

Notes and pictures taken during the sampling process that cannot be collected using the FieldNow® application will be compiled and uploaded to the project specific folder on SharePoint.

Refer to the Arcadis TGI – Sample Chain of Custody for appropriate procedures for required documentation during the collection of samples and transfer of custody to a laboratory. It provides direction for completion of the Chain of Custody form that must accompany collected field samples for analysis by a laboratory.

11 Quality Assurance

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP). Additionally:

1. Canisters should be pre-cleaned by an accredited laboratory and individually certified.
2. Communicate with laboratory to ensure that project-specific reporting limits and deliverables are met.
3. If tubing is used during sampling activities, the tubing should be Teflon or Teflon-lined tubing.
4. All fittings should be stainless-steel or other appropriately inert material.

12 References

USEPA. 1999. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. Compendium Method TO-15. Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry. January.

Attachment E

TGI for Building Survey Prior to Indoor Air Sampling

TGI – Building Surveying Prior to Vapor Intrusion Indoor Air Sampling

Rev: 4

Rev Date: May 19, 2025

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	1	August 19, 2016	All	Update Rev 0	Margaret Bartee Mitch Wacksman
	2	December 22, 2021	All	Updated Rev 1 and for QMS Relaunch	Megan Hamilton Robert Uppencamp
	3	August 22, 2023	All	Updated Rev 2	Megan Hamilton
	4	May 19, 2025	All	Updated Rev 3; Revised equipment list and reporting requirements; Added example of FieldNow form	Megan Hamilton

Approval Signatures

Prepared by:

5/15/2025



Brittany Fagin

Date

Reviewed by:

5/15/2025



Megan Hamilton (Subject Matter Expert)

Date

1 Introduction

This document describes specific procedures and considerations to be used and observed by Arcadis staff when conducting a building survey prior to indoor air sampling.

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

3 Scope and Application

This Technical Guidance Instruction (TGI) document describes the procedures to conduct a building survey prior to collecting indoor air samples for the purpose of assessing the potential vapor intrusion pathway.

4 Personnel Qualifications

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be competent in the relevant procedures and possess the required skills and experience necessary to successfully complete a thorough building survey and the desired field work. Arcadis personnel responsible for directing indoor air and/or ambient air sample collection activities, including

building surveying, must have previous indoor air sampling experience and be able to complete the field work without direct supervision.

5 Equipment List

The equipment required for conducting a building survey is presented below:

- Building survey form specific to state or region (if required) or Fulcrum FieldNow® Indoor Air Building Survey Form. Examples can be obtained from the survey form repository located on the Vapor Intrusion Teams SharePoint Site or by asking the project manager. A blank copy of the FieldNow® Indoor Air Building Survey Form is attached for reference. If the building survey form does not include sufficient space for documenting the chemical product inventory, bring additional pages to complete the chemical product inventory.
- Plain white paper to sketch floor plans
- Photoionization detector (PID) capable of readings in the parts per billion by volume (ppbV) range (e.g., ppbRae)
- Nitrile gloves
- Camera
- Flashlight and/or headlamp
- Tape measure and/or measuring wheel

6 Cautions and Health and Safety Considerations

All survey personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Building surveys should always be completed by a team of at least two Arcadis personnel.

7 Procedure

Using the appropriate building survey form or FieldNow® application, document site information; building construction, usage, and layout; and chemical products present in the building prior to conducting indoor air sampling. The building survey form should be jurisdiction-specific since various states and regions require specific forms. The Fulcrum FieldNow® Indoor Air Building Survey Form is preferred when jurisdiction-specific forms are not required.

- Complete the portions of the form to provide site and property information. This information may be completed in advance of the building survey.
- If property contact is available, review building construction, layout, usage, and occupancy information with property contact. If no property contact is available, complete these portions of the form based on observations during the building survey.
- Document observed products or materials that may potentially produce or emit volatile organic compounds (VOCs) on the building survey form, or if sufficient space is unavailable, on separate pages.
 - Record brand name, product name, and product identification number (i.e. UPC number on barcode if labeled for individual consumer sales; product code on drum if labeled for commercial distribution).

- Take a reading with the PID at vapor escape points to evaluate potential off-gassing, such as lid seams on bottles (keep product closed).
 - Take a photograph(s) of each product or material documented (ensure photos clearly capture the brand and product name, quantity, as well as ingredients, if listed).
 - Use nitrile gloves, as needed, to handle chemical products without opening containers.
- If the building is owned and/or occupied by a commercial/industrial occupant, ask the property contact whether a copy of the chemical product inventory (e.g. SDSs) could be provided for confirmatory purposes.
 - Items or materials that contain contaminants of concern and/or exhibit elevated PID readings shall be considered probable sources of VOCs. Request approval of the owner or occupant to have these items removed to a structure not attached to the target structure at least 48 hours prior to sampling, if possible.
 - Note the building's current condition, particularly the floor slab. Pay attention for any penetrations or perforations in the floor that could act as preferential pathways and note these on the building sketch. These include floor cracks, floor drains, utility penetrations, and sumps.
 - Complete all sections of the building survey form or FieldNow® application. Record not applicable (NA) in fields where appropriate rather than leaving blank. Make sure to note whether the heating or air conditioning system is running during the site visit or sampling event.
 - Set a date and time with the owner or occupant to return to conduct sampling.

8 Waste Management

No specific waste management procedures are required.

9 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

Notes and pictures taken during the initial building survey that cannot be collected using the FieldNow application will be compiled and uploaded to the project specific folder on SharePoint.

10 Quality Assurance

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP).



Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Contact Information

Preparer's Name: _____ Phone No: _____

Preparer's Affiliation: _____ Company Code: _____

Purpose of Investigation: _____ Date of Inspection: _____

Contact Name: _____ Affiliation: _____

Phone No: _____ Alt. Phone No: _____ Email: _____

Number of Occupants (total): _____ Number of Children: _____

☐ Occupant Interviewed? ☐ Owner Occupied? ☐ Owner Interviewed?

Owner Name (if different): _____ Owner Phone: _____

Owner Mailing Address: _____

Building Details

Bldg Type (Res/Com/Ind/Mixed): _____ Bldg Size (S/M/L): _____

If Commercial or Industrial Facility, Select Operations: _____

If Residential Select Structure Type: _____

Number of Floors: _____ Approx. Year Construction: _____ ☐ Building Insulated? ☐ Attached Garage?

Describe Overall Building 'Tightness' and Airflows(e.g., results of smoke tests):

Foundation Description

Foundation Type: _____ Foundation Depth (bgs): _____ Unit:

Foundation Floor Material: _____ Foundation Floor Thickness: _____ Unit:

Foundation Wall Material: _____ Foundation Wall Thickness: _____

☐ Floor penetrations? Describe Floor Penetrations: _____

☐ Wall penetrations? Describe Wall Penetrations: _____

Basement is: _____ Basement is: _____ ☐ Sumps/Drains? Water In Sump?: _____

Describe Foundation Condition (cracks, seepage, etc.) : _____

☐ Radon Mitigation System Installed? ☐ VOC Mitigation System Installed? ☐ Mitigation System On?

Heating/Cooling/Ventilation Systems

Heating System: _____ Heat Fuel Type: _____ ☐ Central A/C Present?

Vented Appliances

Water Heater Fuel Type: _____ Clothes Dryer Fuel Type: _____

Water Htr Vent Location: _____ Dryer Vent Location: _____



Structure Sampling Questionnaire and Building Inventory
New York State Department of Environmental Conservation

PRODUCT INVENTORY

Building Name: _____ Bldg Code: _____ Date: _____

Bldg Address: _____ Apt/Suite No: _____

Bldg City/State/Zip: _____

Make and Model of PID: _____ Date of Calibration: _____

Location	Product Name/Description	Size (oz)	Condition *	Chemical Ingredients	PID Reading	COC Y/N?
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐

* Describe the condition of the product containers as **Unopened (UO)**, **Used (U)**, or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Complete? ☐ Were there any elevated PID readings taken on site? ☐ ☐ Products with COC?



Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Factors Affecting Indoor Air Quality

Frequency Basement/Lowest Level is Occupied?: _____ Floor Material: _____

☐ Inhabited? ☐ HVAC System On? ☐ Bathroom Exhaust Fan? ☐ Kitchen Exhaust Fan?

Alternate Heat Source: _____ ☐ Is there smoking in the building?

☐ Air Fresheners? Description/Location of Air Freshener: _____

☐ Cleaning Products Used Recently?: Description of Cleaning Products: _____

☐ Cosmetic Products Used Recently?: Description of Cosmetic Products: _____

☐ New Carpet or Furniture? Location of New Carpet/Furniture: _____

☐ Recent Dry Cleaning? Location of Recently Dry Cleaned Fabrics: _____

☐ Recent Painting/Staining? Location of New Painting: _____

☐ Solvent or Chemical Odors? Describe Odors (if any): _____

☐ Do Any Occupants Use Solvents At Work? If So, List Solvents Used: _____

☐ Recent Pesticide/Rodenticide? Description of Last Use: _____

Describe Any Household Activities (chemical use/storage, unvented appliances, hobbies, etc.) That May Affect Indoor Air Quality:

☐ Any Prior Testing For Radon? If So, When?: _____

☐ Any Prior Testing For VOCs? If So, When?: _____

Sampling Conditions

Weather Conditions: _____ Outdoor Temperature: _____ °F

Current Building Use: _____ Barometric Pressure: _____ in(hg)

Product Inventory Complete? ☐ Building Questionnaire Completed? ☐



Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Building Code: _____ Address: _____

Sampling Information

Sampler Name(s): _____ Sampler Company Code: _____

Sample Collection Date: _____ Date Samples Sent To Lab: _____

Sample Chain of Custody Number: _____ Outdoor Air Sample Location ID: _____

SUMMA Canister Information

Sample ID:

Location Code:

Location Type:

Canister ID:

Regulator ID:

Matrix:

Sampling Method:

Sampling Area Info

Slab Thickness (inches):

Sub-Slab Material:

Sub-Slab Moisture:

Seal Type:

Seal Adequate?: ☐ ☐ ☐ ☐ ☐

Sample Times and Vacuum Readings

Sample Start Date/Time:

Vacuum Gauge Start:

Sample End Date/Time:

Vacuum Gauge End:

Sample Duration (hrs):

Vacuum Gauge Unit:

Sample QA/QC Readings

Vapor Port Purge: ☐ ☐ ☐ ☐ ☐

Purge PID Reading:

Purge PID Unit:

Tracer Test Pass: ☐ ☐ ☐ ☐ ☐

Sample start and end times should be entered using the following format: MM/DD/YYYY HH:MM



Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

LOWEST BUILDING LEVEL LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the lowest building level .
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image



Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sketch.
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or F	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	xxxxxxx	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	#####	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.



Structure Sampling Questionnaire and Building Inventory
New York State Department of Environmental Conservation

FIRST FLOOR BUILDING LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the first floor of the building.
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image



Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sketch.
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or F	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	xxxxxxx	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	#####	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.



Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

OUTDOOR PLOT LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the outdoor plot of the building as well as the surrounding area. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image



Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sketch.
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or F	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	xxxxxxx	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	#####	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Attachment F

TGI for Sub-Slab Vapor and Soil Vapor Sampling

TGI - Sub-Slab Vapor Port Installation Using Vapor PIN[®] Approach

Rev: 3.1

Rev Date: April 9, 2025

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	1	July 20, 2017	All	Original/Rev 1	Dawn Cacia Mitch Wacksman
	2	December 30, 2021	All	Rev 2 for QMS Library / Updates	Robert Uppencamp
	3	May 31, 2024	All	Rev 3 Update	Aubrey Balzani Megan Hamilton Sarah Jonker
	3.1	April 9, 2025	All	Annual review; editorial changes only	Megan Hamilton

Approval Signatures

Prepared by:

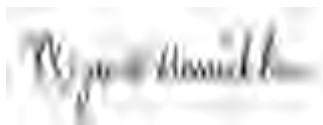


4/9/2025

Sarah Jonker (Subject Matter Expert)

Date

Reviewed by:



4/9/2025

Megan Hamilton (Subject Matter Expert)

Date

1 Introduction

This Technical Guidance Instruction (TGI) provides the methods and procedures for installing sub-slab vapor ports using the Vapor Pin® approach.

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

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In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

3 Scope and Application

This document describes the procedures for installing permanent sub-slab vapor port using the Vapor Pin® approach. These sub-slab vapor ports can then be used for the collection of sub-slab vapor samples, for vacuum readings, or other uses. When not in use, the sub-slab vapor ports can be sealed in place without having to abandon the sub-slab vapor port.

The following sections list the necessary materials, equipment, and detailed instructions for installing sub-slab vapor ports using the Vapor Pin® approach.

4 Personnel Qualifications

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first-aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be well versed in the relevant standard operating procedures (SOPs), technical guidance instructions (TGIs) and possess the required skills and experience necessary to successfully complete the desired field work. Arcadis personnel responsible for leading sub-slab vapor port installation activities must have previous sub-slab vapor port installation experience.

5 Equipment List

- Appropriate personal protective equipment (PPE), as required by the site-specific Health and Safety Plan (HASP) and the job safety analysis (JSA)
- Electric hammer drill (big – e.g., Bosch, Hilti, etc.)
- 5/8-inch and 1 ½-inch concrete drill bits for impact drill (drill bit length contingent on slab thickness)
- 2-inch concrete coring drill bit (for stainless steel flush mount cover installation)
- Contractor Vapor Pin® Kit that includes:
 - Decontaminated Stainless Steel Vapor Pin® option applicable to the project and slab depth
 - Vapor Pin® rubber protective caps
 - Secure, steel flush mount covers or plastic flush mount cover
 - Spanner tool screwdriver or equivalent
 - Stainless steel drilling guide
 - Installation/Extraction tool
 - Bottle brush
 - Vapor Pin® SOP
- Photoionization detector (PID) with appropriate eV lamp for site related contaminants of concern (COCs); e.g., 10.6 eV or 11.7 eV
- Dead blow hammer or rubber mallet
- Pliers
- Whisk broom and dustpan or shop vacuum with clean fine-particle filter, charged battery, and a compatible vacuum shroud if appropriate for dust control.
- Spray bottle with distilled water
- Paper towels
- Nitrile gloves
- Work gloves
- Knee pads
- Ground fault circuit interrupter (GFCI)
- Extension cords capable of amperage required for hammer drill

- Plastic sheeting and garbage bags
- Field notebook and/or FieldNow® application
- Water dam leak test and purging materials
 - Vapor Pin® Water Dam Leak Test SOP
 - 6-inches of 0.25-inch ID silicone tubing
 - Tedlar bag
 - 60-ml syringe with Lok-Luer™ tip
 - 3-way valve with Lok-Luer™ tip
 - Distilled water or DI water
 - Water dam cup (for stick-up applications)
 - Modeling clay (for stick-up applications)

6 Cautions

The following cautions and field tips should be reviewed and considered prior to installing or collecting a sub-slab vapor sample.

- When drilling sample collection holes, be mindful of utilities that may be in the area. Always complete utility location, identification and marking before installing sub-slab ports as required by the Arcadis Utility Location Policy and Procedure. Be aware that public utility locator organizations frequently do not provide location information within buildings so alternative lines of evidence must be used. Examples of alternative lines of evidence include tracing the utilities, including sewer, gas, electric, water, and plumbing, from the entry/exit locations in floors and ceilings and concrete slabs or contracting with a private utility locate company to locate utilities inside a building via a concrete scanner. If the driller is concerned about a particular location, consult the project manager about moving it to another location. Do not hesitate to use Stop Work Authority; if something doesn't seem right stop and remedy the situation.
- Use of Vapor Pins® and drill bit length will be based on the thickness of the slab encountered. Every effort will be made to establish the thickness of the slab during the preliminary investigation activities, such as interviews with site personnel, review of construction drawings, building walk through and utility clearance process. If slab is determined to be too thin for a standard installation Vapor Pin®, consider using a Mini Vapor Pin® or a stick-up Vapor Pin® installation. If these options do not work, another option is to collect a sub-slab sample from a temporary sub-slab vapor port. Contact a SME for guidance on the installation and sampling of a temporary sub-slab port.
- Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens (sharpies), use hand sanitizer, wear/apply fragrances, or smoke cigarettes/cigars before and/or during the installation event.
- Only a clean decontaminated hammer drill and drill bits should be used for installation. A hammer drill and drill bits dedicated to VI work are preferred. Be extra cautious if using rental equipment.
- Field personnel will properly seal the sub-slab vapor port at the slab surface to prevent leaks of atmosphere into the sub-slab vapor port during purging and sampling. Permanent sub-slab vapor ports will be fit snug into the predrilled hole by ensuring that the silicone sleeve is fitted properly around the Vapor Pin® before installation and expands sufficiently inside the hole during installation. A protective cap will be installed on the

end of the Vapor Pin®. If this is not done properly, the integrity of the sub-slab vapor port may be compromised.

- Be careful not to install the Vapor Pin® too shallow it that makes it difficult to remove the protective white cap for sampling and screw down the stainless-steel cover below grade level (trip hazard) or too deep that the stainless-steel cover threads cannot reach the threads on the Vapor Pin®.
- Make sure to have extra protective white caps available during installation in case of rips or tears.
- If possible, have equipment shipped two to three days before the scheduled start of the installation event so that all materials can be checked. Order replacements if needed.

7 Health and Safety Considerations

All sampling personnel should review the appropriate HASP and JSA prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Field sampling must be carefully performed to minimize the potential for injury and the spread of hazardous substances. For sub-slab vapor port installation, drilling with an electric concrete impact drill should be done only by personnel with prior experience using such a piece of equipment or directly supervised by an experienced person and with the appropriate health and safety measures in place as presented in the JSA. It is possible to encounter high concentrations of VOCs in sub-slab vapor, so the amount of time the borehole remains open should be minimized. For the same reason, when installing sub-slab vapor port in spaces with minimal dilution potential, such as closets, it is advisable to provide local ventilation. Finally, sub-slab vapor port installation should be completed at least 24 hours in advance or after any indoor air sampling to avoid cross contamination of the indoor air samples.

Proper procedures should be used to eliminate exposure to silica dust when drilling through concrete and asbestos containing materials such as floor tile, etc.

8 Procedure

Permanent sub-slab vapor port are installed using a hammer drill and manual placement of the Vapor Pin® probe. After a dry fit, the vapor probe is inserted into the hole and installed using a dead blow hammer to tap the installation/extraction tool over the Vapor Pin® to protect the barb fitting. The vapor probe is equipped with a rubber protective cap that is used to close the sampling port when not in use. Figures presenting a properly installed Vapor Pin® are found in the Vapor Pin® Installation SOP.

The Vapor Pin® and tubing will be purged prior to collecting the sub-slab vapor sample. Detailed installation methods are as follows:

1. Complete the procedure in the Arcadis Utility Location and Clearance Standard prior to drilling activities.
2. Remove, only to the extent necessary, any covering on top of the slab (e.g., carpet) if present.
3. Lay down plastic sheeting to keep the work area clean. Check to make sure shop vacuum is working properly and fine concrete particles will not pass through filter.
4. Advance the 1½-inch drill bit approximately 1.75 inches into the slab (Please note that if the stainless-steel flush mount is being used, advance the 2-inch drill bit approximately 1/8 inch into the slab first before using the 1½-inch drill bit). This hole is drilled deep enough to permit the top of the Vapor Pin® to be set flush with the slab when the Vapor Pin® is inserted into the 5/8-inch hole drilled under Step 7, below. Careful not to

advance too far into the slab. This will cause the threaded portion of the Vapor Pin® to be set too deeply to engage with stainless-steel cover. Clean up cuttings with shop vacuum, bottle brush, and dust pan.

5. Drill a 5/8-inch-diameter hole into the concrete slab using the hammer drill. Do not fully penetrate the slab at this time. Stop drilling approximately 1-inch short of penetrating the slab.
6. Use the shop vacuum, bottle brush and dust broom to clean up the work area and material that may have fallen into and around the drill hole.
7. Advance the 5/8-inch drill bit the remaining thickness of the slab and approximately 3 inches into the sub-slab material to create an open cavity. Record any observations from the drill cuttings, if possible, regarding approximate soil type(s), presence of soil moisture/water, and presence or absence of a plastic sub-slab sheet. Record PID readings. Note: Vapor Pins® should not be installed in saturated soil. Soil saturation inhibits vapor accumulation and will not provide a representative sample. Saturation will also make it difficult to collect a sample and may introduce water into the sampling equipment. If the sub-slab soil is saturated, consult the project manager and consider installing the point at an offset location.
8. Use the bottle brush, dust broom and dustpan to clean material around and within the hole. Do not use the shop vacuum to clean up the drill hole after the full thickness of the slab has been penetrated, as this will create a vacuum and remove soil vapors.
9. Using a Vapor Pin® without the silicone sleeve fitted, test fit the components so that the proper depth of the 1½-inch hole provides enough space for the Vapor Pin®. Adjust so that the Vapor Pin® will lie flush with the slab surface and does not create a tripping hazard.
10. Use a bottle brush or piece of steel rod, sample tubing, or a piece of heavy wire (e.g., coat hanger) to ensure the hole remains clear. If needed, re-drill with caution, taking care not to widen the 5/8-inch diameter hole. Widening the hole will not allow for a good seal.
11. Assemble the Vapor Pin® for installation by fitting the silicone sleeve over the lower end of the pin.
12. Place the lower end of Vapor Pin® assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the Vapor Pin® to protect the barb fitting and tap the Vapor Pin® into place using a dead blow hammer. Make sure the installation/extraction tool is aligned with the Vapor Pin® to avoid damaging the barb fitting. Place the rubber protective cap over the Vapor Pin® barb so that it covers the first barb. Do not push the cap down so that it is flush as this will make it very difficult to remove when preparing to sample.
13. For flush mount installations, cover the Vapor Pin® with a flush mount cover, using either the plastic cover or by threading the stainless-steel secure cover onto the Vapor Pin®. Replace the surface covering (e.g., carpet) if warranted. Sample collection location should be returned to pre-sampling conditions to the extent feasible given the presence of a permanent probe.
14. All permanent sub-slab vapor ports should be allowed to equilibrate for a minimum of 2 hours before proceeding to sample collection.
15. Complete a water dam leak test on the sub-slab port following the procedures outlined in the Vapor Pin® SOP to ensure the sub-slab vapor port is viable. Purge approximately 100 mL of air from the sub-slab vapor port at a rate <200 mL/min using a syringe, silicone tubing, 3-way valve, and Tedlar® bag. Collect purged air into a Tedlar® bag as not to introduce sub-slab vapors into the building.
16. Per specific project requirements, complete differential pressure readings, and collection of gas parameters (e.g. methane).

9 Waste Management

Silica dust generated from drilling through concrete must be captured and disposed of properly. If drilling through known or potential asbestos containing materials (e.g., floor tile, linoleum, etc.), discuss with the project manager and VI lead for proper management and disposal of dust and cuttings.

10 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

11 Quality Assurance

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP).

12 References

Vapor Pin Standard Operating Procedure for Installation and Extraction of the Vapor Pin®. [Microsoft Word - Standard Operating Procedure \(VP\) \(vaporpin.com\)](#)

Vapor Pin Standard Operating Procedure for Leak Testing the Vapor Pin® Sampling Device via Water Dam. [Microsoft Word - Standard Operating Procedure \(Water Dam\) \(vaporpin.com\)](#)

TGI – Administering Helium Tracer Gas Leak Test

Rev: 4.1

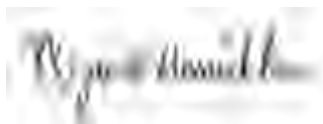
Rev Date: April 10, 2025

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
	1	December 14, 2016	All		Mitch Wacksman
	2	December 5, 20218		Revised purge rate to be consistent with other vapor intrusion TGIs. Add Health and Safety Considerations section.	Eric Cathcart Mitch Wacksman
	3	December 30, 2021	All	Updated format for QMS Library, Content Updates, Remove "Vapor Intrusion" from title since not necessary.	Robert Uppencamp
	4	May 30, 2024	All	Update	Sarah Jonker
	4.1	April 10, 2025	All	Annual review; editorial updates only	Sarah Jonker

Approval Signatures

Prepared by:

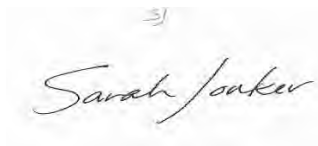


4/10/2025

Megan Hamilton (Subject Matter Expert)

Date

Reviewed by:



4/10/2025

Sarah Jonker (Subject Matter Expert)

Date

1 Introduction

This Technical Guidance Instruction (TGI) provides recommended procedures for administering a helium tracer leak test during soil vapor or sub-slab vapor sampling. A separate TGI is available for administering a helium tracer leak test in the State of California. Some clients outside of California may also require the use of the California requirements. The *TGI – Sub-Slab Vapor or Soil Vapor Sampling Using Whole Air Canister* is presented under a separate cover and should be referenced in conjunction with this TGI.

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

It is the responsibility of the Arcadis Certified Project Manager (CPM) to provide this document to the persons conducting services that fall under the scope and purpose of this procedure, instruction, and/or guidance. The Arcadis CPM will also ensure that the persons conducting the work falling under this document are appropriately trained and familiar with its content. The persons conducting the work under this document are required to meet the minimum competency requirements outlined herein, and inquire to the CPM regarding any questions, misunderstanding, or discrepancy related to the work under this document.

This document is not considered to be all inclusive nor does it apply to all projects. It is the CPM's responsibility to determine the proper scope and personnel required for each project. There may be project- and/or client- and/or state-specific requirements that may be more or less stringent than what is described herein. The CPM is responsible for informing Arcadis and/or Subcontractor personnel of omissions and/or deviations from this document that may be required for the project. In turn, project staff are required to inform the CPM if or when there is a deviation or omission from work performed as compared to what is described herein.

In following this document to execute the scope of work for a project, it may be necessary for staff to make professional judgment decisions to meet the project's scope of work based upon site conditions, staffing expertise, regulation-specific requirements, health and safety concerns, etc. Staff are required to consult with the CPM when or if a deviation or omission from this document is required that has not already been previously approved by the CPM. Upon approval by the CPM, the staff can perform the deviation or omission as confirmed by the CPM.

3 Scope and Application

When collecting subsurface vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control method to verify the integrity of the vapor port seal and the numerous connections comprising the sample train. Without the use of a tracer, verification that a soil vapor sample has not been diluted by ambient or indoor air is difficult.

This TGI focuses on using helium as a tracer gas. It should be noted that a field helium meter could register a false positive if methane is present in the subsurface. In this case an alternative method should be employed such

as a water dam test or use of a different tracer gas (i.e., isopropyl alcohol with caution). The protocol for using a tracer gas includes the following basic steps:

1. Enrich the atmosphere in the immediate vicinity of the sample port where ambient air could enter the sampling train during sampling with the tracer gas; and
2. Measure a vapor sample from the sample tubing for the presence of elevated concentrations (> 10%) of the tracer. Percent leakage is defined as the ratio of tracer gas concentration in the purged air as compared to the concentration of tracer gas in the shroud. If the leakage is greater than 10% personnel must rectify issues with the seal at the sample port and repeat the helium leak testing procedure. If the seal cannot be fixed, consider reinstallation of the sample point at the direction of your local Subject Matter Expert (SME). The calculation to determine leakage percentage is as follows:

$$\% \text{ Leakage} = \frac{\text{Tracer Gas Concentration in Purged Air}}{\text{Tracer Gas Concentration in Shroud}} * 100$$

The intent of the leak check compound is to enhance the integrity of the soil gas sample by demonstrating that minimal or no ambient air breakthrough during sampling is occurring. Although it is preferable not to have any tracer gas breakthrough, minor amounts of breakthrough (less than 10% leakage) may be acceptable if the breakthrough is appropriate for the project's data quality objectives. Detecting leak check compounds indicate potential field problems. Some potential sources of leaks in sampling trains are poor quality fittings, stripped, over tightened, dirty or worn threads, and excessive sampling train connections. Regardless of the cause of the leak, a data adjustment factor based upon the concentration of the leak check compound to compensate for the inability to collect representative samples is inappropriate. In addition, if the leak is greater than 10%, the data may be qualified as rejected.

Note that the display screen of the most commonly used helium detector, the Dielectric MGD-2002, shows concentration values in ppm until it exceeds the 10,000 ppm threshold. You will need to convert the ppm read out into a percentage prior to performing the above calculation; 1% = 10,000 pm. A plastic pail, bucket, garbage can or even a plastic bag can serve as a shroud to keep the tracer gas in contact with the port during the testing.

There are two basic approaches to testing for the tracer gas:

1. Include the tracer gas in the list of target analytes reported by the laboratory; and/or
2. Use a portable monitoring device to analyze a sample of soil vapor for the tracer prior to sampling for the compounds of concern. Note that tracer gas samples can be collected via syringe, Tedlar® bag, etc. They need not be collected in evacuated stainless-steel canisters or minicans. If your project will not be utilizing laboratory analysis to confirm tracer gas in the sample collected, performing an additional leak check after the sample is collected is required.

This TGI focuses on monitoring helium using a portable sampling device, although helium can also be analyzed by the laboratory along with other volatile organic compounds (VOCs) from the same canister that is used for TO-15 sampling – see the TGI for *Sub-Slab Vapor or Soil Vapor Sampling Using Whole Air Canister* for details. Real-time tracer sampling allows the investigator to confirm the integrity of the port seals prior to formal sample collection.

During the initial stages of a subsurface vapor sampling program, tracer gas samples should be collected at each of the sampling points. If the results of the initial samples indicate that the port seals are adequate, the Project Manager can consider reducing the number of locations at which tracer gas samples are used in future monitoring rounds. At a minimum, at least 10% of the subsequent samples should be supported with tracer gas analyses. When using permanent soil vapor points as part of a long-term monitoring program, the port should be tested

prior to the first sampling event. Tracer gas testing of subsequent sampling events may often be reduced or eliminated unless conditions have changed at the site. Soil gas port integrity should certainly be rechecked with Tracer gas if land clearing/grading activities, freeze thaw cycles, or soil desiccation may have occurred. Points should also be rechecked if more than 2 years have elapsed since the last check of that port.

4 Personnel Qualifications

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be competent in the relevant procedures and possess the required skills and experience necessary to successfully complete the desired field work. Arcadis personnel responsible for directing tracer gas testing must have previous experience conducting similar tests without direct supervision.

5 Equipment List

The equipment required to conduct a helium tracer gas test is presented below:

- Appropriate PPE for site (as required by the Health and Safety Plan).
- Helium (ultra-high purity [UHP] or laboratory grade).
- Compatible regulator for helium tank.
- Shroud (plastic bucket, garbage can, plastic bag, plastic drop cloth, laboratory provided helium leak detection kit, etc.).
 - The size of the shroud should be sufficient to fit over the sample port. It is worth noting that using the smallest shroud possible will minimize the volume of helium needed; this may be important when projects require a large number of helium tracer tests.
 - If using a solid structure as your shroud it will need to have three small holes in it. These holes will include one on the top (to accommodate the sample tubing), and two on the side (one for the helium detector probe, and one for the helium line). If using a plastic bag or drop cloth, these inlets can be run underneath the heavy chain or sandbags used to seal the shroud.
 - The shroud should ideally enclose the sample port and as much as possible of the sampling train.
- One or two helium detectors capable of measuring from 1 - 100% (Dielectric MGD-2002, Mark Model 9522, or equivalent).
- Tedlar® bag.
- 1/4-inch OD tubing (Teflon®, Nylaflo® or similar).
- 1/4-inch inner diameter silicone tubing (to connect to either pump or syringe, helium tank, if Vapor Pins™ are present, etc.).
- Seal material for shroud (rubber gasket, VOC-free modeling clay, sand-bags, weighted chain, bentonite, etc.) to keep helium levels in shroud stable in windy conditions. Although the sealing material is not in direct contact with the sample if leakage does not occur, sealing materials with high levels of VOC emissions should be avoided, since they could contaminate a sample if a leak occurs. If using modeling clay, it must be a natural color, made in the US, and meet the ASTM requirement for no VOCs.
- Appropriate-sized open-end wrench (typically 9/16-inch and 1/2-inch, #14 spanner for Vapor Pins™).

- 1-inch adjustable wrench.
- 1 1/8-inch open-end wrench or channel locking plier with 1.5-inch or larger opening (helium tank manifold and two-way valves).
- Sample collection log.
 - FieldNow® TO-15 application.
 - Standard Soil Vapor Sampling Log.
 - San Mateo County Soil Vapor Sampling Log.
- Nitrile gloves.
- Work Gloves.
- Field notebook/tablet.

6 Cautions

- Helium is an asphyxiant! Be cautious with its use indoors! Never release large volumes of helium within a closed room! When in use during soil vapor sampling, place the cylinder in a horizontal position on the ground surface close to the sample train to mitigate tipping hazards. Upon daily sample completion, immediately close the flow valve, release the remaining gas within the flow regulator, and disconnect from the gas cylinder using the appropriately sized wrench. Compressed gas cylinders should be handled with caution; see Section 3.32 of the Arcadis United States Employee Field Health & Safety Handbook on the use, transport, and storage of compressed gasses before beginning field work.
- Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances. All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Field staff should review the attachment on safely handling compressed gas cylinders prior to commencing field work.
- Care should be taken not to pressurize the shroud while introducing helium. If the shroud is completely air tight and the helium is introduced quickly, the shroud can be over-pressurized and helium can be pushed into the ground. Provide a relief valve or small gap where the helium can escape.
- Because minor leakage around the port seal should not materially affect the usability of the soil vapor sampling results, the mere presence of the tracer gas in the sample should not be a cause for alarm. Consequently, portable field monitoring devices with detection limits in the low ppm range are more than adequate for screening samples for the tracer. If high concentrations (> 10%) of tracer gas are observed in a sample, the port seal should be enhanced and fittings within the sampling train should be checked and/or tightened to reduce the infiltration of ambient air and the tracer test readministered.
- . If an alternate sample train yields the same tracer gas breakthrough, sample collection should not proceed at the sample location in question. The project team will need to consult with their local SME to determine whether a new sample point should be installed at a later date to replace the sample location with repeated tracer gas breakthrough.
- Flow rates between 100 to 200 milliliters per minute (mL/min) and vacuums less than 100 inches of water (7.3 inches of mercury [Hg]) should be maintained during purging and sampling to minimize stripping (partitioning of vapors from pore water to soil gas), to prevent ambient air from diluting the soil gas samples, and to reduce

variability between contractors. Maintaining these flow rates and vacuums will increase the likelihood that representative samples will be collected. A flow rate greater than 200 mL/min may be used when purging times are excessive, such as for deep wells with larger-diameter tubing. However, a vacuum of 100 inches of water (7.3 inches of Hg) or less must be maintained during sampling whenever a higher flow rate is used.

- This TGI is not a substitute for a Work Plan. Staff involved with a soil vapor sampling event must review the Work Plan prior to pre-field planning activities.

7 Health and Safety Considerations

All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Field sampling must be carefully performed to minimize the potential for injury and the spread of hazardous substances.

Soil Vapor sampling is often done on the ground with workers on their knees. Knee pads or a large pad can be used under the entire sample area (i.e., a large folded box). This will protect the worker's knees and the sampling equipment from touching the potentially impacted ground (i.e., asphalt parking lot with car oil stains).

The metal on metal fittings often create small metal splinters, so always used gloves when handling the canisters, fittings, valves, etc. Do not blow the splinters off towards other workers

8 Procedure

The helium tracer test can be conducted when using temporary or permanent sampling points and inside or outside a facility. A visual of an example helium tracer gas test equipment set up is included as Figure 1.

1. Attach the sample train to the sample point. This can be accomplished utilizing a number of different methods depending on the sample install (i.e., Swagelok® or comparable fittings).
2. Place the shroud over the sample point and tubing (sampling media, tubing, sampling point, valves, etc.).
3. Pull the tubing through hole in top of shroud. Seal opening at top of shroud with VOC free modeling clay.
4. Place weight on top of shroud to help maintain a good seal with the ground.
5. Insert helium tubing and helium detector probe into side of shroud. Seal both with modeling clay to prevent leaks.
6. Fill shroud with helium. Fill shroud slowly, allowing atmospheric air to escape either by leaving a gap where the shroud meets the ground surface or by providing a release valve on the side of the shroud. Do not pressurize the shroud!
7. Use the helium detector to monitor helium concentration within the shroud from the lowest hole drilled in the shroud (bottom of the shroud nearest where the sample tubing intersects the ground). Helium should be added until the environment inside the shroud has > 40% helium.
8. Purge the sample point through the sample tubing into a Tedlar bag using a syringe equipped with a three-way Luer lock valve. The purge rate should at least match the sample collection rate but not exceed 200 ml/min. Test the air in the Tedlar bag for helium using portable helium detector. If the point is free of leaks there should be very low helium in the purge air from the soil. The natural concentration of helium in the atmosphere is 0.00052% by volume and there are few if any natural sources of helium to soil gas.

9. If there is greater than 10% ratio of tracer gas concentration in the purged air as compared to the concentration of tracer gas in the shroud, a significant leak may be present, and personnel should rectify issues with the seal at the sample port and repeat the testing procedure. If the seal cannot be fixed, consider reinstallation of the sample point at the direction of your local SME.
10. Monitor and record helium level in shroud before, during and after tracer test. Maintain helium concentration at target level during sampling.
11. Monitor and record helium level in purge exhaust.
12. At successful completion of tracer test and sample point purging, the soil vapor sample can be collected. Maintain 40% helium in the shroud during sampling.
13. After sample collection, repeat the helium leak test process in Step 8 to verify breakthrough did not occur during sampling.

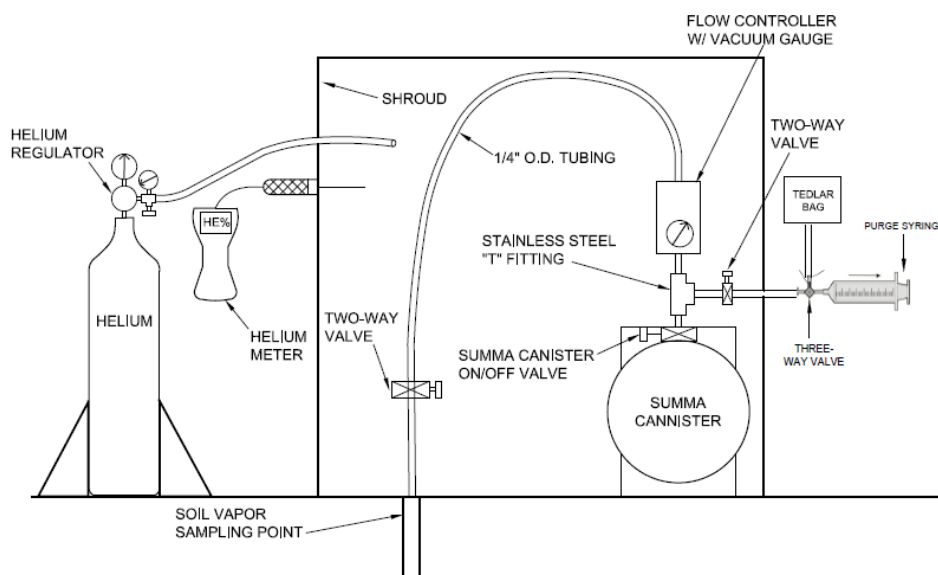


Figure 1 - Sampling Set Up with canister enclosed in shroud. Some jurisdictions only require the soil vapor sampling point or sub-slab port be enclosed in the shroud.

9 Waste Management

No specific waste management procedures are required.

10 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff

are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

Measurements will be recorded on the sample logs or FieldNow® digital form at the time of measurement with notations of the project name, sample date, sample start and finish time, sample location, and the helium concentrations in both the shroud and the purge air before, during, and after tracer testing. Any problems encountered should also be recorded in the field notes.

11 Quality Assurance

Conduct quality assurance as required by the project-specific work plan and/or Quality Assurance Project Plan (QAPP).

12 References

New Jersey Department of Environmental Protection (NJDEP). 2018. Vapor Intrusion Technical Guidance. January.

New York Department of Health. 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October.

United States Environmental Protection Agency (USEPA). 2015. OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air. June.

TGI - Sub-Slab Vapor and Soil Vapor Sampling Using Whole Air Canisters

Rev: 3

Rev Date: July 22, 2025

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By
1	1	9/18/2016	All	Updated Rev0	Mitch Wacksman
2	2	8/4/2023	All	Updated Rev1	Sarah Jonker Christina Weaver Robert Uppencamp
3	3	7/22/2025	All	Complete re-write to all sections.	Sarah Jonker Margaret Bartee

Approval Signatures

Prepared by:



7/22/2025

Sarah Jonker

Date

Reviewed by:



7/22/2025

Margaret Bartee

Date

1 Introduction

This Technical Guidance Instruction (TGI) provides the methods and procedures for collecting whole air samples via USEPA Method TO-15 from sub-slab vapor or exterior soil vapor using whole air stainless-steel canisters. It is advisable to consult with a vapor intrusion subject matter expert (SME) when planning and executing the procedures detailed in this TGI.

2 Intended Use and Responsibilities

This document describes general and/or specific procedures, methods, actions, steps, and considerations to be used and observed by Arcadis staff when performing work, tasks, or actions under the scope and relevancy of this document. This document may describe expectations, requirements, guidance, recommendations, and/or instructions pertinent to the service, work task, or activity it covers.

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3 Scope and Application

This Technical Guidance Instruction (TGI) has been updated to reflect United States Environmental Protection Agency (USEPA) criteria (USEPA 2015) and best practices.

This document describes the procedures for collecting exterior soil vapor or sub-slab soil vapor (herein referred to as "soil vapor") samples using whole air stainless-steel canisters for the analysis of volatile organic compounds (VOCs) by USEPA Method TO-15 (TO-15). This document assumes a sample port (either sub-slab port or exterior soil vapor probe) has already been installed. This document covers the above ground assembly and sampling methods.

Separate TGIs are available in the TGI library for the installation of sub-slab ports and exterior soil vapor probes. Sampling is typically able to commence a minimum of 2 hours after installation of a sub-slab port (VaporPin®) and a minimum of 24 hours after installation of a soil vapor probe. Confirm equilibration times with the project's regulatory jurisdiction.

Method TO-15 typically uses a 1-liter, 3-liter, or 6-liter stainless-steel canisters to collect a whole air sample. The whole air sample is then analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer (GS/MS) system to provide typical compound detection limits of 0.5 parts per billion volume (ppbv).

The following sections list the necessary equipment, materials, and detailed instructions for collecting soil vapor samples for VOC analysis.

4 Personnel Qualifications

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, Department of Transportation (DOT)/International Air Transport Association HazMat #1, site-specific training, first-aid, and cardiopulmonary resuscitation (CPR), as needed. Arcadis field sampling personnel will be well versed in the relevant technical guidance instructions (TGIs) and possess the required skills and experience necessary to successfully complete the desired field work. Arcadis personnel responsible for leading soil vapor sample collection activities must have previous soil vapor sampling experience.

5 Equipment List

The equipment required for soil vapor sample collection is presented below. All stainless-steel supplies must be cleaned/decontaminated prior to use.

5.1 Laboratory

- 1, 3, or 6-liter whole air stainless-steel canisters. Order either batch certified canisters or individually certified canisters as required by the project. Order at least one extra whole air stainless-steel canister per 20 samples to account for a potential loss of vacuum malfunction in shipping, if feasible. A 1-liter whole air stainless-steel canister is typical for soil vapor sampling and will achieve most reporting limit requirements. Confirm the applicable screening levels for the project will be met by the laboratory reporting limits.
- Flow controllers must be ordered for each whole air stainless-steel canister ordered. Flow controllers will come with in-line particulate filters and vacuum gauges. Flow controllers are pre-calibrated to specified sample duration (e.g., 5, 10, or 30 minutes) or flow rate (e.g., between 80-200 milliliters per minute [mL/min]). Confirm with the laboratory that the flow controller comes with a particulate filter and vacuum gauge.
- Order a stainless-steel duplicate tee as needed. Projects typically require 1 duplicate per 10 samples or 20 samples. Confirm the project QA/QC requirements.

5.2 Supplies

Soil vapor probes are typically completed with all sample assembly components permanently connected and contained within the manway vault. Purging materials and sampling media are required.

Supplies to build one sub-slab port assembly are listed below. Clean/decontaminate all stainless-steel supplies prior to use. Tubing and ferrules cannot be reused. Stainless-steel supplies should be Swagelok® or Parker A-Lok compatible compression fittings. Supplies can be purchased at companies such as Swagelok® www.swagelok.com, McMaster Carr www.mcmaster.com, or ESP Supply www.shop-esp.com.

Two sub-slab sample assembly types are detailed in Section 8. Materials to build each type of sample assembly are listed below.

Sub-Slab Port Assembly for Vapor Pin™ with Barb Fitting using the Sample Configuration with Purge Isolation

- 1: 1/4-inch stainless-steel valve with compression fittings.
- 6: 1/4-inch stainless-steel compression nuts.
- 6: 1/4-inch stainless-steel front and back compression ferrules.
- 1: 1/4-inch stainless steel union tee. Some labs have flow controllers with a purge port and valve built in. Confirm with the lab flow controller setup (request a diagram or photo). A Luer-Lok™ 3-way valve can be used at the tee fitting as well (single use).
- 36-inches: 1/4-inch outer diameter (OD) Teflon®, Teflon® lined, or Nylaflow tubing.
- 8-inches: 1/4-inch inner diameter (ID) silicone tubing.
- 50 or 60-mL syringe equipped with a three-way Luer-Lok™ valve. Alternately, a low-flow air pump may be used.
- 1-liter Tedlar® bag to collect purge air for the leak detection test, field parameter measurements, and venting outside a structure if working inside.

Sub-Slab Port Assembly for Vapor Pin™ with Barb Fitting using Separate Purge and Sample Configuration

- 1: 1/4-inch stainless-steel ball with compression fittings.
- 3: 1/4-inch stainless-steel compression nuts.
- 3: 1/4-inch stainless-steel front and back compression ferrules.
- 24-inches: 1/4-inch OD Teflon®, Teflon® lined, or Nylaflow tubing.
- 8-inches: 1/4-inch ID silicone tubing.
- 60-mL syringe equipped with a three-way Luer-Lok™ valve. Alternately, a low-flow air pump may be used.
- 1-liter Tedlar® bag to collect purge air for the leak detection test, field parameter measurements, and venting outside a structure if working inside.

5.3 Rental Equipment/Supplies

Appropriate equipment and materials for quality assurance testing are detailed in the respective quality assurance TGIs (i.e., helium leak testing, water dam testing, methane testing).

- Appropriate equipment and materials for quality assurance testing as laid out in the respective quality assurance TGIs (i.e., helium leak testing, water dam testing, methane testing).
- Low-flow air pump with time-elapse clock (GilAir or equivalent) capable of a flow rate between $100 \leq \text{flow rate} \leq 200$ mL/min for purging. This may require a low-flow module. Alternately, a 60-mL syringe with a three-way Luer-Lok™ valve may be used.

- Air pump calibration instrument such as a DryCal® Defender (or equivalent), as needed.
- Photoionization detector (PID) with calibration kit, as needed.
- Multi-gas monitor (LANDTEC® GEM™ 2000 PLUS/5000 or similar) capable of detecting percentage of carbon dioxide, methane, and oxygen with calibration kit, as needed.
- Helium detector (Dielectric MGD-2002 or similar).
- Ultra-high purity (UHP) helium tank with compatible regulator.
- Portable weather meter, as needed. Alternately, weather applications or weather websites can be used.

5.4 Personal Gear and Documents

- Appropriate-sized open-end wrench (typically 9/16-inch and 1/4-inch, #14 spanner for Vapor Pins®).
- 1/4-inch adjustable wrench.
- Channel locking plier with 1.5-inch or larger opening (helium tank manifold and 2-way valves).
- Non-VOC containing modelling clay to mitigate leaks such as Craft Smart Natural Clay (air-dry) or Pepsy Plasticine (non-drying). Clay should have no color added and meet ASTM D-4236 standards for required clear labeling (This means they must include general VOCs or harmful ingredients in the label).
- Shroud (plastic bucket, garbage can, plastic bag, plastic drop cloth, laboratory provided helium leak detection kit, etc.).
- Sand filled socks, weighted chain, or equivalent to seal helium shroud when using a plastic bag or drop cloth.
- Chain-of-custody (COC) form(s) – lab supplied preferred.
- Nitrile gloves.
- Work gloves.
- Sample collection log, field notebook/tablet, or current Standard Vapor Intrusion Sampling FieldNow® application.

6 Cautions

The following cautions and field tips should be reviewed and considered prior to installing or collecting a soil vapor sample.

- Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens (e.g., Sharpie®), wear/apply fragrances including sunscreens, hand sanitizer, or alcohol-based cleaning products. Do not smoke cigarettes/cigars before and/or during the sampling event.
- Soil vapor sampling equipment and tools should be stored separately from adhesives with VOCs such as duct tape. Field staff should take note of any sanitation stations or recent use of chemicals within proximity of their sample locations.
- Tubing and piping materials commonly used for other types of sampling such as HDPE, LDPE, and PVC should not be used in soil vapor sampling. These materials can either absorb constituents of potential concern present in soil vapor or introduce VOCs via off gassing. Refer to Section 5 for the list of approved soil vapor sampling materials.

- Ensure the flow controller is pre-calibrated to the proper sample collection duration (confirm with laboratory) by checking equipment inventory enclosed with equipment packaging and flow controller tags. Discuss discrepancies with project team prior to final mobilization for sampling. Sample integrity can be compromised if sample collection is extended to the point that the canister reaches atmospheric pressure. Sample integrity is maintained if sample collection is terminated prior to the target duration and a measurable vacuum (e.g., 2 to 10 inches of mercury [in Hg]) remains in the canister when sample collection is terminated.
- The helium detector will function correctly at high relative humidity levels of 50% or greater, but its accuracy and sensitivity may be reduced. In addition, high concentrations of methane can cause false readings. Use a multi-gas monitor to screen purged air during leak check if methane interference is anticipated. Review the TGI for *Administering Helium Tracer Gas Leak Test* for further details on helium leak testing.
- The integrity of the sample train and sample port will be tested in accordance with the project specific requirements. These procedures are contained in their own TGI documents and include helium leak testing, water dam testing, and methane testing.
- When conducting a shut-in test, pull the syringe slowly at a rate no faster than 1 to 2 mL/second (approximately 60 to 120 mL/min, the lower the better) to avoid damage to the flow controller, and stop pulling once you have achieved a vacuum. Most flow controllers are not constructed to withstand vacuum from the outlet side of the device, and therefore, rapid application of strong vacuum from a quick, full pull of a syringe can damage the internal components.
- It is important to record the canister vacuum, start and stop times, and sample identification on a proper field sampling form or current Standard Vapor Intrusion Sampling FieldNow® application. You should observe and record the time/ vacuum at the start, and then again one or two minutes after starting the sample collection. It is a good practice to lightly tap the vacuum gauge with your finger before reading it to make sure the needle is not stuck. If the canister is filling as expected, the sampling rate should match the rate of the flow controller set point. Consult your project manager, risk assessor, or air sampling expert by phone if the canister does not appear to be working properly due to insufficient or rapid pressure changes.
- Ensure that there is still measurable vacuum in the canister after sampling. The target residual vacuum is -5 inches Hg, however the acceptable range is between -2 in Hg and -10 in Hg. Sometimes the gauges sent from labs have off-set errors, or they stick.
- When sampling, carefully consider elevation. If your site is over 2,000 feet above sea level, or the difference in elevation between your site and your lab is more than 2,000 feet, then pressure effects will be significant. If you take samples at a higher elevation, they will contain less air for a given ending vacuum reading. High elevation samples analyzed at low elevation will result in more dilution at the lab, which could affect reporting limits. Conversely, low elevation samples received by a laboratory at high elevation may appear to not have much vacuum left in them. Pressure at sea level is 1 atm which corresponds to 29.92 inches Hg. Enter the sample location (city/town) atmosphere (atm) into the Pressure Conversions Calculator to determine the difference in the corresponding pressure in inches of Hg: http://www.uigi.com/Atmos_pressure.html. For instance, the atmosphere in Denver, Colorado is 0.830 atm which corresponds to 24.83 in Hg. This indicates approximately 5 inches Hg difference from sea level.
- If possible, have equipment shipped two to three days before the scheduled start of the sampling event so that all materials can be checked. Check the vacuum in each canister as soon as they arrive. The preference is a starting vacuum of -28 inches of Hg or more, but some canisters may be used in certain jurisdictions with lower starting vacuum. However, if the initial vacuum registers less than -25 inches of Hg, then the canister is not appropriate for use and another canister should be used. The initial vacuum required varies by

jurisdiction; confirm with the project regulatory authority and project team prior to sampling. If an analog or digital gauge is available when conducting inventory, ensure the vacuum is similar to the laboratory recorded vacuum on the sample tag. Order replacements, if needed.

- Requesting extra canisters and flow controllers from the laboratory should also be considered to ensure that you have enough equipment on site in case of an equipment failure, especially at remote sites.
- When taking field measurement readings of the soil vapor conditions, it is best practice to collect reading from a Tedlar® bag instead of directly from sample port. This is due to field instruments having a flow rate of greater than 200 ml/min, which can cause partitioning of contaminants during sampling. In addition, for health and safety reasons, when there are elevated concentrations of site contaminants it is best not to purge into the sampler's breathing zone.
- Considering laying out a new trash bag or tarp on the ground next to the sample port to prevent sampling equipment from touching potentially impacted ground (i.e., asphalt parking lot with car oil stains).
- Shallow exterior soil-gas sampling normally should not proceed immediately following a significant rain event. Consult applicable regulations and guidance for recommended wait times following precipitation events before sampling can proceed.
- This TGI is not a substitute for a Work Plan. Staff involved with a soil vapor sampling event must review the Work Plan prior to pre-field planning activities.

7 Health and Safety Considerations

All sampling personnel should review the appropriate health and safety plan (HASP) and job safety analysis (JSA) prior to beginning work to be aware of all potential hazards associated with the job site and the specific task. Field sampling must be carefully performed to minimize the potential for injury and the spread of hazardous substances.

Soil vapor sampling is often done on the ground with workers on their knees. Low stools, knee pads, or a large pad can be used under the entire sample area (i.e., a large, folded box). This will protect the worker's knees. Ensure proper hand protection is worn while working with hand tools during sample train assembly. The metal-on-metal fittings often create small metal splinters, so always use gloves when handling the canisters, fittings, valves, etc. Do not blow the splinters off towards other workers. Use outer nitrile gloves when handling all sample train components to prevent potential cross contamination.

Methane is encountered at some project sites, especially petroleum sites and in situ remediation sites. Package the canister and flow controller per DOT regulations for return shipment to the laboratory. These regulations can be found at the [Transportation Safety Program's Team Site](#) on the Source. The canister does not require preservation with ice or refrigeration during shipment. Refer to TGI – Soil Gas Methane Monitoring for Shipping Determination of Soil Gas Samples if sampling in an area with unknown or known methane conditions. A shipping determination form is required for shipment of any type of samples prior to field mobilization.

8 Procedure

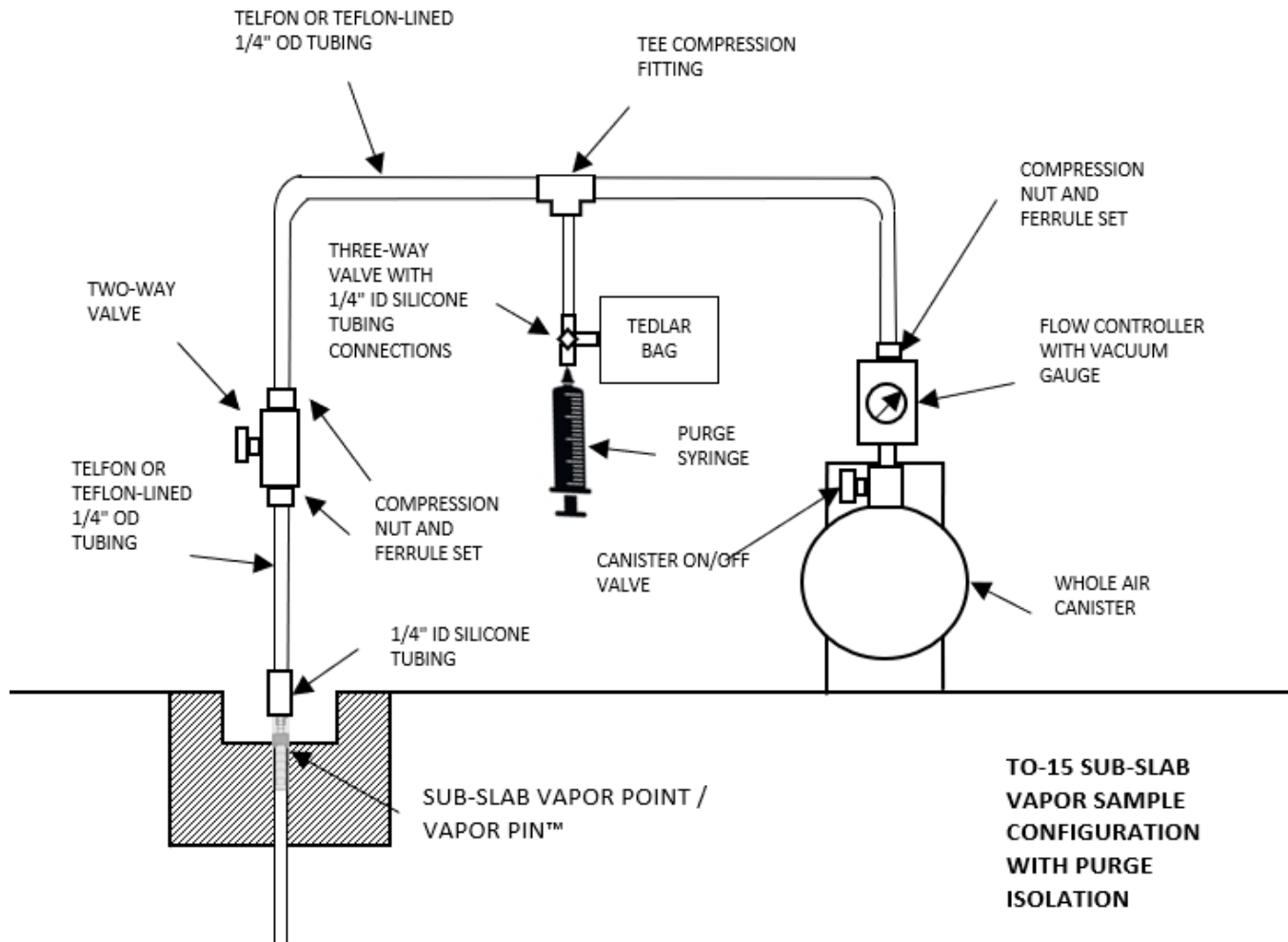
8.1 Sample Train Assembly

The following procedures should be used to collect a soil vapor sample using a whole air stainless-steel canister. These methods can be used for both soil vapor probe samples and interior sub-slab soil vapor samples collected from both permanent and temporary sample point installations. Two configurations of the sample train are acceptable in most jurisdictions; confirm with the project regulatory authority.

Sub-Slab Port Assembly for Vapor Pin™ with Barb Fitting using the Sample Configuration with Purge Isolation

1. Pre-assemble the sample train for each sub-slab port to be sampled (Vapor Pin® with barb fitting). Cut three ~10-inch pieces of 1/4- inch OD Teflon®, Teflon® lined, or Nylaflow tubing and 1 ~6-inch piece of the same tubing.
2. Connect one piece of the 10-inch tubing to the two opposite sides of the stainless-steel tee with compression nuts and ferrule sets. Install a compression nut and ferrule set to the other side of each tubing piece.
3. Remove the cap from the canister and connect the flow controller with in-line particulate filter and vacuum gauge. The flow controller attaches directly to the canister and the pre-set rate dictates the sample duration. The laboratory may have connected the canister and flow controller prior to shipping. Attach the canister and flow controller assembly to the tubing from one side of the stainless-steel tee.
4. Unless the flow controller manifold came with a purge port and valve, one will need to be added. Cut a short length (~6-inches) of 1/4- inch OD Teflon®, Teflon® lined, or Nylaflow tubing. Connect to the open end of the tee fitting using a compression nut and ferrule set. This tee adds a leg to the sample train that will be used to purge “dead” air from the sample train.
5. Connect the purge syringe with three-way valve and/or air pump to the free end tubing from the tee using a length short piece of 1/4-inch ID silicone tubing.
6. Attach a two-way compression valve to the remaining free end of the tee tubing. Cut another 6-inch piece of 1/4-inch OD Teflon tubing and connect to the other side of the two-way valve with a compression nut and ferrule set. The two-way valve will be immediately adjacent to the sample point in the train assembly. This valve is used to isolate the sample train from the sample point prior to sampling in order to test the sample train’s integrity. See Section 8.3 for purging details.
7. When collecting duplicate or other quality assurance/quality control (QA/QC) samples as required by applicable regulations and guidance, couple two canisters using a stainless-steel compression duplicate sample tee-fitting supplied by the laboratory. Attach flow controller with in-line particulate filter and vacuum gauge to duplicate sample tee.
8. Attach the terminal end of the two-way compression valve to the sample port as appropriate. This may be done using the options below:
 - a. Use a section of silicone tube to connect the Teflon sample tubing to the barbed fitting of a Vapor Pin® port.
 - b. Use Swagelok® or equivalent compression fittings to connect Teflon tubing to the sample port. Teflon tape should never be used on Swagelok® or equivalent compression fittings.

A schematic of the first suggested sample train setup isolating the purge line is illustrated below:

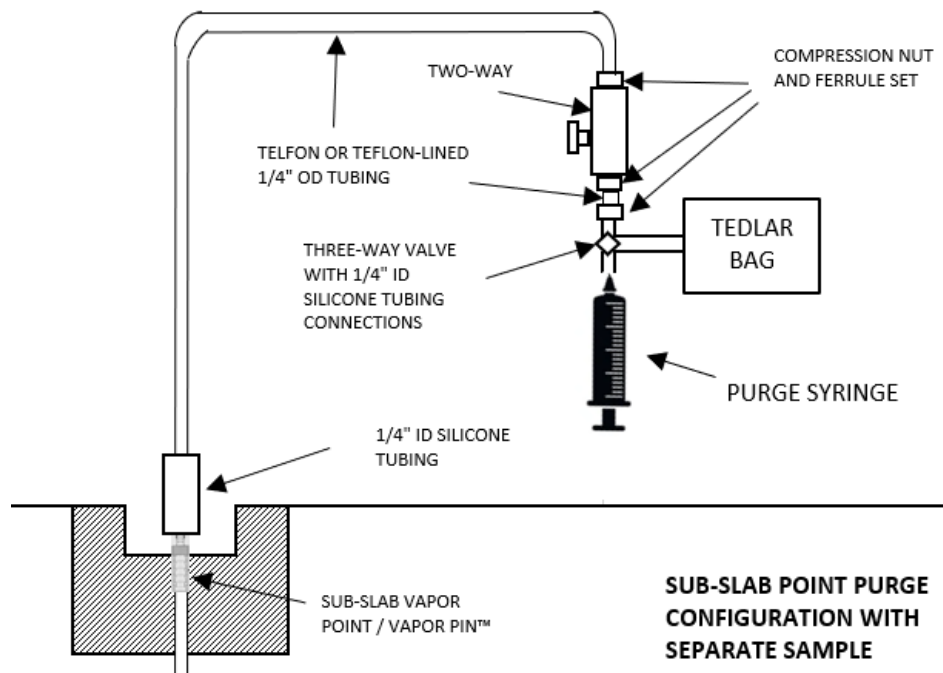


Sub-Slab Port Assembly for Vapor Pin™ with Barb Fitting using Separate Purge and Sample Configuration

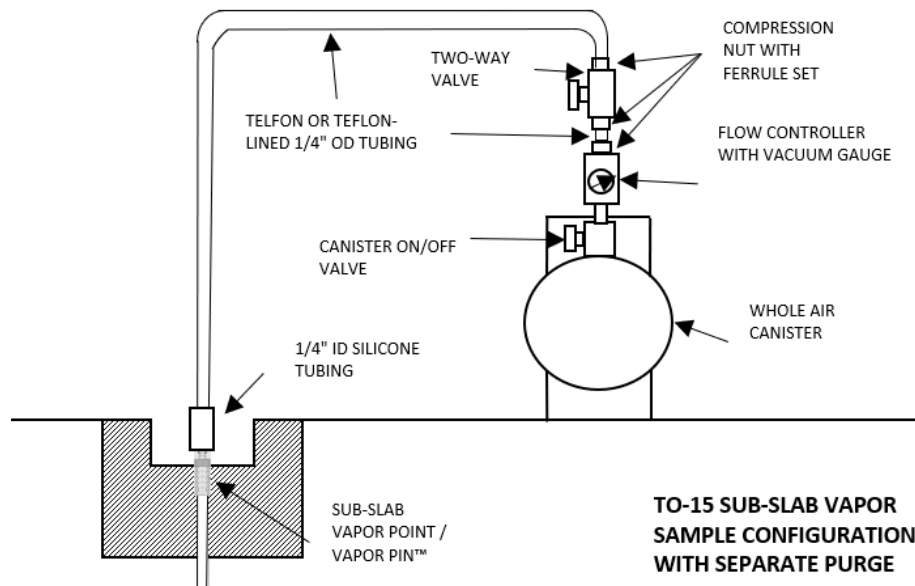
1. Pre-assemble the sample train for each sub-slab port to be sampled (Vapor Pin® with barb fitting). Cut an approximate 18-inch length and a 1-inch length of Teflon or Teflon-lined 1/4-inch OD tubing. Cut a 2-inch piece of 1/4-inch ID silicone tubing. Connect the silicone tubing to one end of the 18-inch length of tubing. Connect a stainless-steel two-way valve with compression fittings to the other side of the Teflon tubing. Connect the 1-inch piece of Teflon tubing to the other side of the two-way valve. Connect a compression nut and ferrule set to the other end of the 1-inch piece of Teflon tubing for the connection to the canister. This sample train is found within the well vault at permanent soil vapor probes.
2. Assemble the sample train by removing the cap from the canister and connecting the flow controller with in-line particulate filter and vacuum gauge. The flow controller attaches directly to the canister and the pre-set rate dictates the sample duration. The laboratory may have connected the canister and flow controller prior to shipping.

3. At sub-slab ports, connect the silicone end of the sample train to the barb fitting of the Vapor Pin®. For both sub-slab ports and soil vapor wells, connect a three-way valve to a syringe using the Lok-Lur tip. Connect one end of the sample train to the three-way valve with a 1-inch piece of silicone tubing and the last end to a Tedlar bag with a 1-inch piece of silicone tubing. A personal air pump capable of 200 milliliters per minute (mL/min) can be substituted for the syringe. See Section 8.3 for purging details.

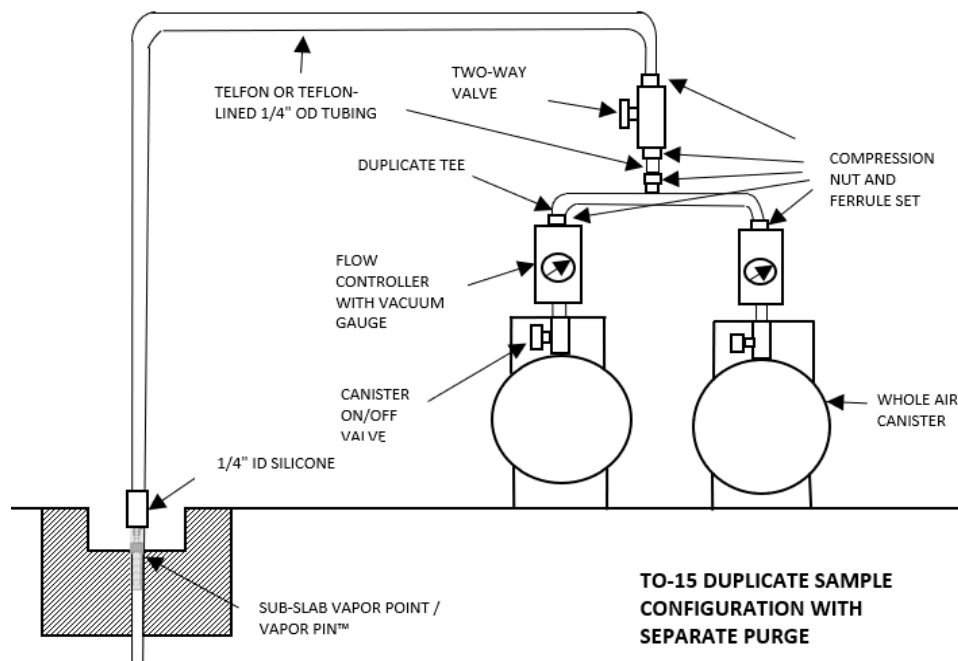
A schematic of the suggested second type of sample train setup is illustrated below:



4. Once purging is complete, close the two-way valve, then disconnect the silicon tubing next to the two-way compression valve from the sample assembly. Connect the canister and flow controller using the installed compression nut.



5. When collecting duplicate or other quality assurance/quality control (QA/QC) samples as required by applicable regulations and guidance, couple two canisters using stainless-steel duplicate sample T-fitting supplied by the laboratory. Attach flow controller with in-line particulate filter and vacuum gauge to duplicate sample tee-fitting as illustrated below.



8.2 Sample Documentation

Record weather information at the beginning of each day of the sampling event at a minimum. If appropriate record weather information during the middle and end of each day of the sampling event. Use the weather function in the FieldNow® Standard – Vapor Intrusion Sampling Log application. If using a field sampling form contact the local airport or other suitable information source (e.g., weatherunderground.com, or NOAA) to obtain the following information:

- Wind speed and direction;
- Ambient temperature;
- Barometric pressure; and
- Relative humidity.

Record information on sample label tags on canister, on field sample log or in the FieldNow® Standard – Vapor Intrusion Sampling Log application, and COC. This includes:

- Canister number;
- Flow controller number;
- Sample ID;
- Start and end times; and
- Canister initial and final vacuum.

Take a photograph of the canister, completed canister tag, and surrounding area.

8.3 Sample Collection

At sub-slab ports, connect the sample train to the sub-slab port barb fitting with 1/4-inch ID silicone tubing. The two-way compression valve should be closed. Soil vapor probes are typically completed with all sample train components permanently connected and contained within the manway vault.

Sample collection consists of pre-sampling (i.e., shut-in test, 3-volume purge, and leak check) as well as sampling activities, discussed below. The procedures listed below for the 3-volume purge may also be used to conduct the post-installation purge of the soil vapor sampling point, which should be conducted within 24 to 48 hours following soil vapor sampling point installation, but includes additional calculated volume.

8.3.1 Shut-in Test and 3-Volume Purge

Conduct a shut-in test, 3-volume purge, and leak check prior to sampling. The shut-in test is conducted first, and then the 3-volume purge is completed concurrently with the leak check. The pre-sampling purge volume conducted immediately prior to sampling includes the internal volume of the tubing and sub-slab port or probe tip. The post-installation purge volume conducted immediately after installation includes the following:

- The internal volume of the tubing and probe;
- The void space of the sand pack around the probe; and
- The void space of the dry bentonite in the annular space.

Sample Train Purge Isolation Setup with Syringe

1. Set-up the helium leak test shroud or water dam test in accordance with applicable TGI, when necessary. Note, the water dam test can only be performed on sub-slab ports not soil vapor probes.
2. Perform a shut-in test or leak-down-test with the two-way compression valve closed to the sample port. Open the three-way valve to the syringe and slowly pull a vacuum at a rate no faster than 1 to 2 mL/second (approximately 60 to 120 mL/min). Quickly close the three-way valve and record the pressure indicated on the gauge.
3. Open the canister valve but do not open the two-way valve on the sample assembly.
4. Record the vacuum indicated on the gauge connected to the canister. Observe the vacuum gauge for at least two minutes and no longer than 10 minutes. If there are no leaks in the system, this vacuum should be held exactly (estimate the decimal place – i.e., 29.1 inches of Hg). Tap the gauge and wait to see if pressure drops on the gauge.
5. If vacuum holds, document values and proceed with purge by opening the two-way sample assembly valve. If not, attempt to rectify the situation by tightening fittings and restart shut-in test.
6. Purge approximately three volumes of air from the sample port and tubing using the syringe or personal air pump capable of rates of <200 mL/min into the Tedlar® bag using a flow rate <200 mL/min. Purge rate should not exceed 200 mL/min or 1 to 1.5 mL per second when using a syringe. Purge volume is calculated using the equation of $V = \pi^2 h$:

$$\text{Purge volume} = 3 \times \pi \times \text{inner radius of tubing}^2 \times \text{length of tubing}$$

7. Purged air will be collected into a Tedlar® bag so VOCs are not released into interior spaces or the sampler's breathing zone. Perform quality control method tests such as helium leak testing, water dam testing, and/or field screening for VOCs concurrently per the project-specific work plan.
8. Close the three-way valve to the syringe to isolate this leg of the sample train.

Sample Train Separate Purge/Sample Setup with Canister

1. Connect the three-way valve, syringe, and Tedlar bag to the sample train. Open the two-way compression valve and purge approximately three volumes of air from the sample port and tubing using the syringe or personal air pump capable of <200 mL/min into the Tedlar® bag using a flow rate <200 mL/min. Purge rate should not exceed 200 mL/min or 1 to 1.5 mL per second when using a syringe. Purge volume is calculated using the equation above.
2. Close the two-way compression valve and disconnect the syringe purge setup.
3. Connect the canister and flow controller to the sample train. Perform a shut-in test or leak-down-test by opening the canister valve but do not open the two-way valve on the sample assembly.
4. Record the vacuum indicated on the gauge connected to the canister. Observe the vacuum gauge for at least two minutes. If there are no leaks in the system, this vacuum should be held exactly (estimate the decimal place – i.e., 29.5 inches of Hg).
5. If vacuum holds, document values and proceed with sampling by opening the two-way sample assembly valve. If not, attempt to rectify the situation by tightening fittings and restart shut-in test.

8.3.2 Sampling

1. Open the canister valve to initiate sample collection. Record the start time and the initial canister vacuum on the sample log or FieldNow® application. The preference is a starting vacuum of -28 inches of Hg or more, but some canisters may be used in certain jurisdictions with lower starting vacuum. However, if the initial vacuum registers less than -25 inches of Hg (-27 inches of Hg in Michigan), then the canister is not appropriate for use and another canister should be used. The initial vacuum required varies by jurisdiction; confirm with the project regulatory authority.
2. Check the canister approximately halfway through the sample duration and note progress on sample logs or FieldNow® application. If the vacuum decreases greater than a rate of 200 mL/min or the vacuum stops decreasing during sample collection contact the project team.

8.3.3 Termination of Sample Collection

1. Sampling canisters should not be left unattended. For example, a 1-liter canister will typically take approximately 5 to 30 minutes, so even brief inattention or distraction can mistakenly lead to the canister reaching 0 inches of Hg or water in the tubing damaging the equipment.
2. Record the final vacuum on the sample collection log or FieldNow® Standard – Vapor Intrusion Sampling Log app. Stop collecting the sample by closing the canister valve then the sample train valve. The canister should have a minimum amount of vacuum (approximately 5 inches of Hg or slightly greater). Check with the project team on final pressure requirements as these vary by region.
3. Record the date and local time (24-hour basis) of valve closing on the canister tag, sample collection log or FieldNow® Standard – Vapor Intrusion Sampling Log application, and COC form.
4. Refill the Tedlar® bag with purged air with enough air to fill the bag via the purge to pump or syringe. Connect the Tedlar® bag to the PID and record stabilized VOC concentration on sample collection log. Disconnect the PID then connect the methane meter to the Tedlar® bag. Make sure to activate the pump on the methane meter, if not automatically started once turned on, and then allow time for vapor to flow through the meter to collect readings. Record stabilized methane concentration readings on sample collection log.
5. Disconnect sample tubing from the sample port and replace any coverings or abandon as appropriate to mitigate tripping hazards.
6. Remove the flow controller from the canister, re-install the brass plug on the canister fitting, and tighten with the appropriate wrench. If the canister and flow controller were shipped pre-assembled from the laboratory do not disassemble; simply re-install the brass plug on the flow controller fitting.
7. Verify the appropriate forms and sample labels are filled out appropriately as directed by the laboratory (e.g., affix card with a string).
8. Package the canister and flow controller per DOT regulations for return shipment to the laboratory. These regulations can be found at the [Transportation Safety Program's Team Site](#) on the Source. The canister does not require preservation with ice or refrigeration during shipment. Refer to TGI – Soil Gas Methane Monitoring for Shipping Determination of Soil Gas Samples if sampling in an area with unknown or known methane conditions. A shipping determination form is required for shipment of any type of samples prior to field mobilization.
9. Complete and verify the COC form and place the requisite copies in a shipping container. Close the shipping container and affix a custody seal to the container closure. Ship the container to the laboratory via overnight

carrier (e.g., Federal Express) or sign COC over to courier. Consult with the project team on appropriate shipping speeds and shipment insurance.

9 Waste Management

No specific waste management procedures are required.

10 Data Recording and Management

Digital data collection is the Arcadis standard using available FieldNow® applications that enable real-time, paperless data collection, entry, and automated reporting. Paper forms should only be used as backup to FieldNow® digital data collection and/or as necessary to collect data not captured by available FieldNow® applications. The Field Now® digital form applications follow a standardized approach, correlate to most TGIs and are available to all projects accessible with a PC or capable mobile device. Once the digital forms are saved within FieldNow®, the data is instantly available for review on a web interface. This facilitates review by project management team members and SMEs enabling error or anomalous data detection for correction while the staff are still in the field. Continual improvements of FieldNow® applications are ongoing, and revisions are made as necessary in response to feedback from users and subject matter experts.

11 Quality Assurance

Quality assurance and quality control (QA/QC) will be conducted following project requirements.

11.1 Duplicate Samples

Duplicate samples should be collected in the field as a quality assurance step per project requirements. Generally, one duplicate is taken per 10 or per 20 samples analyzed, but project specific requirements should take precedence. A duplicate tee is required when collecting soil vapor duplicate samples.

11.2 Equipment Blank

Equipment blank samples may be collected in the field as a quality assurance step in order to verify and evaluate the effectiveness of decontamination procedures for new, recycled, or reused materials (i.e., syringes, Swagelok® fittings, 1/4-inch tubing) per project requirements. Generally, one equipment blank sample is taken per 20 sample locations, but project specific requirements should take precedence. Equipment blank sampling steps detailed below:

1. Connect decontaminated reusable sampling supplies, in line with a clean, laboratory provided soil vapor manifold and 1-liter canister to a laboratory provided nitrogen-filled canister.
2. Conduct a shut-in test as described in section 8.3.1. Please note: a 3-volume purge and leak test are not necessary for the equipment blank.
3. Collect a sample (generally following the steps from sections 8.3.2 and 8.4.3 using the nitrogen

canister as the vapor source. Gas collection readings from a PID and methane meter are not necessary for the equipment blank.

12 References

- DiGiulio et. al. 2003. Draft Standard Operating Procedure (SOP) for Installation of Sub-Slab Vapor Probes and Sampling Using EPA TO-15 to Support Vapor Intrusion Investigations.
<http://www.cdphe.state.co.us/hm/indoorair.pdf>.
- DiGiulio et. al. 2006. Assessment of Vapor intrusion in Homes Near the Raymark Superfund Site Using Basement and Sub-Slab Air Samples. USEPA. EPA/600/R-05/147.
- USEPA. 1999a. Compendium Method TO-15. Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). Center for Environmental Research Information. Office of Research and Development. January.
- USEPA. 2015. Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air. OSWER Publication 9200.2-154. June.
- New York State Department of Health (NYSDOH). 2005. DRAFT "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" February 23, 2005.

Attachment G

PID Calibration Log

PID Calibration Log



Zero Gas Source:	_____	Instrument Type:	_____	PAGE ____ of ____
Lot Number/Expiration Date:	_____	Serial Number:	_____	
Calibration Gas Source:	_____	Instrument Type:	_____	
Lot Number/Expiration Date:	_____	Serial Number:	_____	
Concentration:	_____		_____	

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Appendix I

Quality Assurance Project Plan

NYSEG

Quality Assurance Project Plan

**Binghamton Court Street Former Manufactured
Gas Plant Site, Operable Unit No. 1 & No. 2
Broome County, Binghamton, New York
NYSDEC Site No. 7-04-031**

July 2026

Quality Assurance Project Plan

Binghamton Court Street Former Manufactured Gas Plant Site, Operable Unit No. 1 & No. 2

July 2026

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Attachment

A EQUIS™ Lab Standard Operating Procedure

Acronyms and Abbreviations

ASP	Analytical Services Protocol
Arcadis	Arcadis of New York, Inc.
BTEX	benzene, toluene, ethylbenzene, and xylenes
CFR	Code of Federal Regulations
COC	chain of custody
DQO	data quality objective
EDD	electronic data deliverable
FSP	Field Sampling Plan
GC/MS	gas chromatography/mass spectrometry
GIS	geographic information system
GPS	global positioning system
ID	identification
IDW	investigation-derived waste
LCS	laboratory control sample
MB	method blank
MDL	method detection limit
MGP	manufactured gas plant
MS	matrix spike
MSD	matrix spike duplicate
NAPL	non-aqueous phase liquid
NEIC	National Enforcement Investigations Center
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric & Gas Corporation
ORP	oxidation reduction potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAH	polynuclear aromatic hydrocarbon
PPE	personal protective equipment
QA	quality assurance

Quality Assurance Project Plan

QAC	quality assurance coordinator
QAM	quality assurance manager
QAPP	Quality Assurance Project Plan
QC	quality control
RL	reporting limit
RPD	relative percent difference
SDG	sample delivery group
SIM	selective ion monitoring
SMP	Site Management Plan
SOP	standard operating procedure
SVOC	semi-volatile organic compound
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1 Introduction

This Quality Assurance Project Plan (QAPP) was prepared to support the Site Management Plan (SMP) and provides guidance for data collection associated with the New York State Electric & Gas Corporation (NYSEG) Binghamton Court Street Former Manufactured Gas Plant (MGP) Site located in Binghamton, New York (the Site) located in Binghamton, New York. Site background information, including a summary of the remedial investigation results and the completed remedial actions, are included in the SMP.

1.1 Purpose

The QAPP, along with the Field Sampling Plan (FSP), are intended to guide all sampling, measurement, and other field and laboratory measurement activities conducted as part of the SMP and the Excavation Work Plan (EWP). This QAPP contains laboratory analysis procedures and quality control (QC) methods to be used to characterize environmental media as needed for future site monitoring. Laboratory analysis includes volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).

This QAPP is applicable to the SMP approved as of the date of this document. To the extent that other work plans are written and approved relevant to this QAPP, those activities will be incorporated by reference to the scope of the QAPP herein.

This QAPP was prepared in a manner consistent with the following documents, where applicable:

- United States Environmental Protection Agency (USEPA) guidance document entitled EPA Requirements for Quality Assurance Project Plans, EPA-QA/R-5 (USEPA, 2001) <http://epa.gov/quality/qs-docs/r5-final.pdf>
- USEPA Guidance for Quality Assurance Project Plans, EPA-QA/G-5 (USEPA, 2002b) <http://epa.gov/quality/qs-docs/g5-final.pdf>
- The National Enforcement Investigations Center (NEIC) Policies and Procedures Manual (USEPA 1991).

1.2 Report Organization

Information contained in this QAPP has been organized as presented in the following table.

Table 1.1 – QAPP Organization

Section	Content
Project Management	
1	Introduction
2	Project Organization
3	Quality Objectives and Criteria for Measurement Data
4	Special Training Requirements/Certification
5	Documentation and Records
Measurement/Data Acquisition	
6	Sampling Process Design
7	Sampling Method Requirements
8	Sample Handling and Custody Requirements
9	Analytical Method Requirements

Quality Assurance Project Plan

Section	Content
10	Quality Control Requirements
11	Instrument/Equipment Testing, Inspection and Maintenance Requirements
12	Instrument Calibration Frequency
13	Inspection/Acceptance Requirements for Supplies and Consumables
14	Data Management
Assessment/Oversight	
15	Assessment and Response Actions
16	Reports to Management
Data Validation and Usability	
17	Data Reduction and Review
18	Data Validation and Verification
19	Reconciliation with User Requirements
20	References

2 Project Organization

The activities to be completed under the SMP may require integration of personnel from the organizations identified below, collectively referred to as the “project team.” A description of the responsibilities of each member of the project team is presented below.

2.1 Overall Project Management

The QAPP will be executed by a project team assigned per the specific work plan. The project team will perform sampling activities and will evaluate data and prepare the deliverables as specified in the SMP. Project direction will be provided with lead regulatory oversight by the New York State Department of Environmental Conservation (NYSDEC). A list of key project management personnel is provided in Table 1.1 of the SMP.

2.2 Team Member Responsibilities

The responsibilities and duties of the various team members are summarized below by organization.

2.2.1 NYSEG

Project Manager

Responsibilities and duties include:

- Provide overall direction of site actions.
- Direct Consultant(s) and Contractors/Subcontractors.
- Review work products, including data, memoranda, letters, reports, and all other documents transmitted to the NYSDEC.

2.2.2 Environmental Consultant

Project Manager/Assistant Project Manager

Responsibilities and duties include:

- Manage and coordinate the project as defined in the SMP and any other related work plans with an emphasis on adhering to the objectives of the site activities.
- Review documents prepared by subcontractors.
- Verify that corrective actions are taken for deficiencies cited during any audits of site activities.

Task Managers

The sampling 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.

Quality Assurance Project Plan

- 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 quality assurance (QA)/QC of the relevant portions of the site activities.
- Review relevant field records and logs.
- Instruct personnel working on relevant site activities.
- 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 site activities.
- Maintain field and laboratory files of notebooks/logs, data reductions, and calculations. Transmit originals to the Project Manager.

Field Personnel

Responsibilities and duties include:

- Perform field procedures associated with the investigations as set forth in the specific work plan.
- Perform field analyses and collect QA samples.
- Calibrate, operate, and maintain field equipment.
- Reduce field data.
- Maintain sample custody.
- Prepare field records and logs.

Quality Assurance Coordinator (QAC)

Responsibilities and duties include:

- Review laboratory data packages
- Oversee and interface with the analytical laboratory.
- Coordinate field QA/QC procedures with Task Managers, concentrating on field analytical measurements and practices to meet data quality objectives (DQOs).
- Perform and review audit reports.
- Prepare interim QA/QC compliance reports.
- Prepare a QA/QC report in accordance with USEPA guidelines, including an evaluation of laboratory data and data usability reports.

2.2.3 Analytical Laboratories

General responsibilities and duties of the analytical laboratories include:

- Perform sample analyses and associated laboratory QA/QC procedures.
- Supply sample bottles and coolers.
- Maintain laboratory custody of sample.
- Strictly adhere to all protocols in the QAPP.

Laboratory Project Manager

Responsibilities and duties include:

- Serve as primary communication link between environmental consultant and laboratory technical staff.
- Monitor workloads and maintain availability of resources.
- Oversee preparation of analytical reports.
- Supervise in-house chain-of-custody (COC).

Quality Assurance Manager (QAM)

Responsibilities and duties include:

- Supervise personnel reviewing and inspecting all project-related laboratory activities.
- Conduct audits of all laboratory activities.

2.2.4 Regulatory Agencies

Project Manager

Responsibilities and duties include:

- Provide review and approval of the QAPP, work plans, supporting documents, and future deliverables.
- Monitor progress of site activities.

3 Quality Objectives for Criteria for Measurement Data

The DQO process, as described in Guidance for QAPPs (USEPA, 2002b), is intended to provide a “logical framework” for planning field investigations. The following section addresses, in turn, each of the seven sequential steps in the USEPA’s QAPP DQO process.

Step 1: Problem Statement

The site-specific constituent list will be evaluated during the time of sampling. Existing sampling data from past investigations will be incorporated and utilized to determine the site-specific constituent list. Past investigations are summarized in the SMP.

Step 2: Goal Identification

The goal of the sampling program will depend on the specific sampling needs. In general, the goal will be to protect human health and the environment, and to manage remaining site impacts in accordance with applicable rules and regulations. Analytical results of constituents will be compared to applicable NYSDEC standards/guidance values and any other applicable regulations. The analyzed environmental media will then be managed and handled, accordingly. Based on analytical results, additional characterization or remedial measure may be required.

Step 3: Identifying Decision Inputs

Decision inputs incorporate both the concentration and distribution of constituents in site media. A fundamental basis for decision making is that a sufficient number of data points of acceptable quality must be available to support decisions. Thus, the necessary inputs for the decision are: 1) the proportion of non-rejected (usable) data points; and 2) the quantity of data needed to evaluate whether there is unacceptable risk to human health and the environment at and surrounding the site.

The data will be evaluated for completeness, general conformance with requirements of this QAPP, and consistency among data sets and with historical data, as appropriate.

Step 4: Defining the Study Boundaries

OU-1 is located in Binghamton, New York. The OU-1 property, currently owned and operated by NYSEG, consists of an approximately 4.3-acre area that is rectangular in shape. It is bounded to the north by the Norfolk Southern Railroad, to the south by the Susquehanna River, to the east by a private property (295 Court Street, and to the west Brandywine Avenue. The boundaries of the NYSEG-owned property are more fully described in the Environmental Easement included as Appendix A of the SMP.

Step 5: Developing a Decision Rule

The decision on whether data can be used will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions will be noted. The media-specific sampling plans have been devised so that the loss of any single data point will not hinder description of the distribution of constituents or the development of a remediation plan. Given this, a reasonable decision rule would be that 90 percent of the data points not be rejected or deemed unusable.

The usable data will be evaluated versus the applicable NYSDEC standards and guidance values. The required reporting limits are documented in tables outlined in Tables 1 through 3 with the intent that the lowest achievable reporting and method detection limits will be reported by the laboratory and where possible at or below the screening criteria. Applicable actions would be evaluated, if needed, based on the results of the exposure evaluation.

Step 6: Limits on Decision Errors

Specifications for this step call for: 1) giving forethought to corrective actions to improve data usability; and 2) understanding the representative nature of the sampling design. This QAPP has been designed to meet both specifications for this step. The sampling and analysis programs have been developed based on a review of previous site data and knowledge of present site conditions. The representative nature of the sampling design has been facilitated by discussions among professionals familiar with the site and the appropriate government agencies.

Step 7: Design Optimization

The overall QA objective is to develop and implement procedures for field sampling; COC, laboratory analysis, and reporting that will provide results to support the evaluation of the site data consistent with SMP requirements. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, data reporting, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP.

A DQO summary for anticipated sampling efforts is presented in the following subsections. The summary consists of stated DQOs relative to data uses, data types, data quantity, sampling and analytical methods, and data measurement performance criteria. Field sampling procedures are detailed in the FSP, included as Appendix H to the SMP.

3.1 Data Categories

Three data categories have been defined to address various analytical data uses and the associated QA/QC effort and methods required to achieve the desired levels of quality. These categories are:

Screening Data: Screening data affords a rapid preliminary assessment of site characteristics or conditions. These data collection activities involve rapid, non-rigorous methods of analysis and QA. Screening data quality objectives are generally applied to physical and/or chemical properties of samples, preliminary ecological and/or human health and safety indicators, and visual or other qualitative observations used to make rapid assessment decisions for deployment or additional assessment.

Screening Data with Definitive Confirmation: Screening data provide rapid identification and quantitation; however, because screening generally involves the use of less precise methods of analysis with less rigorous sample preparation, the quantitation may be relatively imprecise. Generally, at least 10% of the data are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. This objective can also be used to verify less rigorous laboratory-based methods. This objective of data quality is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings.

Definitive Data: Definitive data are generated using rigorous analytical methods, such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods

produce tangible raw data (e.g., chromatograms, spectra, digital values). Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For data to be definitive, either analytical or total measurement error must be determined. Definitive data are used for formal site characterization, environmental monitoring, confirmation of field data, to support decision-making, and for risk assessments.

It is anticipated that both screening and definitive data will be collected during the assessment. Groundwater, indoor air, ambient air, soil vapor, and sub-slab vapor samples may be collected for laboratory analysis or for observational review to refine and optimize the sampling and assessment approach. For the purposes of the assessment, one level of data reporting have been defined, as follows:

NYSDEC Analytical Services Protocol (ASP) Category B: Category B reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols. Based on the intended data use, full documentation is required. Category B reporting will be required for groundwater samples.

Category B laboratory data reports include the following items:

- Sample delivery group narrative.
- Sample information sheets.
- NYSDEC data package summary forms.
- COC forms.
- Test analysis results.
- Calibration standards.
- Surrogate recoveries.
- Method blank (MB) results.
- Spike recoveries (matrix spike/matrix spike duplicate (MS/MSD), laboratory control sample (LCS).
- Confirmation samples.
- Internal standard area and retention time summary.
- Chromatograms.
- Raw data files.
- Other method-specific information.

Analytical results will be reported by the laboratory in the electronic data deliverable (EDD) formatted in either an ASCII comma-separated value format or format outlined in EQulS™ Lab SOP FSMP Rev. 9 (Attachment A) and in a PDF or electronic spreadsheet format, within 15 working days from date of receipt. The Level 2 data packages from the laboratory will be due within 15 working days from date of receipt.

3.2 Field Investigations

To obtain information necessary to meet the objectives stated above, additional field sampling may be conducted to support the DQOs. Further details of anticipated field sampling will be presented in future sampling plans. For purposes of the SMP, anticipated sampling details are provided in the EWP, FSP and this QAPP.

3.2.1 Groundwater Monitoring Wells

Monitoring well samples will be analyzed for the following:

- BTEX using USEPA SW-846 Method 8260
- PAHs using USEPA SW-846 Method 8270

3.2.2 Ambient Air/Indoor Air and Soil Vapor/Sub-Slab Vapor

Ambient air, indoor air, soil vapor, and sub-slab vapor samples will be analyzed for VOCs and naphthalene using USEPA Compendium Method TO-15.

Data Uses

The data generated as part of the field sampling will be used as specified in any future work plan. The EWP provides guidance for anticipated data usages for the future of the site.

Data Quantity

The field activities will involve collecting environmental samples and associated quality control samples. The anticipated number of samples to be collected, the number of QC samples, and the constituents to be analyzed are presented in Table 2 of this QAPP.

Sampling and Analytical Methods

The sampling procedures are provided in the FSP. The laboratory analytical methods for the chemical constituents are listed above. ASP Category B will be used for data reporting (as defined previously).

Measurement Performance Criteria

Table 4 presents precision and accuracy QC limits for chemical constituents used during data review to assess analytical performance. Data representativeness is addressed by the sample quantities and locations identified in the sampling plans. Data comparability will be achieved by using standard USEPA-approved methods. Data completeness will be assessed at the conclusion of the analytical activities.

4 Special Training Requirements/Certification

In compliance with the Occupational Safety and Health Administration's (OSHA) final rule, "Hazardous Waste: Operations and Emergency Response," 29 Code of Federal Regulations (CFR) 1910.120(e)", all personnel performing sampling activities at the site, except as noted below, will have completed the requirements for OSHA 40-Hour Hazardous Waste Operations and Emergency Response initial training and current 8-hour refresher training. Persons in field supervisory positions will have also completed the additional OSHA 8 Hour Supervisory Training.

5 Documentation and Records

Samples will be collected as described in the FSP. Detailed descriptions of the documentation and reporting requirements are presented below.

5.1 Sample Designation System

Samples will be identified with a unique designation system that will facilitate sample tracking. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events and conditions. An alpha-numeric system is considered appropriate and will be used by field personnel to assign each sample with a unique sample identification number. The sample identification number will begin with a two- or three-letter prefix indicating the sample type and two digits indicating the sequential sample number collected from the location.

The sample types (if applicable) will be designated using the following codes:

- Groundwater Sample – “GW” or “MW”
- Ambient Air – “AA”
- Indoor Air – “IA”
- Soil Vapor – “SG”
- Sub-Slab Vapor – “SSV”
- Trip Blank Sample – “TB”
- Field Duplicate Sample – “DUP”
- Equipment Blank Sample – “EB”
- Matrix Spike and Matrix Spike Duplicate – “MS” and MSD”

The location code will follow the sample type code. The sample code will also be a six-digit number indicating the month, day and year the sample was obtained. For example, a groundwater sample collected from MW-10 on March 11, 2020 will be designated MW-10(200311).

QA/QC samples will be designated using the sample type code followed by the six-digit sample collection date. For example, a field blank collected on March 11, 2020 during groundwater samples collection would be designated GW-FB1-200311. The locations of field duplicates must be recorded in the field log

5.2 Field Documentation

Field personnel will provide comprehensive documentation covering various aspects of field sampling, field analysis, and sample COC. This documentation consists of a record that allows reconstruction of field events to aid in the data review and interpretation process. Documents, records, and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the investigation include:

- Sampling Information – Detailed notes will be made as to the exact sampling location, physical observations, and weather conditions (as appropriate).

- Sample COC – COC forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. COC forms will be filled out at each sampling site, at a group of sampling sites, or at the end of each day of sampling by field personnel responsible for sample custody. In the event that samples are relinquished by the designated sampling person to other sampling or field personnel, the COC form will be signed and dated by the appropriate personnel to document the sample transfer. The original COC form will accompany the samples to the laboratory, and copies will be forwarded to the project files.

Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

- Field Equipment, Calibration, and Maintenance Logs – To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory calibrated.

5.3 Laboratory Documentation Files

Analytical laboratory documentation requirements are presented in the following subsections.

5.3.1 Laboratory Project Files

The laboratory will establish a file for pertinent data. The file will include correspondence, faxed information, phone logs, and COC forms. The laboratory will retain project files and data packages for a period not less than five years.

5.3.2 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and to document important aspects of the work, including the associated quality control checks. As such, logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, the instrument used, and the instrument conditions.

Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance with this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

5.3.3 Computer and Hard Copy Storage

All electronic files and deliverables will be retained by the laboratory for not less than five years; hard copy data packages (or electronic copies) will also be retained for not less than five years.

5.4 Data Reporting Requirements

Data will be reported both in the field and by the analytical laboratory, as described below.

5.4.1 Field Data Reporting

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the work plans and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and (as necessary) incorporated into the data evaluation process.

If applicable, field data forms and calculations will be processed and included in appendices to the appropriate reports (when generated). The original field logs, documents, and data reductions will be kept in the project file.

5.4.2 Laboratory Data Reporting

Analytical results will be provided by the laboratory in a digital format. The data packages will be examined to ensure that the correct analyses were performed for each sample submitted and that all of the analyses requested on the chain of custody form were performed. If discrepancies are noted, the QAC will be notified and will promptly follow up with the laboratory to resolve any issues.

If validation is required, each data package will be validated in accordance with the procedures presented in this QAPP. Data that do not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of that data may not necessarily be restricted.

Following completion of the data validation, the data review will be used to populate the appropriate database tables. This format specifies one data record for each constituent and each sample analyzed. Specific fields include:

- Sample identification number
- Date sampled
- Date analyzed
- Parameter name
- Analytical result
- Units
- Detection limit
- Qualifier(s)

The individual EDDs supplied by the laboratory in either an ASCII comma-separated value format or format outlined in Arcadis' EQuISTM Standard Operating Procedure (Attachment A), will be loaded into the appropriate database. Analytical data that cannot be provided by the laboratory in electronic format will be entered manually. Hand-keyed data will be reviewed for accuracy. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data were received.

The laboratory is responsible for preparing NYSDEC ASP Category B data packages (as defined previously) for all samples. Data reports for all parameters will include, at a minimum, the following items:

Narrative – Summary of activities that took place during the course of sample analysis, including the following information:

- Laboratory name and address
- Date of sample receipt
- Cross reference of laboratory identification number to sample identification
- Analytical methods used
- Deviations from specified protocol
- Corrective actions taken

Included with the narrative will be any sample handling documents, including field and internal COC forms, air bills, and shipping tags.

Analytical Results – These will be reported according to analysis type and include the following information, as applicable:

- Sample identification (ID)
- Laboratory ID
- Date of collection
- Date of receipt
- Date of extraction
- Date of analysis
- Dilution factor
- Detection limits

Sample results on the report forms will be corrected for dilutions. Unless otherwise specified, all results will be reported uncorrected for blank contamination.

5.5 Project File

Project documentation will be placed in project files according to Arcadis' protocol for document management. Project files typically consist of the following components:

1. Agreements/Proposals (filed chronologically)
2. Change Orders/Purchase Orders (filed chronologically)
3. Invoices (filed chronologically)
4. Project Management (filed by topic)

Quality Assurance Project Plan

5. Correspondence (filed chronologically)
6. Notes and Data (filed by topic)
7. Public Relations Information (filed by topic)
8. Regulatory Documents (filed chronologically)
9. Marketing Documents (filed chronologically)
10. Final Reports/Presentations (filed chronologically)
11. Draft Reports/Presentations (filed chronologically)
12. Documents Prepared by Others (filed chronologically)

Final reports (including QA Reports) are filed in a designated folder within the project file. Analytical laboratory documentation (when received) and field data will also be filed in a designated folder within the project file. Filed materials may be removed and signed out by authorized personnel on a temporary basis only.

6 Sampling Process Design

Information regarding the sampling design and rationale and associated sampling locations will be evaluated during a future sampling plan. Field investigation activities will be conducted according to the appropriate FSP and applicable NYSDEC regulations.

7 Sampling Method Requirements

Environmental samples will be collected as described in the FSP. The approximate sample quantities and field QC samples are shown in Table 5. The FSP also contains the procedures that will be followed to measure water and non-aqueous phase liquid (NAPL) fluid levels; perform field measurements; handle investigation derived waste (IDW); and handle, package, and ship collected samples.

8 Sample Handling and Custody Requirements

Sampling handling requirements for various project personnel are presented in the following subsections.

8.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods, and laboratory holding times for the samples are shown in Table 6.

The analytical laboratory will supply appropriate sample containers and preservatives, as necessary. The bottles will be purchased pre-cleaned to USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9240.05A requirements. The field personnel will be responsible for properly labeling containers and preserving samples (as appropriate). The field personnel will be responsible for properly labeling containers. Sample labeling procedures are discussed in Section 8.2.2.

8.2 Field Custody Procedures

The objective of field sample custody is to ensure that samples are not tampered or modified from the time of collection through transport and transfer to the analytical laboratory. Persons will have “custody of samples” when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field COC forms.

8.2.1 Field Logbooks

Field logbooks will provide the means of recording the data collecting activities that are performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel but will be stored in a secure location when not in use. Each logbook will be identified by the project specific document number. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned
- Logbook number
- Project name
- Project start date
- End date

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather conditions, names of all sampling team members present, and signature of the person making the entry will be provided. The names of visitors to the site and field sampling or investigation team personnel, as well as the purpose of their visit, will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. Entries will be made in ink, with no erasures. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station will be recorded. The number of the photographs taken, if any, will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures documented in the FSP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description

8.2.2 Sample Labelling

The following information is required on each sample label:

- Project name
- Date collected
- Time collected
- Location
- Sampler
- Analysis to be performed
- Preservative
- Sample identification number

8.2.3 Field COC Forms

Completed COC forms will be required for all samples to be analyzed. COC forms will be initiated by the sampling crew in the field. The COC forms will contain the unique sample identification number, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC will be made prior to shipment (or multiple copy forms will be used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., Federal Express), hand delivered to a mobile or permanent laboratory or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink. The labels will include the information listed in Section 8.2.2. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

Whenever samples are split with a government agency or other party, a separate COC will be prepared for those samples and marked to identify the party with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.

8.3 Management of Investigation-Derived Materials and Wastes

IDW will be generated during site activities, and may include decontamination liquids, personal protective equipment (PPE), sorbent materials, purge water, recovered NAPLs, and disposable sampling materials that may have come into contact with potentially impacted materials. The intent of managing IDW is to ensure that impacted materials and media are not allowed to contaminate non-impacted materials and media. An example of an impacting event would be the purging of impacted groundwater and discharging that water onto non-impacted soil and shallow groundwater. Those kinds of activities will not be allowed. Where necessary to promote the safe, efficient, and environmentally protective performance of work, management of investigation-derived materials and wastes will be performed consistent with the USEPA guidance Guide to Management of Investigation – Derived Wastes, 9345.3-03FS (USEPA 1992). Disposable equipment (including PPE) will be containerized, appropriately labeled during the sampling events, and disposed of accordingly. All purged groundwater and water generated during equipment decontamination will be containerized, temporarily staged onsite in 55-gallon drums or portable tanks and disposed of appropriately based on analytical results. Equipment will be decontaminated, as appropriate.

8.4 Packing, Handling, and Shipping Requirements

Sample packaging and shipment procedures are designed so that the samples will arrive at the laboratory, with the COC, intact.

Samples will be packaged for shipment as outlined below:

- Securely affix the sample label to the container with clear packing tape.
- Check the cap on the sample container to confirm that it is properly sealed.
- Wrap the sample container cap with clear packing tape to prevent the label from becoming loose.
- Complete the COC form with the required sampling information and confirm that the recorded information matches the sample labels. NOTE: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the COC prior to this transfer. The appropriate personnel will sign and date the COC form to document the sample custody transfer.
- Wrap glass sample containers in bubble wrap or other cushioning material.
- Place 1 to 2 inches of cushioning material at the bottom of the cooler.
- Place the sealed sample containers into the cooler.
- Place ice in plastic bags, seal the bags, and place the bags loosely in the cooler.
- Fill the remaining space in the cooler with cushioning material.
- Place COC forms in a plastic bag and seal. Tape the forms to the inside of the cooler lid.
- Close the lid of the cooler and secure with duct tape.
- Wrap strapping tape (or equivalent) around both ends of the cooler at least twice.
- Mark the cooler on the outside with the shipping address and return address, affix “Fragile” labels, and draw (or affix) arrows indicating “this side up.” Cover the labels with clear plastic tape. If the samples are being delivered directly to the laboratory or will be picked up by the lab’s courier service, this step is eliminated.

- Place a signed custody seal over the sample cooler lid.

Samples will be packaged by the field personnel and transported as low-concentration environmental samples. The samples will be hand delivered or delivered by an express carrier within 48 hours of the time of collection. In some cases, the analytical method may require analysis within a shorter holding time, and arrangements will need to be made to accommodate the laboratory requirements. Shipments will be accompanied by the COC form identifying the contents. The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading will be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the COC form as long as the forms are sealed inside the sample cooler, and the custody seals remain intact.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage.

8.5 Laboratory Custody Procedures

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field COC form will accompany all samples requiring laboratory analysis. The laboratory will use COC guidelines described in the USEPA guidance documents. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for documenting and maintaining sample integrity.

8.5.1 Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will verify the integrity of the cooler seal, open the cooler, and compare the contents against the field COC. If a sample container is missing, a sample container is received broken, the sample is in an inappropriate container, or the sample has not been preserved by appropriate means, the Project Manager and/or QAC will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling the sample bottle with the laboratory identification number, and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file.

8.5.2 Sample Analysis

Analysis of an acceptable sample will be initiated by a work sheet that will contain pertinent information for analysis. The routing sheet will be forwarded to the analyst, and the sample will be moved into an appropriate storage location to await analysis. The document control officer will file COC forms in the project file.

Samples will be organized into sample delivery groups (SDGs) by the laboratory. An SDG may contain up to 20 field samples (field duplicates and trip blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG will be received by the laboratory over a maximum of seven calendar days and must be processed through the laboratory (preparation, analysis, and reporting) as a group. If reanalysis

of a sample is required it may be re-run separately from the original SDG; however, the resulting data will be reported with the original SDG.

Every SDG must include a minimum of one MB and one MS/MSD pair; each SDG will, therefore, be self-contained for all of the required quality control samples. Project samples to be used for MS/MSDs will be noted on the COC.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded in a laboratory notebook by the analyst. These notes will be dated and identify the analyst, the instrument used, and the instrument conditions.

8.5.3 Sample Storage Following Analysis

Samples will be maintained by the laboratory for at least one month after the final report is delivered. The laboratory will be responsible for the eventual and appropriate disposal of the samples. The analytical laboratory will inform the environmental consultant before any samples are disposed. Unused portions of the samples, sample extracts, and associated wastes will be disposed of by the laboratory in accordance with applicable rules and regulations, as specified in their SOP for waste disposal.

9 Analytical Method Requirements

Analytical method requirements are presented in the following subsections.

9.1 Field Analytical Procedures

Specific field measurement protocols are provided in the FSP.

9.2 Laboratory Parameters and Methods

Laboratory analytical requirements presented in the subsections below include a general summary of requirements, specifics related to each sample medium that may be analyzed, and details of the methods to be used for this project. SW-846 methods, USEPA Methods for the Chemical Analysis of Water and Wastes and Standard Methods for Water and Wastewater with NYSDEC, ASP, 2005 Revision, QA/QC and reporting deliverables requirements will be used for analytes.

9.2.1 Groundwater

Analyses in this category will relate to groundwater samples. Analyses will be performed following the methods and units listed in Tables 1. Analyses will be performed following the quality control limits listed in Table 4 and quality control frequencies listed in Table 5.

The primary sources to describe the analytical methods to be used during the investigation are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition, and USEPA Methods for Chemical Analysis of Water and Waste, QA/QC, and reporting deliverables requirements.

9.2.2 Air and Vapor

Analysis in this category will be related to indoor air, ambient air, soil vapor, and sub-slab vapor samples. Analysis will be performed following the methods listed in Table 2 for indoor/ambient air and Table 3 for soil/sub-slab vapor. Quality control frequencies are listed in Table 4. Analysis will be performed following the quality control limits listed in Table 5. Results will be reported in units presented in Table 2 and Table 3.

The primary source to describe analytical methods to be used during the investigation are provided in USEPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (USEPA, 1999a) and New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor in the State of New York (NYSDOH, 2006).

10 Quality Control Requirements

The following subsections present a summary of the project quality control requirements.

10.1 Selection of Measurement Parameters, Laboratory Methods, and Field-Testing Methods

Laboratory analyses of the matrices will be performed as described in Subsection 9.2 of this QAPP. The analytical parameters selected for each media are described in Tables 1 through 3. Table 5 lists the required field quality control sample frequencies. Table 6 presents the preservation and hold time for the analytical methods.

All applicable field parameter measurement procedures are described in the FSP.

10.2 Quality Assurance Objectives and Criteria

The overall quality assurance objective for this assessment is to develop and implement procedures for sampling, COC, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action such that valid data will be generated for site assessment purposes. These procedures are presented or referenced in subsequent sections of the QAPP.

Quality assurance objectives are generally defined in terms of the following parameters:

- Representativeness
- Comparability
- Completeness
- Precision
- Accuracy
- Sensitivity

Each parameter is defined below. Specific objectives for this assessment are set forth in other sections of this QAPP as referenced below.

10.2.1 Representativeness

Representativeness is the degree to which sample data accurately and precisely represent site conditions and is dependent on sampling and analytical variability and the variability (or homogeneity) of the site itself. The site assessment has been designed to assess the presence of the chemical constituents and supplemental parameters at the time of sampling and throughout the study area. The sampling plans and this QAPP present field sampling methodologies and laboratory analytical methodologies. The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.

10.2.2 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between phases of the current assessment, and to the extent possible, between new and existing data will be maintained through consistent use of the sampling and analytical methodologies set forth in the QAPP and the sampling plans through stringent application of established QA/QC procedures and through utilization of appropriately trained personnel.

10.2.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the total amount that was obtained. This will be determined upon final assessment of the analytical results.

10.2.4 Precision

Precision is a measure of the reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the site assessment. To maximize precision, sampling and analytical procedures will be strictly followed; work will adhere to established protocols presented in the QAPP and sampling plans. Checks for analytical precision will include the analysis of matrix spike/matrix spike duplicates pairs, laboratory duplicates, and field duplicates. Field measurement precision will be monitored by obtaining duplicate field measurements.

10.2.5 Accuracy

Accuracy is a measure of how close a measured result is to the true value. Recovery of reference standards, matrix spikes, laboratory control standards, and surrogate standards will be used to assess the accuracy of the analytical data.

10.2.6 Sensitivity

Sensitivity is defined as the ability of the method or instrument to detect the contaminant of concern and other target compounds at the level of interest. Method detection limit (MDL) is defined as the minimum concentration of a substance that can be identified, measured, and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from repeated analysis of a sample in a given matrix containing the analyte. MDLs have been determined as required in Title 40 CFR Part 136B. The reporting limit (RL) is greater than or equal to the lowest standard used to establish the calibration curve. The RLs for this investigation are generally at least 3 times greater than the MDL. Results greater than the MDL and less than the RL will be qualified estimated (J) by the laboratory. Non-detected results will be reported at the RL.

10.3 Field Quality Control Checks

Field quality control requirements are presented in the following subsections.

10.3.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for all field measurements. A duplicate measurement will involve obtaining measurements a second time at the same sampling location.

10.3.2 Sample Containers

Certified, clean sample containers in accordance with Exhibit I of the NYSDEC ASP Revision 2005 (Eagle Picher pre-cleaned containers or equivalent) will be supplied by the laboratory.

10.3.3 Field Duplicates

Field duplicates will be collected to verify the reproducibility of the sampling methods. In general, field duplicates will be analyzed at a 5 percent frequency (every 20 samples) for the chemical constituents. For groundwater, one well will have a field duplicate collected per sampling event. Table 5 provides an estimated number of field duplicates to be prepared for each applicable parameter and matrix.

10.3.4 Trip Blanks

Trip blanks will be used to assess whether samples have been exposed to non-site-related VOCs during storage and transport. Trip blanks will be analyzed at a frequency of once per day, per cooler containing samples to be analyzed for VOCs. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory), which remains unopened with field samples throughout the sampling event. Table 5 provides an estimated number of trip blanks collected for each matrix and parameter during the investigation activities.

10.4 Analytical Laboratory Quality Control Checks

Internal laboratory QC checks will be used to monitor data integrity. These checks will include method blanks, laboratory control samples, matrix spike/matrix spike duplicates, laboratory duplicates, internal standards, surrogate samples and calibration standards. Project quality control limits are identified in Table 4. Laboratory control charts will be used to determine long-term instrument trends.

10.4.1 Method Blanks

Sources of contamination in the analytical process, whether specific analyses or interferences, must be identified, isolated, and corrected. The method blank is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank be initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. As such, the method blank would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources that could affect sample analysis. One method blank will be analyzed with each analytical series associated with no more than 20 samples.

10.4.2 Matrix Spike/Matrix Spike Duplicates

MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices and will be site-specific. MS/MSD pairs will be analyzed at a 5 percent frequency (every 20 samples).

When MS recoveries are outside quality control limits, associated control sample and surrogate spike recoveries will be evaluated, as applicable, to attempt to verify the reason for the deviation and determine the effect on the reported sample results. Table 5 presents an estimated number of MS and MSD analyses for each applicable parameter.

10.4.3 Laboratory Control Samples

LCS are standards of known concentration and are independent in origin from the calibration standards. The intent of LCS analysis is to provide insight into the analytical proficiency within an analytical series. This includes preparation of calibration standards, validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

10.4.4 Surrogate Spikes

Surrogates are compounds that are unlikely to occur under natural conditions but that have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by gas chromatography/mass spectrometry (GC/MS) and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to sample matrix.

If surrogate spike recoveries exceed specified QC limits, the analytical results must be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data may not be verifiable, and reanalysis of the samples with additional control may be necessary.

Surrogate spike compounds will be selected utilizing the guidance provided in the analytical methods.

10.4.5 Laboratory Duplicates

Laboratory duplicates will be analyzed to assess laboratory precision. Laboratory duplicates are defined as a separate aliquot of an individual sample that is analyzed as a separate sample. Table 5 presents an estimated number of laboratory duplicates for each applicable parameter.

10.4.6 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding instrument stability. A calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours or more frequently, as specified in the applicable analytical method. If results of the calibration check standard exceed specified tolerances, samples analyzed since the last acceptable calibration check standard will be re-analyzed.

Laboratory instrument calibration standards will be selected utilizing the guidance provided in the analytical methods as summarized in Section 3.2.

10.4.7 Internal Standards

Internal standard areas and retention times will be monitored for organic analyses performed by GC/MS methods. Method-specified internal standard compounds will be spiked into all field samples, calibration standards, and quality control samples after preparation and prior to analysis. If internal standard areas in one or more samples exceed the specified tolerances, the cause will be investigated, the instrument will be recalibrated if necessary, and all affected samples may be re-analyzed.

The acceptability of internal standard performance will be determined using the guidance provided within the analytical methods.

10.4.8 Reference Standards/Control Samples

Reference standards are standards of known concentration and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes the preparation of calibration standards, the validity of calibration, sample preparation, instrument set up, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

10.5 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system, including sampling, handling, shipping, storage, preparation and analysis.

Laboratory data precision for analyses will be monitored through the use of matrix spike duplicates, laboratory duplicates and field duplicates, as identified in Table 5.

The precision of data will be measured by calculation of the relative percent difference (RPD) by the following equation:

$$RPD = \frac{abs(D1 - D2)}{\frac{(D1 + D2)}{2}} \times 100$$

Where:

- abs = absolute value
- RPD = relative percent difference
- D1 = sample value
- D2 = duplicate sample value

Precision objectives for MSD and laboratory duplicate analyses are identified in the NYSDEC's Analytical Services Protocol (NYSDEC, 2005) and in Table 4.

10.6 Data Accuracy Assessment Procedures

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed by using MSs, surrogate spikes, internal standards and reference standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated in terms of percent recovery as follows:

$$\% \text{ Recovery} = \frac{A - X}{B} \times 100$$

Where:

A = value measured in spiked sample or standard

X = value measured in original sample

B = amount added to sample or true value of the standard

This formula is derived under the assumption of constant accuracy between the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for MS recoveries and surrogate recovery objectives are identified in NYSDEC's Analytical Services Protocol (NYSDEC, 2005) and in Table 4.

10.7 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.

$$\text{Completeness} = \frac{\text{usable data points obtained}}{\text{total data points planned}} \times 100$$

As a general guideline, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgment to determine data usability for the intended purposes.

11 Instrument/Equipment Testing, Inspection and Maintenance Requirements

Testing and maintenance schedules have been developed for both field and laboratory instruments. This section summarizes the testing and maintenance activities to be performed.

11.1 Field Instruments and Equipment

Prior to field sampling, each piece of field equipment will be calibrated (if necessary) and inspected to confirm that it is operational. If the equipment is not operational, it will be serviced prior to use. All meters that require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, the appropriate Field Activities Task Manager or field personnel will be responsible for following the maintenance schedule and arranging for timely service. Field instruments will be maintained according to the manufacturers' instructions.

Field instrumentation to be used in this study includes meters to measure pH, oxidation reduction potential (ORP), turbidity, temperature, conductivity, dissolved oxygen, and groundwater levels. Field equipment also includes sampling devices for groundwater. A logbook will be kept for each field instrument. Each logbook contains records of operation, maintenance, calibration, and any problems and repairs. The Task Manager will review calibration and maintenance logs.

All measuring and test equipment to be used in support of the field sampling activities that directly affect the quality of the analytical data will be subject to preventive maintenance measures that minimize equipment downtime. Equipment will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual to confirm that all maintenance requirements are being observed. Field notes from previous sampling events will be reviewed to verify that any prior equipment problems are not overlooked and that any necessary repairs to equipment have been carried out. However, in most cases, the Environmental Consultant will use field meters maintained and calibrated by national, reputable environmental rental equipment companies; calibration and maintenance records are provided with these pieces of rental equipment and will be maintained as part of the project file.

Field equipment returned from a site will be inspected to confirm that it is in working order. The inspection will be recorded in the logbook or field notebooks, as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook. Non-operational field equipment will either be repaired or replaced. Appropriate spare parts for field equipment/meters will be available from the rental companies or manufacturers. Consultant-/subcontractor-owned or leased equipment will be maintained in accordance with the manufacturer's instructions.

11.2 Laboratory Instruments and Equipment

Laboratory instrument and equipment documentation procedures include details of any observed problems, corrective measure(s), routine maintenance and instrument repair (including information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer.

Maintenance schedules for laboratory equipment adhere to each manufacturer's recommendations. Records reflect the complete history of each instrument and specify the time frame for future maintenance. Major repairs or maintenance procedures are performed through service contracts with the manufacturer or qualified contractors. Paperwork associated with service calls and preventive maintenance calls will be kept on file by the laboratory.

Laboratory Systems Managers are responsible for the routine maintenance of instruments used in the laboratory. Any routine preventive maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the method used and/or the judgment of the Laboratory Systems Manager.

All major instruments are backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts is also available to minimize equipment/instrument downtime.

11.2.1 Equipment Monitoring

On a daily basis, the operation of balances, incubators, ovens, refrigerators, and water purification systems will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

12 Instrument Calibration Frequency

Instrument calibration requirements are presented in the following subsections.

12.1 Field Equipment Calibration Procedures and Frequency

Calibration checks will be performed daily or as often is as required to ensure the accuracy of field equipment.

Field calibration solutions, standards and gases will be used within specified expiration dates and will be obtained from manufacturers or authorized suppliers. Calibration solutions, standards and gases will be discarded or returned to the supplier if expiration dates have been exceeded.

Field personnel are responsible for confirming that a master calibration/maintenance log is maintained following the procedures specified for each measuring device. A calibration log for each specific field instrument (as identified by serial/instrument number) will be used to link daily calibrations to that specific field instrument. Where applicable, each log will include, at a minimum, the following information in order to link daily calibrations to specific field instruments:

- name of device and/or instrument calibrated
- device/instrument serial/identification numbers
- calibration method
- tolerance
- calibration standard used
- frequency of calibration
- date(s) of calibration(s)
- name of person(s) performing calibration(s)

Instruments and equipment used to gather, generate or measure environmental data will be calibrated at the intervals specified by the manufacturer or more frequently, and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. If an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service. Equipment found to be out of tolerance during the period of use will be removed from the field and measuring and testing activities performed using the equipment will be addressed via the corrective action system described in Section 15.3 of this QAPP.

12.2 Laboratory Equipment Calibration Procedures and Frequency

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for chemical constituents are identified in Table 1 through 3.

Volatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP, Exhibit E, Part III (NYSDEC, 2005).

Semi-Volatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP, Exhibit E, Part IV (NYSDEC, 2005).

13 Inspection/Acceptance Requirements for Supplies and Consumables

All supplies to be used in the field and laboratory will be available when needed. They will be free of target chemicals and interferences.

All laboratory reagents will be tested for acceptability, prior to use in the analyses of site samples. All standards will be verified against a second source standard. The laboratory will follow a “first in/first out” procedure for the storage and use of all consumables to minimize the risk of contamination and degradation.

14 Data Management

The purpose of the data management is to provide for the accuracy and ready accessibility of all of the necessary data to meet the analytical and reporting objectives of the project.

The data management program established for the project includes field documentation and sample QA/QC procedures, methods for tracking and managing the data, and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process the information collected such that the data are readily accessible and accurate. These procedures are described in detail in the following section.

The data management plan has five elements:

1. sample designation system
2. field activities
3. sample tracking and management
4. data management system
5. document control and inventory

Each of these elements is discussed in the following subsections.

14.1 Sample Designation System

A concise and easily understandable sample designation system is an important part of the project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy re-sampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sampled collected, as outlined in Section 5.1.

14.2 Field Activities

Field activities designed to gather the information necessary to make decisions regarding the off-site areas require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documenting field activities, data security, and QA. These procedures are described in further detail in the following subsections.

14.2.1 Field Documentation

Complete and accurate record keeping is a critical component of the field investigation activities. When interpreting analytical results and identifying data trends, investigators realize that field notes are an important part of the review and validation process. To provide for the thorough documentation of the field investigation, several different information records, each with its own specific reporting requirements, will be maintained, including:

- Field logs
- Instrument Calibration Records

- COC forms

A description of each of these types of field documentation is provided below.

Field Logs

The personnel performing the field activities will keep field logs that detail all observations and measurements made during sampling. Data will be recorded directly into site-dedicated, bound notebooks, with each entry dated and signed. To confirm, at any future date, that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it, and then documenting the proper information. In addition, certain media sampling locations will be surveyed to accurately record their locations. The survey crew will use their own field logs and will supply the sampling location coordinates to a file custodian.

Instrument Calibration Records

As part of data quality assurance procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration confirms that equipment used is of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Section 12.1. In order to demonstrate that established calibration procedures have been followed, calibration records will be prepared and maintained to include, as appropriate, the following:

- calibration date and time
- type and identification number of equipment
- calibration frequency and acceptable tolerances
- identification of individual(s) performing calibration
- reference standards used
- calibration data
- information on calibration success or failure

The calibration record will serve as a written account of monitoring or detection equipment QA. All erratic behavior or failures of field equipment will be subsequently recorded in the calibration log.

COC Forms

COC forms are used as a means of documenting and tracking sample possession from time of collection to the time of disposal. A COC form will accompany each field sample collected, and one copy of the form will be filed in the field office. All field personnel will be briefed on the proper use of the COC procedure.

14.2.2 Data Security

Measures will be taken during the field investigation to prevent samples and records from being lost, damaged, or altered. When not in use, all field notebooks will be stored at the field office or locked in the field vehicle. An electronic copy (e.g., scan to pdf) of all field data and laboratory data are available to all project team members.

14.3 Sample Tracking and Management

A record of all field documentation will be maintained to provide verification of the validity of data used in the site analysis. To effectively execute such documentation, specific sample tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of COC forms, as summarized in Section 8.2.3. The completed COC forms associated with samples collected will be faxed and/or scan and emailed to the Task Manager. Copies of all completed COC forms will be maintained in the field office. The laboratory will verify receipt of the samples electronically (via email) on the following day.

When analytical data are received from the laboratory, the QAC or his designee will review the incoming analytical data packages against the information on the COCs to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed up by the QAC.

14.4 Data Management System

In addition to the sample tracking system, a data management system will be implemented. The central focus of the data management system will be the development of a personal computer-based project database. Additionally, the data management system will allow submission of data to the NYSDEC's EQulS™ database. The project database, to be maintained by the database administrator, will combine pertinent geographical, field, and analytical data. Information that will be used to populate the database will be derived from three primary sources: surveying of sampling locations, field observations, and analytical results. Each of these sources is discussed in the following sections.

14.4.1 Computer Hardware

The database will be constructed on personal computer workstations connected through a network server. The network will provide access to various hardware peripherals, such as laser printers, backup storage devices, image scanners, and modems. Computer hardware will be upgraded to industrial and corporate standards, as necessary, in the future.

14.4.2 Computer Software

The data will be warehoused in a CORE or EQulS™ database. Geographic information system (GIS) applications will be developed in ESRI ArcGIS, with additional customization performed with Visual Basic. Tables and other database reports will be generated through Microsoft Access in conjunction with Microsoft Excel and/or Microsoft Word. These software products will be upgraded to current industrial standards, as necessary.

14.4.3 Survey Information

In general, each location sampled will be surveyed or located using a global positioning system (GPS) with sub-meter accuracy to confirm that accurate documentation of sample locations for mapping and geographic information system purposes (if appropriate) to facilitate the re-sampling of select sample locations during future monitoring programs, if needed, and for any potential remediation activities. The surveying activities that will occur

in the field will consist of the collection of information that will be used to compute a northing and easting in state plane coordinates for each sample location and the collection of information to compute elevations relative to the North American Vertical Datum of 1988 for select sample locations, as appropriate. All field books associated with the surveying activities will be stored as a record of the project activities.

14.4.4 Field Observations

An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field.

During each sampling event, appropriate field documentation may be prepared by the field personnel who performed the sampling activities. The purpose of the documentation is to create a summary and a record of the sampling event. Items included may be the locations sampled, the sampling methodologies used, blind duplicate and sample identification numbers, equipment decontamination procedures, personnel involved in the activity, and any noteworthy events that occurred.

14.4.5 Analytical Results

Analytical results will be provided by the laboratory in both digital and a hard copy format. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the QAC will be notified and will promptly follow up with the laboratory to resolve any issues.

Each data package will be validated in accordance with the procedures presented in Section 18. Any data that do not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of those data may not necessarily be restricted.

Following completion of the data validation, the digital files will be used to populate the appropriate database tables. An example of the format of EDD format is included in EQUIS™ SOP in Attachment A. This format specifies one data record for each constituent for each sample analyzed. Specific fields include:

- Sample identification number
- Date sampled
- Date analyzed
- Parameter name
- Analytical result
- Units
- Detection limit
- Qualifier(s)

The individual EDDs, supplied by the laboratory in EQUIS™ file format, will be loaded into the appropriate database. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.

14.4.6 Data Analysis and Reporting

The database management system will have several functions to facilitate the review and analysis of the data. Data entry screens will be developed to assist in the keypunching of field observations. Routines have been developed to permit the user to scan analytical data from a given site for a given media. Several output functions are also available that can be modified, as necessary, for use in the data management system.

A valuable function of the data management system will be the generation of tables of analytical results from the project databases. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. This data management system function creates a digital file of analytical results and qualifiers for a given media. The file can then be processed into a table of rows and columns that can be transferred to word processing software (e.g., Microsoft® Excel) for final formatting and addition of titles and notes. Tables of analytical data will be produced as part of data interpretation tasks and the reporting of data to the USEPA.

The data management system also has the capability of producing a digital file of select parameters that exists in one or more of the databases. This type of custom function is accomplished on an interactive basis and is best used for transferring select information into a number of analysis tools, such as statistical or graphing programs.

14.5 Document Control and Inventory

Arcadis will maintain project files as discussed in Section 5.5.

15 Assessment and Response Actions

Performance and systems audits will be completed in the field and the laboratory during the sampling, as described below.

15.1 Field Audits

The following field performance and systems audits may be completed during this project.

The appropriate Task Manager will monitor field performance. Field performance audit summaries will contain an evaluation of field activities to verify that the activities are performed according to established protocols. Field performance audits may be performed by the NYSDEC, and the Arcadis Project Manager (or designee). The auditor(s) will review field reports and communicate concerns to the Arcadis Project Manager and/or Task Managers, and/or NYSDEC Project Manager, as appropriate.

In addition, systems audits comparing scheduled QA/QC activities from this QAPP with actual QA/QC activities completed will be performed. The appropriate Task Manager and QAC will periodically confirm that work is being performed consistent with this QAPP and the FSP.

15.2 Laboratory Audits

Internal laboratory audits are conducted by the Laboratory QAM. As part of the audit, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the laboratory QA manual and SOPs. The results of the audits are summarized and issued to each department supervisor, the Laboratory Manager, and the Laboratory Director. A systems audit of each laboratory may be performed by the QAM to determine whether the procedures implemented by each laboratory are in compliance with the QA manual and SOPs.

As a participant in state and federal certification programs, the laboratory is audited by representatives of the regulatory agency issuing certification in addition to the laboratory's internal audits. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

15.3 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP or the FSP. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the assessment are described below.

15.3.1 Field Procedures

When conducting field work, if a condition is noted by the field crew that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and

corrective action implemented by the Field Manager or a designee will be documented on a Corrective Action Form and reported to the appropriate Task Manager, QAC, and Project Manager. The QAC or his designee will be responsible for follow-up and acceptance of corrective actions.

Examples of situations that would require corrective actions are provided below:

- Protocols as defined by the QAPP, SOPs and/or work plans have not been followed.
- Equipment is not in proper working order or properly calibrated.
- QC requirements have not been met.
- Issues resulting from performance or systems audits.
- Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

15.3.2 Laboratory Procedures

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action to be taken will be documented, and reported to the appropriate project manager and QAC.

Corrective action may be initiated, at a minimum, under the following conditions:

- Protocols as defined by this QAPP have not been followed.
- Predetermined data acceptance standards are not obtained.
- Equipment is not in proper working order or calibrated.
- Sample and test results are not completely traceable.
- QC requirements have not been met.
- Issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities. Corrective action will be initiated upon identification of the problem. At whatever level this occurs (analyst, supervisor, data review or QC), it will be brought to the attention of the Laboratory QAM and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director. If previously reported data are affected by a situation requiring correction or if the corrective action impacts a project budget or schedule, the action will directly involve the Arcadis Project Manager and QAC.

Any corrective action deemed necessary based on system or performance audits, the analytical results of split samples, or the results of data review will be implemented. The corrective action may include sample re-extraction, re-preparation, reanalysis, cleanup, dilution, matrix modification or other activities.

16 Reports to Management

The QAC will audit the implementation of the QAPP. Each project component will result in some type of QA report or, by its absence, will indicate that no significant QA or QC deviations occurred. Items that may result in a QA report include:

- changes or updates to the QAPP
- deviations from QAPP or work plan specification
- results of system and performance audits
- significant QA/QC problems, recommended solutions and results of corrective actions
- limitations on the use of measurement data

16.1 Field Reports

Reporting of the quality of field sample collection and field measurements will be the responsibility of the Field Supervisor or designee. Information from the field logbooks will be compiled, and a summary report on field activity QA will be prepared for the project file.

16.2 Laboratory Reports

The laboratory will maintain QA records related to analyses, QC and corrective action. This information will be made available to the Project Manager upon request. Routine reporting will include documenting all internal QC checks performed for this project.

17 Data Reduction and Review

After field and laboratory data are obtained, the data will be subject to the following:

- Reduction, or manipulation mathematically or otherwise into meaningful and useful forms
- Data validation
- Review
- Organization, interpretation, and reporting

17.1 Field Data Reduction and Review

Requirements for field data reduction and review are presented in the following subsections.

17.1.1 Field Data Reduction

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks, data sheets, and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the Work Plan and this QAPP and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and (as necessary) incorporated into the data evaluation process.

17.1.2 Field Data Review

Field data calculations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the appropriate Task Manager and the QAC. Field documentation and data reduction prepared by field personnel will be reviewed by the appropriate Task Manager and QAC. Logs and documents will be checked for:

- General completeness
- Readability
- Usage of appropriate procedures
- Appropriate instrument calibration and maintenance
- Reasonableness in comparison to present and past data collected
- Correct sample locations
- Correct calculations and interpretations

17.2 Laboratory Data Reduction and Review

Requirements for laboratory data reduction and review are presented in the following subsections.

17.2.1 Laboratory Data Reduction

The calculations used for data reduction will be in accordance with the analytical methods. Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data will be entered into permanently bound laboratory notebooks. The data entered must be sufficient to document all factors used to arrive at the reported value.

Concentration calculations for chromatographic analyses will be based on response factors. Quantitation will be performed using internal standards for GC/MS methodology.

Unless otherwise specified, all values will be reported uncorrected for blank contamination.

17.2.2 Laboratory Data Review

Data will be subject to multi-level review by the laboratory. The group leader will review all data reports prior to release for final data report generation. The QAM will review the final data reports, and the Laboratory Director will review a cross section of the final data reports prior to shipment to the environmental consultant.

If discrepancies or deficiencies are present in the analytical results, corrective action will be taken, as discussed in Section 15. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form. This form will be submitted to the Project Manager and QAC.

18 Data Verification and Validation

Data validation will be conducted as outlined in USEPA Guidance on Environmental Data Verification and Data Validation EPA QA/G-8 (USEPA, 2002a).

Data validation is a standardized review process for judging the analytical quality and usefulness of a discrete set of chemical data. Data validation is a systematic process that compares a body of data to the requirements in a set of documented acceptance criteria to ascertain its completeness, correctness, and consistency.

18.1 Data Validation Process

All data generated will be validated using USEPA National Functional Guidelines for Organic Superfund Methods Data Review, EPA 540-R-2017-002, January 2017 (with reference to the historical USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, OSWER 9240.1-05A-P, October 1999, as appropriate) and NYSDEC Analytical Service Protocol (NYSDEC, 2005), where appropriate. These procedures and criteria may be modified, as necessary, to address project-specific and method-specific criteria, control limits, and procedures. Data validation will consist of data screening, checking, reviewing, and editing to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs.

The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Any deviations from the analytical method or any special reporting requirements apart from those specified in this QAPP will be detailed on COC forms.

Upon receipt of laboratory data, the following procedures will be executed by the data validator:

- Evaluate completeness of data package.
- Verify that field COC forms were completed and that samples were handled properly.
- Verify that holding times were met for each parameter. Holding time exceedances, if they occur, will be documented. Data for all samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis.
- Verify that parameters were analyzed according to the methods specified.
- Review QA/QC data (i.e., confirm that duplicates, blanks and LCS were analyzed for the required number of samples, as specified in the method and verify that duplicate RPDs are acceptable).
- Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the Project Manager and/or Laboratory Manager, as appropriate.

Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report addressing the following topics, as applicable to each method:

- Assessment of the data package
- Description of any protocol deviations
- Failures to reconcile reported and/or raw data
- Assessment of any compromised data

- Laboratory case narrative
- Overall appraisal of the analytical data
- Table of site name, sample quantities, data submitted to the laboratory, year of protocol used, matrix, and fractions analyzed

It should be noted that qualified results do not necessarily invalidate data. The goal to produce the best possible data does not necessarily mean that data must be produced without QC qualifiers. Qualified data can provide useful information.

18.2 Data Verification

During the review process, laboratory qualified and unqualified data are verified against the supporting documentation. Based on this evaluation, qualifier codes may be added, deleted, or modified by the data reviewer. Results will be qualified with the following codes in accordance with the National Functional Guidelines.

Concentration (C) qualifiers

- U The analyte/compound was analyzed for but not detected. The associated value is the compound quantitation limit.
- J The compound was positively identified; however, the associated numerical value is an estimated concentration only.

Quantitation (Q) qualifiers

- B The compound has been found in the sample as well as its associated blank, its presence in the sample may be suspect.
- N The analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification.
- JN The analysis indicates the presence of a compound for which there is presumptive evidence to make a tentative identification. The associated numerical value is an estimated concentration only.
- E The compound was quantitated above the calibration range.
- D Concentration is based on a diluted sample analysis.
- C Identification confirmed by GC/MS.

Validation qualifiers

- UJ The compound was not detected above the reported sample quantitation limit. However, the reported limit is approximate and may or may not represent the actual limit of quantitation.
- UB Compound considered non-detect at the listed value due to associated blank contamination.
- R The sample results are rejected.

Two facts will be noted to all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems, the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains error.

Quality Assurance Project Plan

Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the data validator. Suggestions for reanalysis may be made by the QAC at this point.

Data validation reports will be kept in electronic format (e.g., PDF) by Arcadis.

19 Reconciliation with User Requirements

The data results will be examined to determine the performance that was achieved for each data usability criterion. The performance will then be compared with the project objectives and DQOs. Deviations from objectives will be noted. Additional action may be warranted when performance does not meet performance objectives for critical data. Options for corrective action relating to incomplete information, questionable results, or inconsistent data may include any or all of the following:

- Retrieval of missing information
- Request for additional explanation or clarification
- Reanalysis of sample from extract (when appropriate)
- Recalculation or reinterpretation of results by the laboratory

These actions may improve the data quality, reduce uncertainty, and eliminate the need to qualify or reject data.

If these actions do not improve the data quality to an acceptable level, the following additional actions may be taken:

- Extrapolation of missing data from existing data points
- Use of historical data
- Evaluation of the critical/non-critical nature of the sample

If the data gap cannot be resolved by these actions, an evaluation of the data bias and potential for false negatives and positives can be performed. If the resultant uncertainty level is unacceptable, additional sample collection and analysis may be required.

20 References

- NYSDEC. 2005. *Analytical Services Protocol*. July 2005.
- NYSDOH. 2006. Health Guidance for Evaluating Soil Vapor in the State of New York. October.
- USEPA. 1999a. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition. January.
- USEPA. 1999b. Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA-540/R-99-008. October.
- USEPA. 2001. EPA Requirements for QA Project Plans for Environmental Operations. EPA-QA/R-5. Office of Environmental Information. March.
- USEPA. 2002a. Guidance on Environmental Data Verification and Data Validation EPA QA/G-8, Office of Environmental Information. November.
- USEPA. 2002b. Guidance for Quality Assurance Project Plans. EPA-QA/G-5. Office of Environmental Information, December.
- USEPA. 2017. USEPA National Functional Guidelines for Organic Superfund Methods Data Review, EPA 540-R-2017-002, January.

Attachment A

EQUIS™ Lab Standard Operating Procedure

INTRODUCTION

ARCADIS manages and verifies/validates analytical data generated by commercial analytical laboratories in the EQulS database (product of Earthsoft, Inc.). All laboratories contracted by ARCADIS or their clients, on a site-by-site basis, may be required to submit electronic data deliverables (EDDs) in addition to the hard copy report. This Standard Operating Procedure (SOP) describes the structure, format, and submission requirements for electronic data deliverables (EDDs) in the EQulS EFWEDD (Sample, Test, Result, Batch) format.

This document is a general guidance for preparation of the required electronic data and associated quality control information. The structure of the EDD as defined in this document will remain constant unless Earthsoft modifies the database structure. Reference values and requirements for population of additional fields with specific information will not change from project to project.

Modification to reference value lists may NOT be made by the laboratory without authorization from ARCADIS.

Section I provides ARCADIS contact information and the procedure to submit electronic deliverables directly via e-mail. However, all EDDs will be required to be submitted in a final CD compilation for each specific sampling event or as directed by the ARCADIS Project Manager (PM).

Section II outlines the table structures and general requirements of the EDDs. The EDD structure is based on EarthSoft's EFWEDD EDD format. EarthSoft's EDD format has not been changed; however, some 'optional' fields identified in the EarthSoft EDD have been modified to be 'required' in this EDD format. Additional information regarding the EarthSoft products can be found at <http://www.earthsoft.com/>.

Section III presents some additional explanation and requirements for populating the table structure and population set forth in Section II.

Section IV summarizes the use of the EDP. Each laboratory **MUST** use EDP to check each EDD file set prior to submission to ARCADIS. The EDP Error Report must be submitted with the EDD. ***All errors identified by the EDP routine must be corrected prior to forwarding the files for entry into the EQulS database. Or approval for submittal with errors must be authorized by ARCADIS.***

I. CONTACT INFORMATION

Laboratories should contact the ARCADIS National Program Lab Managers with questions regarding this document. The contact info is as follows:

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Direct: 315.671.9299
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Cell: 315.751.1672
Dennis.capria@arcadis.com

ELECTRONIC LABORATORY DATA CHECKER EDP

Prior to submitting an EDD to ARCADIS, the EarthSoft EDP must be run to check and verify the EDD structure, format and reference value compliance. The EDP report must be submitted for each file with each EDD set. The Data Checker error report, which demonstrates that the EDD files were successfully checked, must be electronically submitted with the four EDD files to ARCADIS.

REFERENCE VALUES

A specific set of values is required to be utilized in populating certain key fields of the EDD. The Reference Value Lists for the EDP will be provided for each ARCADIS subcontracted laboratory. The Reference Value Lists must be utilized as provided. Alterations or additions to the Reference Values are **NOT** allowed **without prior** written authorization by the ARCADIS Data Manager. Electronic mail may be considered written authorization.

ELECTRONIC DATA DELIVERABLE (EDD) SUBMISSION

Prior to submission to ARCADIS, each data file must also be reviewed by the laboratory to ensure that the sample IDs, dates, times and other inter-related information is consistent between all four (4) files and the EDD is complete. All parameters that are subcontracted to other laboratories must be included in the EDD for a specific SDG or Laboratory Project Number. It is not acceptable to submit separate EDDs for subcontract parameters. Manual review of the files may be necessary to complete this review.

It is **IMPERATIVE** that the EDD results match the hard copy results. If the results do not match the lab will correct the error ASAP at no additional charge. This includes issues involving various rounding routines for different electronic data management programs within the laboratory (i.e. LIMS vs. EPA CLP). Significant figures must also match hard copy and be consistent from one sampling event to the next. Reporting limits must be consistent between events as well and must be in compliance with the Laboratory Task Order or Project Statement of Work. There may be instances where diluted surrogates and unrecovered spike compounds will require population of the EDD with numeric values in lieu of data flags in the hard copy report. The ARCADIS Data Manager will provide project specific guidance for these conditions. Adherence to the SOP requirements for population of spike/surrogate recovery and RPD fields is required to allow electronic validation of the data.

The EDP Reports for each file must be submitted with the 4 files of the actual EDD.

Laboratories must submit EDDs via e-mail for verification of compatibility and completeness to the assigned ARCADIS Data Manager for the project.

The subject line of this e-mail must include the following text:

[Facility-Code] [Laboratory Project/Log/SDG Number] - EDD Submission

The e-mail should also include the laboratory contact name and phone number.

EDDs must be submitted via e-mail prior to or at the same time the final hard copy document is delivered. ARCADIS may review the EDDs prior to requesting final submittal on CD. EDDs will be returned to the laboratory for modifications until the files can be successfully imported into the EQuIS Project Database and Electronic Data Validation can be performed without field population errors. Any revisions to the EDD will be required within 24 hours of notification to the laboratory regarding observed problems with the EDD. When the EDD is acceptable to the ARCADIS Data Manager and Project Manager, a CD containing all final versions of the EDD should be submitted to ARCADIS for archiving.

Invoices for analytical work will not be approved for payment until the final EDD revisions are acceptable.

II. ELECTRONIC DELIVERABLE DATA FORMAT

This section identifies the structure and format requirements for EQuIS EFWEDD EDDs submitted by all laboratories to ARCADIS. Specific field definitions are presented for each of the four files. Laboratories should review the unique requirements for these fields. The format population and adherence to the criteria are mandatory. Data are electronically validated and errors are quickly identifiable if the EDD is incorrect.

GENERAL FORMAT REQUIREMENTS

All laboratory data must be saved as an ASCII file format using the following standard format. Each subcontracting laboratory's data must be incorporated into the primary laboratory's EDD.

Each data field must be either separated by tabs or enclosed in double quotes (") and separated by commas. Data fields that do not contain information may be represented by two commas. Maximum length of text fields is indicated in the parentheses. If the input information is less than the maximum field length, **DO NOT ADD** spaces to account for the difference.

Each record must be terminated with a carriage return/line feed (i.e., standard DOS text file). The file can be produced using any software with the capability to create ASCII files.

THE LABORATORY SHALL LEAVE THE HEADERS IN EACH ASCII FILE TO ASSIST IN REVIEW AND RESOLUTION OF ERRORS.

Four files are required for each SDG or Laboratory Project Number: one each for samples, tests, results, and batches. Each file must be saved as a Tab Delimited or Comma Separated file.

Enterprise EDD File Naming Conventions

EDD packages must be named using a specific naming convention. An EDD Package consists of a .zip file containing the text (.txt) EDDs and a User Certificate. The zip file and text file names must contain the specific elements listed below under file naming conventions, separated by a period. A User Certificate file will be supplied to the lab by Arcadis for inclusion in the zip file. Please include in the subject line of emailed EDD submissions the facility code and Sample Delivery Group (SDG) number.

File Naming Conventions:

ZIP File Name = Unique ID.Facility Code.Format Name.zip

Text File EDDs Name = Unique ID.EDD Section Name.txt

Unique ID = SDG number.

Facility Code = The facility code (i.e., Site Name from ENFOS)

Format Name = The EQUiS EDD format name (e.g., ESBasic, EFWEDD, etc.).

EDD Section Name = The name of the section within the EDD (e.g. EFW2FSample, EFW2LabTST, etc.).

For example, ZIP File Name = "2009001.BP-99999.EFWEDD.zip" will contain the following files: "2009001.EFW2FSample.txt", "2009001.EFW2LabTST.txt", "2009001.EFW2LabRES.txt", "2009001.EFW2LabBCH.txt" and "pfoos usr".

Package re-submittal

In order to re-submit corrected EDDs, the .zip file and text (.txt) EDDs must each be renamed. If the example EDD package above were to be re-submitted it would have ZIP File Name = "2009001B.BP-99999.EFWEDD.zip" containing "2009001B.EFW2FSample.txt", "2009001B.EFW2LabTST.txt", "2009001B.EFW2LabRES.txt", "2009001B.EFW2LabBCH.txt" and "pfoos usr". Note that a "B" has been appended to the SDG name in both the zip file name and each of the text file names. A subsequent re-submittal of the same SDG would require that a C be appended and so on.

Referential integrity is enforced between tables (e.g. sys_sample_code present in the result, batch, and test tables must also be present in the sample table). For example, a data record with a specific sys_sample_code found in the result table, but not in the sample table, will cause an error in the Data Import Module and the file will not be allowed to be entered into the database. Dates and times associated with each test must match in the "Test" and "Result" files or the database will not allow entry of the entire file.

Reference values must be adhered to for a variety of fields as identified in the Reference Value list and described in the following table format requirements.

FORMAT DETAILS

The following four sections provide a detailed summary and the specific layout for each field required in each of the four (4) tables of the EDD. The ARCADIS EDD has been derived from the EarthSoft EFWEDD EDD.

Date is reported as MM/DD/YY (month/day/year) and time as HH:MM (hour:minute). Time must be reported in 24-hour (military) format (3:30 p.m. = 15:30 and 8:30 AM = 08:30 not 8:30). **NOTE:** Make certain that the LIMS systems format the date and time the same way for all files.

The columns in the following 4 tables relate to:

"Number" Column in Tables = Column of EDD table

"Attribute Name" = Column Name

PK after attribute indicates this is a primary key within Access for the table.

“Column Data” Type = Text or Numeric values required. Parenthetical number indicates total allowable number of characters in the field.

“Required” Column:

The column titled 'Required' will contain the text 'Yes' if the field is required to be populated by the laboratory. In addition, a “condition” is added to indicate additional information applying to population of the associated field. The first number of the condition relates to the table in which the condition applies, i.e. 1 is the Sample File, 2 is the Test File, 3 is the Result File, and 4 is the Batch File. Conditions apply as follows:

Condition	Table	Description
0	ALL	Field always required
1-1	SAMPLE	Field required for field samples only not required for laboratory samples
1-2	SAMPLE	Field required (parent_sample_code) for laboratory QC samples that have 'parents'
1-3	SAMPLE	Field not required for field samples
2-1	TEST	Field required if applicable for specific test
3-1	RESULT	Field required (result_value) for detected analytes only (TRG or TICs). Must be NULL if non-detect or surrogates, internal standards or spiked compounds
3-2	RESULT	Field required if available or appropriate for result
3-3	RESULT	Field required for matrix spikes or matrix spike duplicates (NOT required for surrogate compounds or LCS samples where the original concentration is assumed to be zero).
3-4	RESULT	Field required for surrogate compounds, LCS, Blank Spikes, Matrix Spikes, and Internal Standards.
3-5	RESULT	Field required for LCS duplicates, Blank Spike Duplicates, Matrix Spike Duplicates, Lab Replicates
3-6	RESULT	Field required for LCSD, BSD, MSD, and Lab duplicate samples
3-7	RESULT	Field required for surrogates and spike compounds
4-1	BATCH	Field required if available or appropriate for result

“REQUIRED”:

“YES” = Required data if applicable

“NO” = Optional information unless otherwise directed by ARCADIS Data Manager or preferred for insertion by lab except where lab is specifically directed to leave the field Null.

Parent Sample Definition

Parent Samples are base samples for duplicates or spikes. i.e. original field samples used for matrix spikes or field sample used for Lab Duplicate/Replicate. A Matrix Spike is not the Parent Sample of the Matrix Spike Duplicate.

POPULATING SPIKE FIELDS

SURROGATES: surrogate recoveries are to be populated in qc_spike_added, qc_spike_measure, and qc_spike_recovery fields. Surrogates are analyte type = SUR. Control limits for surrogate recoveries must also be populated.

INTERNAL STANDARDS: internal standard values are to be populated in qc_spike_added, qc_spike_measure, and qc_spike_recovery fields. Internal Standards are analyte type = IS.

LCS, BS, and MS COMPOUNDS: recoveries are to be populated in qc_spike_added, qc_spike_measured, and qc_spike_recovery fields. Compounds spiked to evaluate method accuracy are analyte type = SC. Control limits for spike recoveries must also be populated.

LCSD, BD, AND MSD COMPOUNDS: recoveries are to be populated in qc_dup_spike_added, qc_dup_spike_measured, and qc_dup_spike_recovery fields. The Compounds spiked to evaluate method accuracy are analyte type = SC. Control limits for spike recoveries must also be populated. Additionally, the qc_rpd and qc_rpd_cl fields must be populated for these samples.

LAB REPLICATE SAMPLE DATA: values for lab duplicates/replicates are to be populated in qc_dup_spike_measured field. The qc_rpd and qc_rpd_cl fields must be populated for these samples.

III. ADDITIONAL REQUIREMENTS

SAMPLE TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
1	sys_sample_code	Text(40)	Yes (0)	Unique sample identifier (COC Sample ID). Each sample must have a unique value, including spikes and duplicates. Unique sample identifiers <u>throughout</u> the database are an <u>ABSOLUTE</u> restriction enforced by EQuIS Chemistry. <u>This unique identifier also carries through to each subsequent sampling event where the samples IDs must be unique for EVERY event of the project (continuing years).</u> Laboratory QC samples must also have unique identifiers between sampling event and from 1 year to the next and between laboratories in the event subcontractors are used. For Matrix Spike, Matrix Spike Duplicate, and Laboratory Duplicates of Field Samples, add the suffix MS, MSD, and LR , respectively to create unique identifiers for these types of Lab QC samples.
2	sample_name	Text(30)	No	Additional sample identification information as necessary. Is not required to be unique (i.e., duplicates are OK).

SAMPLE TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
3	sample_matrix_code	Text(10)	Yes (0)	Code, which distinguishes between different types of sample matrix. Examples: Soil samples = "SO", groundwater samples = "WG". Field Blanks, Trip Blanks, and Rinsate Blanks = "WQ". Water Method Blanks and liquid matrix spikes = "WQ". Soil Method Blanks and soil/sludge/sediment matrix spikes = "SQ". This field refers to the sample matrix not the matrix after preparation or extraction. See rt_matrix for the list of valid values.
4	sample_type_code	Text(10)	Yes (0)	Code that distinguishes between different types of samples. For example , normal field samples = "N" and laboratory method blank = "LB". Field QC sample types are Field Duplicates = "FD", Field Blanks = "FB", Trip Blanks = "TB". Lab QC sample types are LCS or Blank Spikes = "BS", LCSD or BS Duplicates = "BD" and Matrix Spikes = "MS" and Matrix Spike Duplicates = "SD". See rt_sample_type in Reference Values list of valid values.
5	sample_source	Text(10)	Yes (0)	Must be either "Field" for field samples or "Lab" for laboratory QC samples. No other values are allowed. Matrix spikes and lab duplicate/replicate are "Lab" samples, even though the parent is a "Field" and the base sample came from the field. The spiking or splitting for duplication is done in the lab. Field duplicates as submitted to the lab by field sampling teams are "Field"
6	parent_sample_code	Text(40)	Yes (1-2)	The value in the "sys_sample_code" that identifies the sample that was the source of this sample. <i>For example</i> , the Matrix Spike and the Matrix Spike Duplicate or Lab Replicates parent_sample_code is the sys_sample_code for the originating field sample that is spiked to generate the MS/MSD or split by the lab for use as the laboratory duplicate. This field is only required in the EDD for laboratory "clone" samples (e.g., matrix spikes and duplicates). Field duplicates are submitted blind to the laboratory, so this field cannot be completed by the laboratory. This field must be blank for samples that have no parent (e.g., normal field samples, method blanks, etc.).
7	sample_delivery_group	Text(10)	Yes (0)	Sample delivery group or laboratory Project/Log Number. All deliverables must reference the SDG or Lab Log-in Number. This field MUST BE POPULATED
8	sample_date	Date	Yes (1-1)	Date of sample collection in MM/DD/YY format including trip blanks. Must be blank for laboratory samples.
9	sample_time	Time	Yes (1-1)	Time of sample collection in 24-hour (military) HH:MM format. 8:45 AM = 08:45 and 3:30 PM = 15:30. Must be blank for laboratory samples.

SAMPLE TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
10	sys_loc_code	Text(20)	No	Sample collection location. To be populated by ARCADIS unless otherwise directed at project initiation.
11	start_depth	Double	No	Beginning depth (top) of soil sample. To be populated by ARCADIS unless otherwise directed at project initiation.
12	end_depth	Double	No	Ending depth (bottom) of soil sample. To be populated by ARCADIS unless otherwise directed at project initiation.
13	depth_unit	Text(15)	No	Unit of measurement for the sample begin and end depths. IRPIMS-style unit of measurement codes (see table X03) are recognized by Chem; other codes may be allowed by the Chem project manager. To be populated by ARCADIS unless otherwise directed at project initiation.
14	chain_of_custody	Text(15)	Yes (1-1)	Chain of custody identifier or number. A single sample may be assigned to only one chain of custody. The COC identifier will be provided by the field sampling team based on conventions established for a specific project.
15	sent_to_lab_date	Date	No	Date sample was sent to lab (in MM/DD/YY format for EDD).
16	sample_receipt_date	Date	Yes (1-1)	Date that sample was received at laboratory in MM/DD/YY format. Must be blank for laboratory samples.
17	sampler	Text(30)	No	Name or initials of sampler.
18	sampling_company_code	Text(10)	Yes (1-1)	Name or initials of sampling company (no controlled vocabulary). "ARCADIS" should be entered into this field unless otherwise directed at project initiation.
19	sampling_reason	Text(30)	No	Optional reason for sampling. No controlled vocabulary is enforced.
20	sampling_technique	Text(40)	No (1-1)	To be populated by ARCADIS unless otherwise directed at project initiation. Sampling technique. For example , low flow, bailing, MIP, etc... Must be blank for laboratory samples.
21	task_code	Text(10)	No	Code used to identify the task under which the field sample was retrieved.
22	collection_quarter	Text(5)	No	Quarter of the year sample was collected (e.g., "1Q96")
23	composite_yn	Text(1)	No	Boolean field used to indicate whether a sample is a composite sample.
24	composite_desc	Text(255)	No	Description of composite sample (if composite_yn is YES).

SAMPLE TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
25	sample_class	Text(10)	No	Navy sample class code.
26	custom_field_1	Text(255)	No	Custom sample field
27	custom_field_2	Text(255)	No	Custom sample field
28	custom_field_3	Text(255)	No	Custom sample field
29	comment	Text(255)	Yes (0)	Field required to contain the full sample ID code.
30	sample_receipt_time	Text(5)	Yes (1-1)	Time of sample receipt by laboratory in 24-hour (military) HH:MM format. 8:45 AM = 08:45 and 3:30 PM = 15:30

TEST TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
1	sys_sample_code (PK)	Text (40)	Yes (0)	SAME AS #1 IN SAMPLE TABLE. This value is used in enforcing referential integrity between tables. Must match sys_sample_code in Sample Table.
2	lab_anl_method_name (PK)	Text (35)	Yes (0)	Laboratory analytic method name or description. See rt_analytic_method in reference value tables for list of valid values.
3	analysis_date (PK)	Date/ Time	Yes (0)	Date of sample analysis in MM/DD/YY format. Refers to initiation of the analysis not prep method date.
4	analysis_time (PK)	Text (5)	Yes (0)	Time of sample analysis in 24-hour (military) HH:MM format. Note that this field, combined with the "analysis_date" field is used to distinguish between reextractions, reanalyses, and dilutions. Please ensure that retests have "analysis_date" and/or analysis_time" different from the original test event (and complete test_type field as appropriate).
5	total_or_dissolved (PK)	Text (1)	Yes (0)	"T" for total metal organic carbon concentration, "D" for dissolved or filtered metal or organic carbon concentration ONLY. USE "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable including TDS.
6	column_number (PK)	Text (2)	Yes (2-1)	Applicable for GC or HPLC methods. "1C" for first column analyses, "2C" for second column analyses, or "NA" for analyses where not applicable. If any "2C" tests are listed, then there must be corresponding "1C" tests present also. Laboratories must indicate which of the two columns is to be considered "primary" by entering "Y" in the "reportable_result" field of the result table for the result presented in hard copy reports. It is NOT acceptable to identify both "1C" and "2C" reportable_result as "Y"; one must be "N" if "1C" and "2C" are provided in the EDD.

TEST TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
7	test_type (PK)	Text (10)	Yes (0)	Type of test. Valid values include "initial", "reextract", and "reanalysis", "dilution" are acceptable. See rt_test_type for all valid values.
8	lab_matrix_code	Text (10)	Yes (0)	Code that distinguishes between different types of matrix analyzed. Soil = "SO"; groundwater = "GW" and TCLP = TCLP as a lab matrix. See rt_matrix for valid values
9	analysis_location	Text (2)	Yes (0)	"LB" for fixed-based laboratory analysis, "FI" for field instrument, "FL" for mobile field laboratory analysis, or.
10	basis	Text (10)	Yes (0)	"Wet" for wet-weight basis; or "Dry" for dry-weight basis. For tests for which this distinction is not applicable use Wet
11	container_id	Text (30)	No	Sample container identifier.
12	dilution_factor	Single	Yes (0)	Test or analytical run dilution factor. Must be "1" if no dilution.
13	Prep_method	Text (35)	Yes (2-1)	Laboratory sample preparation method name. See rt_std_prep_method for valid values.
14	prep_date	Date/Time	Yes (2-1)	Date of sample preparation in MM/DD/YY format.
15	prep_time	Text (5)	Yes (2-1)	Time of sample preparation in 24-hour (military) HH:MM format
16	leachate_method	Text (15)	Yes (2-1)	Method name, e.g., SW1311 or SW1312. See rt_analytic_method for valid values.
17	leachate_date	Date/Time	Yes (2-1)	Date of leachate preparation in MM/DD/YY format.
18	leachate_time	Text (5)	Yes (2-1)	Time of leachate preparation in 24-hour (military) HH:MM format.
19	lab_name_code	Text (10)	Yes (0)	Unique identifier of the laboratory reporting results. See rt_subcontractor for valid values.
20	qc_level	Text (10)	NO	Not populated by Lab.
21	lab_sample_id	Text (20)	Yes (0)	Laboratory sample identifier. A field sample may have more than one laboratory lab_sample_id; however it is limited to only ONE lab_sample_id per method).
22	percent_moisture	Text (5)	Yes (2-1)	Percent moisture of the sample portion used in the specific lab_anl_method_name test; this value may vary from test to test for any sample. The value must be NUMERIC as "NN.MM", e.g., 70.1% could be reported as "70.1" but not as 70.1%". The database assumes that the number is a "%" and units of measure are not necessary. NOTE: This field MUST be populated for all soil, sludge, and sediment samples whether or not the value is reported in the hard copy. Use "0" for lab soil QC samples.
23	subsample_amount	Text (14)	Yes (0)	Amount of sample used for the test. THIS FIELD MUST BE POPULATED
24	subsample_amount_unit	Text (15)	Yes (0)	Unit of measurement for subsample amount. See rt_unit for valid values.

TEST TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
25	analyst_name	Text (30)	Yes (0)	Name or initials of laboratory analyst.
26	instrument_lab	Text (50)	Yes (0)	Instrument identifier.
27	comment	Text (255)	NO	Comments about the test as necessary (Optional).
28	preservative	Text (50)	Yes (2-1)	Indicate preservative or leave blank, if none. THIS FIELD MUST BE POPULATED IF A PRESERVATIVE WAS IN THE SAMPLE AS RECEIVED FROM THE FIELD OR IF THE SAMPLE WAS PRESERVED BY THE LABORATORY BEFORE PREPARATION AND ANALYSIS.
29	final_volume	Text (15)	Yes (2-1)	Final amount of extract or digestate.
30	final_volume_unit	Text (15)	Yes (2-1)	Unit of measure for final_volume. See rt_unit for valid values.

RESULT TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
1	sys_sample_code (PK)	Text (40)	Yes (0)	SAME AS #1 IN SAMPLE & TEST TABLES. This value is used in enforcing referential integrity between tables.
2	lab_anl_method_name (PK)	Text (35)	Yes (0)	Laboratory analytic method name. Must be same as lab_anl_method_name in Test File. See rt_analytic_method for valid values.
3	analysis_date (PK)	Date/Time	Yes (0)	Must be the SAME AS #3 IN THE TEST TABLE. This value is used in enforcing referential integrity between tables. Date of sample analysis in MM/DD/YY format.
4	analysis_time (PK)	Text (5)	Yes (0)	Must be the SAME AS #4 IN THE TEST TABLE. This value is used in enforcing referential integrity between tables.
5	total_or_dissolved_ (PK)	Text (1)	Yes (0)	Must be the SAME AS #5 IN THE TEST FILE.
6	column_number (PK)	Text (2)	Yes (3-2)	Must be the SAME AS #6 IN THE TEST FILE
7	test_type (PK)	Text (10)	Yes (0)	Must be the SAME AS #7 IN THE TEST FILE
8	cas_rn (PK)	Text (15)	Yes (0)	Chemical Abstracts Number for the parameter if available. This must be the true CAS # and "not made up". Where CAS #s are not available, i.e. wet chem. Parameters, identifiers will be provided by ARCADIS project requirements. See notes at end of section for TIC management. See rt_analyte for valid values. The lab is not authorized to add internally developed "CAS #s" for general chemistry parameters, surrogates, internal standards, TICs. CAS#s used for TICs must be available through an outside source such as "Chemfinder".
9	chemical_name	Text (60)	Yes (0)	Chemical name associated with CAS # in #8. The cas_rn field is the only chemical identifier information actually imported in EQuIS Chemistry.

RESULT TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
10	result_value	Text (20)	Yes (3-1)	Analytical result reported for "TRG" or "TIC" result_type ONLY . Appropriate and consistent number of significant digits must be entered. MUST BE BLANK FOR NON-DETECTS . "SUR", "IS", and "SC" results do NOT populate this field (populate the QC fields).
11	result_error_delta	Text (20)	Yes (3-2) [Radiochem]	Error range applicable to the result value for radiochemistry results.
12	result_type_code	Text (10)	Yes (0)	Must be either "TRG" for a target or regular results, "TIC" for tentatively identified compounds, "SUR" for surrogates, "IS" for internal standards, or "SC" for spiked compounds. [LCS, LCSD, MS, MSD, BS, BSD]
13	reportable_result	Text (10)	Yes (0)	Must be either "Yes" for results, which are considered to be reportable, or "No" for other results. Used to distinguish between multiple results where a sample is retested after dilution or to indicate which of the first or second column result should be considered primary. For re-analyses and dilutions all results must be entered into the database if hard copy data is provided BUT ONLY ONE RESULT FOR EACH COMPOUND/ANALYTE MAY BE FLAGGED AS REPORTABLE .
14	detect_flag	Text (2)	Yes (0)	Either "Y" for detected analytes or "N" for non-detects. MUST be "N" for NON-DETECTS .
15	lab_qualifiers	Text (7)	Yes (3-2)	Qualifier flags assigned by the laboratory. See rt_qualifier for valid qualifiers that may be used.
16	Organic_yn	Yes/No	Yes (0)	Must be either "Y" for organic constituents or "N" for inorganic constituents.
17	method_detection_limit	Text (20)	Yes (0)	Laboratory determined MDL per 40 CFR Part 136, adjusted for dilutions and percent moisture (if it applies).
18	reporting_detection_limit	Text (20)	Yes (0)	Detection limit that reflects sample analysis conditions including analysis volumes and dilution factors. This should be the laboratory PQL or standard reporting limits
19	quantitation_limit	Text (20)	No	NOT Currently used unless specifically defined for the project.
20	Result_unit	Text (15)	Yes (0)	Units of measure relates to ALL results including result_value, qc_original_concentration, qc_spike_added, qc_spike_measured, qc_dup_original_conc, qc_dup_spike_added, qc_dup_spike_measured. See rt_unit for valid values.
21	detection_limit_unit	Text (15)	Yes (0)	Units of measure for detection limit(s). See rt_unit for valid values.
22	tic_retention_time	Text (8)	Yes (3-2)	Retention time in minutes for tentatively identified compounds (TICs). Populated only for TIC result_type
23	result_comment	Text (255)	NO	MUST BE LEFT BLANK BY THE LAB

RESULT TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
24	qc_original_conc	Text (14)	Yes (3-3)	The concentration of the analyte in the original (unspiked) sample. Populated for matrix spike samples. Not populated where original concentration is assumed to be zero, i.e. LCS or BS samples.
25	qc_spike_added	Text (14)	Yes (3-4)	The concentration of the analyte added to the original sample. Populated for ALL Surrogates, and LCS, BS, and MS samples
26	qc_spike_measured	Text (14)	Yes (3-4)	The measured concentration of the analyte. Use zero for spiked compounds that were not detected in the sample. MUST BE NUMERIC even if diluted out or not recovered (use "0" if diluted, matrix interference, elevated concentrations of target compounds, etc.) Populated for ALL Surrogates, and LCS, BS, and MS samples
27	qc_spike_recovery	Text (14)	Yes (3-4)	The percent recovery for "SUR" and "SC" results. MUST BE NUMERIC even if diluted out or not recovered (use "0" if diluted, matrix interference, elevated concentrations of target compounds, etc.) Report as percentage (e.g., report "120%" as "120"); DO NOT include "%" sign in field. Populated for ALL Surrogates, and LCS, BS, and MS samples
28	qc_dup_original conc	Text (14)	Yes (3-5)	The concentration of the analyte in the original (unspiked) sample. Populated for matrix spike duplicate samples. Not populated where original concentration is assumed to be zero, i.e. LCSD or BSD samples.
29	qc_dup_spike_added	Text (14)	Yes (3-5)	The concentration of the analyte added to the original sample. Populated for ALL LCSD, BSD, and MSD samples.
30	qc_dup_spike_measured	Text (14)	Yes (3-5)	The measured concentration of the analyte in the duplicate. Populated for ALL LCSD, BSD, and MSD samples. MUST be NUMERIC . Use zero for spiked compounds that were not recovered due to dilution, matrix interference, elevated concentrations of target compounds, etc..
31	qc_dup_spike_recovery	Text (14)	Yes (3-5)	The duplicate percent recovery. Populated for ALL LCSD, BSD, and MSD samples. MUST be NUMERIC . Use zero for spiked compounds that were not recovered due to dilution, matrix interference, elevated concentrations of target compounds, etc Report as percentage (e.g., report "120%" as "120").
32	qc_rpd	Text (8)	Yes (3-6)	The relative percent difference between MS and MSD, LCS and LCSD, BS and BSD, & primary field sample result and Lab Replicate. Populated for ALL LCSD, BSD, MSD, and LR samples. MUST be NUMERIC . Use zero for RPDs that were not calculated due to elevated concentrations of target compounds, dilution, matrix interference, etc Report as percentage (e.g., report "120%" as "120").
33	qc_spike_lcl	Text (8)	Yes (3-7)	Lower control limit for spike recovery. Required for spikes, spike duplicates, surrogate compounds, LCS and any spiked sample. Report as

RESULT TABLE				
Num	Attribute Name	Column Data Type	Required	Attribute Definition
				percentage (e.g., report "120%" as "120").
34	qc_spike_ucl	Text (8)	Yes (3-7)	Upper control limit for spike recovery. Required for spikes, spike duplicates, surrogate compounds, LCS and any spiked sample. Report as percentage (e.g., report "120%" as "120").
35	qc_rpd_cl	Text (8)	Yes (3-6)	Relative percent difference control limit. Required for any duplicated sample. Report as percentage (e.g., report "120%" as "120").
36	qc_spike_status	Text (10)	Yes (3-4)	Used to indicate whether the spike recovery was within control limits. Use the "+" character to indicate failure, otherwise leave blank.
37	qc_dup_spike_status	Text (10)	Yes (3-5)	Used to indicate whether the duplicate spike recovery was within control limits. Use the "+" character to indicate failure, otherwise leave blank.
38	qc_rpd_status	Text (10)	Yes (3-6)	Used to indicate whether the relative percent difference was within control limits. Use the "+" character to indicate failure, otherwise leave blank. Required for any duplicated sample.

BATCH TABLE				
Num	Attribute Name	Column Datatype	Required	Attribute Definition
1	sys_sample_code (PK)	Text (40)	Yes (0)	SAME AS #1 IN SAMPLE , TEST TABLE . This value is used in enforcing referential integrity between tables.
2	lab_anl_method_name (PK)	Text (35)	Yes (0)	SAME AS #2 IN TEST TABLE . See rt_analytic_method for valid values.
3	analysis_date (PK)	Date	Yes (0)	SAME AS #3 IN TEST TABLE . This value is used in enforcing referential integrity between tables. Date of sample analysis in MM/DD/YY format. May refer to either beginning or end of the analysis as required by EQuIS Chemistry project manager.
4	analysis_time (PK)	Text (5)	Yes (0)	SAME AS #4 IN TEST, AND RESULT TABLES . This value is used in enforcing referential integrity between tables.
5	total_or_dissolved (PK)	Text (1)	Yes (0)	SAME AS #5 IN TEST TABLE . This value is used in enforcing referential integrity between tables.
6	column_number (PK)	Text (2)	Yes (4-1)	SAME AS #6 IN TEST TABLE . This value is used in enforcing referential integrity between tables.
7	test_type (PK)	Text (10)	Yes (0)	SAME AS #7 IN TEST TABLE . This value is used in enforcing referential integrity between tables.
8	test_batch_type (PK)	Text (10)	Yes (0)	Lab batch type. Valid values include "Prep", "Analysis", and "Leach". Additional valid values may optionally be provided by the EQuIS Chemistry project manager. This is a required field for all batches.
9	test_batch_id	Text (20)	Yes (0)	Unique identifier for all and each lab batches. Must be unique within EQuIS Chemistry database. For example, the same identifier cannot be used for a prep batch and an analysis batch and the values must be different from one sampling event to another. THIS IDENTIFIER CANNOT BE USED FROM ONE YEAR TO THE NEXT.

ADDITIONAL INFORMATION FOR PREPARING THE 4-FILE EDD

SAMPLE FILE AND SYS_SAMPLE_CODE

1. The sys_sample_code is the unique sample ID as supplied on the Chain of Custody form with the same spacing as identified on the COC or on a supplemental Sample ID list submitted to the laboratory with the Laboratory Task Order or prior to submission of samples.
2. In order to uniquely identify MS/MSD, laboratory duplicates, TCLP, and SPLP samples, the laboratory shall add a suffix to the original sample ID listed on the chain of custody:

Matrix Spike Sample = xxxxx MS
Matrix Spike Duplicate Sample = xxxxx MSD
Lab Duplicate/Replicate = xxxxx LR
TCLP Extract Sample = xxxxx TCLP
SPLP Extract Sample = xxxxx SPLP

These are the only characters that are allowed to be amended to ANY sample ID as listed on the COC or the sample ID list referred to above.

The parent_sample_code shall be entered into the parent_sample_code field of the Sample File.

3. If the sample_name field is provided it must contain the full sample ID from the chain of custody.

4. Sample_Type_Code must be appropriately applied as follows:

"N" = normal field samples
"FD" = field duplicates samples submitted blind to the laboratory
"TB" = trip blanks
"FB" = field blanks
"EB" = rinsate or equipment blanks
"BS" = laboratory control samples or blank spikes
"BD" = laboratory control sample duplicates or blank spike duplicates
"MS" = matrix spikes
"SD" = matrix spike duplicates
"LR" = laboratory duplicates or laboratory replicates

5. The following "matrix_type" codes must be used ("SQ" = soil QC sample and "WQ" = water QC sample):

Method Blank = "SQ" or "WQ"
MS/MSDs = "SQ" or "WQ"
LCS/LCSDs = "SQ" or "WQ"
BS/BSDs = "SQ" or "WQ"

6. SDG Numbers or laboratory Log Numbers (per ARCADIS PM direction) **MUST** be populated in "sample_delivery_group" field of the **Sample File**.

QUALITY CONTROL SAMPLES AND DATA

7. The source of Lab Duplicates, Lab Replicates, Matrix Spikes, and Matrix Spike Duplicates is the Lab not the Field even if the MS/MSD are identified on the COC by the field sampling team. The samples are spiked in the laboratory not in the field.
8. Laboratory QC data, which span more than one SDG may be submitted with each appropriate SDG.
9. Laboratory LCS and LCSD should be reported as two separate samples.

10. **Matrix Spike and Matrix Spike Duplicate recoveries must be reported as “0” if the value is not calculated due to concentrations of the spiked analyte in the sample at concentrations above the 4X factor.**
11. **All laboratory method performance site-specific and batch Quality Control sample results (i.e. Method Blanks, LCS/LCSDs, Blank Spikes, Leachate Blanks as method appropriate) must be included in the EDD.** For most projects, this does **NOT** include **non-site-specific** matrix spikes and laboratory duplicates/replicates.
12. Laboratory batch sample duplicate/replicate and MS/MSD results from **non-project specific** samples (i.e. batch QC samples) shall **NOT** be included in the EDD.
13. Surrogates populate the qc_spike fields not qc_dup_spike fields or the result_value field even if the surrogates are reported for MSD, BSD, or LCSD samples.
14. QC_Spike_Added values for Spike, IS and Surrogate compounds are REQUIRED.
15. QC_Spike_Measured values for Spike, IS and Surrogate compounds are REQUIRED.
16. RPDs for LCSDs, BSDs, MSDs, and Laboratory Duplicates must be populated in the “**qc_rpd**” field. A value of “0” or “100” must be reported, as appropriate, if the RPD is not calculated due to excessive concentrations or interference present in the sample. The “**qc_rpd**” must be a numeric entry.
17. The RPD control limit must be listed in the “**rpd_cl**” field for all parameters where an RPD is reported. This includes lab duplicate/replicate samples.

SAMPLE FILE

18. The following “**matrix_type**” codes must be used for QC samples (“**SQ**” = soil QC sample and “**WQ**” = water QC sample):

Method Blank = “SQ” or “WQ”
MS/MSDs = “SQ” or “WQ”
LCS/LCSDs = “SQ” or “WQ”
BS/BSDs = “SQ” or “WQ”

19. SDG or Laboratory Project numbers must be populated in “sample_delivery_group” field.

TEST FILE

20. Percent moisture must be reported in the “**percent_moisture**” field in the **Test File** for all solid samples (i.e., soil, sediment, and sludge).
21. Subsample weights and final volumes must be listed for all parameters as appropriate.

RESULTS FILE

22. Result_value is only populated with data for “TRG” and “TIC” detections. All other data is entered in the “qc_” fields. The field must be “NULL” for non-detects and other analyte_types. The Reporting Limit must not be entered in this field.
23. Non-detected data shall have a lab_qualifier of “U” in addition to other qualifiers deemed applicable. The Detect_Flag shall be “N” and the Result_value field shall be blank.
24. The Reporting Limit must be provided for all parameters. The RL MUST be adjusted for dilutions made during analysis.

25. Surrogate recoveries **MUST BE REPORTED** in the qc_spike_measured and qc_spike_recovery fields, even if the surrogate had been diluted out. List "0" as the measured and recovered amount. Control Limits must also be entered for surrogates. Surrogates are "SUR" analyte_type not "TRG".
26. Surrogate, LCS, LCSD, BS, BSD, MS, and MSD detected concentrations, and percent recoveries must be populated with a numeric value. A value of "0" **must** be entered if the Spiked Compound is diluted out or not recovered. An "+" is unacceptable as this is a numeric field.
27. **"QC_original_concentration"** must be populated for matrix spikes and matrix spike duplicates
28. Valid entries for the reportable_result field are "Yes" or "No" only.
29. **ONLY** report compounds of interest for any method blank, sample, and sample duplicate, trip blank.
30. Laboratory Qualifier designation must be consistent. For an estimated concentration with blank contamination "BJ" must be used. Note that "JB", "B J" or "J B" cannot be used.
31. Explanation of Duplicate Qualifiers:

B	Analyte found in associated blank	Organic Analysis
B	<CRDL but >= Instrument Detection Limit	Inorganic Analysis
N	Presumptive evidence of a compound	Organic Analysis
N	Sample recovery not within control limits	Inorganic Analysis

It is preferred by ARCADIS that the laboratory not qualifiers with multiple explanations. **Any qualifiers utilized in the hard copy report or the electronic report must be defined in the hard copy report. There is no exception to this requirement for explanation of qualifiers applied to electronic data.**

32. Nomenclature for tentatively identified compounds (TIC):

Use the CAS # if it is available and **REAL (outside verifiable source)** for TICs and enter the chemical name in the chemical_name field.

For UNKNOWN TICs follow the following protocol:

cas_rn for unknown VOA TIC = VTIC 1 through VTIC 10
cas_rn for unknown SVOA TIC = SVTIC 1 through SVTIC 20

Enter "UNKNOWN", "UNKNOWN Hydrocarbon", "UNKNOWN Aliphatic", or other identifier as appropriate or applicable in "chemical_name" field.

TICs will produce errors in the ELDC/EDDP that cannot be corrected by the laboratory. These are the only acceptable errors in the data checker report unless otherwise authorized by ARCADIS.

33. TCLP or SPLP results must be submitted in units of mg/L or appropriate liquid units. **(Make sure that moisture correction is not automatically enforced).**

BATCH FILE

- 34. The laboratory must use unique Batch File Names for each analytical department/method and for continuing years. Electronic validation utilizes Batch IDs to link field samples with quality control data. Overlapping Batch IDs are not acceptable.**

GENERAL ISSUES

35. Incomplete chain-of-custody (C-O-C) forms must be immediately communicated to the project manager. Some of the C-O-C information is used for completion of the Sample_Matrix_Code and Sample_Delivery_Group. These discrepancies must be rectified upon receipt of samples at the laboratory prior to log in.
36. **Duplicate sample IDs are not acceptable within the EQuIS database. It is imperative that samples including field blanks, trip blanks, equipment blanks, field duplicates have unique sample IDs for projects including ongoing sampling events such as quarterly groundwater monitoring.**

SUBCONTRACTED PARAMETERS

37. The EDD must be populated with **ALL** appropriate and applicable fields, including **ALL** QC data for any subcontracted parameters.

PLEASE CONTACT THE ARCADIS PROJECT CHEMIST, DATA MANAGER or PROJECT MANAGER IF THERE ARE ANY QUESTIONS REGARDING PREPARATION OR GENERATION OF THE EDD.

EXAMPLE EDD REPORTS

The following subsections provide examples of how the EQuIS EDD should be populated for QC data.

RESULT FILE FIELDS FOR A NORMAL FIELD SAMPLE, TRG AND TIC RESULTS

The table below shows some of the fields in the Result File for a normal field sample (i.e., Sample_type_code = N, TB, FD, etc.) and “TRG” or “TIC” analyte_type_code. NOTE: all QC fields are blank.

cas_rn	result value	qc original conc	qc spike added	qc spike measured	qc spike recovery	qc dup. original conc	qc dupl. spike added	qc dup. spike measured	qc dup. spike recovery
93-76-5	3.17								
94-75-7	1.56								
94-82-6	2.31								

RESULT FILE FIELDS FOR A NORMAL FIELD SAMPLE WITH SURROGATES

The following table shows some of the fields in the result file for a normal field sample (i.e., Sample_type_code = N, TB, etc.). Note that QC fields are blank except on surrogate Rows.

cas_rn	result value	result unit	result type code	qc original conc	qc spike added	qc spike measured	qc spike recovery
93-76-5	1.56	mg/L	TRG				
94-75-7	3.17	mg/L	TRG				
PHEN2F		mg/L	SUR		12.5	12.9	103

RESULT FILE FIELDS FOR A MATRIX SPIKE

The following table shows some of the fields in the result file for a matrix spike sample (i.e., Sample_type_code = MS). Note that all "dup" QC fields are blank, and that the result_value field is NULL. Also, the qc_rpd field would be blank for these rows. The parent_sample_code must contain the contents of the sys_sample_code of the original (parent) sample.

cas_rn	result value	qc original conc	qc spike added	qc spike measured	qc spike recovery	qc dup. original conc	qc dupl. Spike added	qc dup. spike measured	qc dup. spike recovery
93-76-5		1.56	4.18	5.36	90.9				
94-75-7		3.17	4.18	7.15	95.2				
94-82-6		2.31	4.22	5.66	79.3				

RESULT FILE FIELDS FOR A MATRIX SPIKE DUPLICATE

The following table shows some of the fields in the result file for a matrix spike/matrix spike duplicate considered as a single sample (i.e., Sample_type_code = MSD). Note that all QC fields are completed, and that the result_value field is not needed. Also, the qc_rpd field would be completed for these rows. The parent_sample_code must contain the contents of the sys_sample_code of the original (parent) sample.

cas_rn	result value	qc original conc	qc spike added	qc spike measured	qc spike recovery	qc dup original conc	qc dup. spike added	qc dup spike measured	qc dup spike recovery
93-76-5						1.56	4.23	5.70	97.8
94-75-7						3.17	4.23	7.62	105
94-82-6						2.31	4.13	5.33	73.1

RESULT FILE FIELDS FOR A LCS or BS \

The following table shows some of the fields in the result file for an LCS sample (i.e., laboratory control sample, blank spike, Sample_type_code = BS). The qc_rpd field is left blank for these rows.

cas_rn	result value	qc original conc	qc spike added	qc spike measured	qc spike recovery	qc dup original conc	qc dup spike added	qc dup spike measured	qc dup spike recovery
93-76-5		1.5	5.00	5.26	105				
94-75-7		10.2	1.00	1.02	102				
94-82-6		3.4	12.5	12.9	103				

RESULT FILE FIELDS FOR A LCS DUPLICATE OR BS DUPLICATE

The following table shows some of the fields in the result file for a laboratory control sample duplicate (i.e., Sample_type_code = BD). Note that the result_value field is not required. Also, the qc_rpd field must be completed for these rows.

cas_rn	result value	qc original conc	qc spike added	qc spike measured	qc spike recovery	qc dup original conc	qc dup spike added	qc dup spike measured	qc dup spike recovery	qc_rpd
93-76-5							5.00	4.92	98	2.0
94-75-7							1.00	0.95	95	6.6
94-82-6							12.5	11.8	94	12.3

REANALYSES, REEXTRACTIONS, DILUTIONS

The following table shows how to report retests for three different circumstances. The first example, the sample was retested (for 75-25-2) because the initial result required reanalysis due to QC failure. For the second example, the initial sample result (for 95-95-4) required dilution. The third example (for 67-66-3) required both reanalysis and dilution (reanalysis supercedes dilution). The fourth example (87-86-5) shows an initial result that require re-extraction due to QC failure or elevated concentrations that could not be diluted based on the original extraction. The other results are "turned off" by setting the reportable_result field to "No".

test_type	cas_rn	result_value	reportable_result
initial	75-25-2	1.2	No
reanalysis	75-25-2	1.1	Yes
initial	95-95-4	250E	No
dilution	95-95-4	328	Yes
initial	67-66-3	3.4	No
reanalysis	67-66-3	3.3	Yes
initial	87-86-5	980E	No
reextraction	87-86-5	1500	Yes

ANALYSES REQUIRING SECOND COLUMN CONFIRMATION

Analyte identification requiring confirmation by a second analytical technique is required by certain gas chromatography (GC) methods. A common technique used to confirm the identity of an analyte is to analyze the sample using a second GC column that is dissimilar from the GC column used for the first analysis. This confirmation technique is used routinely when analyzing samples for pesticides, herbicides, and certain volatile organic compounds (e.g., BTEX), and the two analyses often are performed simultaneously using an instrument equipped with dual GC columns connected to common injection port.

The method for reporting data from dual column GC analyses is not standard throughout the environmental laboratory industry. ARCADIS recommends that laboratories use the method described in SW-846 Method 8000B, unless project-specific requirements or the method used for analysis dictate otherwise. The following table illustrates the proper format to be used to report first and second column results. The results for the first and third constituents (75-25-2 and 95-95-4) are being reported from column 1, and the result for the second constituent (67-66-3) is being reported from column 2. The other results are "turned off" by setting the reportable_result field to "No".

column_number	cas_rn	result_value	reportable_result
1C	75-25-2	6.2	Yes
1C	67-66-3	3.4	No
1C	95-95-4	5.6	Yes
2C	75-25-2	1.3	No
2C	67-66-3	33.7	Yes
2C	95-95-4	5.4	No

REFERENCE TABLES

A number of fields in each of the EDD files must be entered to correspond exactly with reference values standardized by ARCADIS. These reference values will be updated from time to time. Each laboratory will be supplied a copy of the updated document. It is the laboratory's responsibility to submit EDDs using the most current reference tables as defined by a specific project.

The following table summarizes the EDD fields where standard reference values must be used:

EDD File	EDD Field	Reference Table
Sample	sample_type_code	rt_sample_type
	sample_matrix_code	rt_matrix
Test	lab_anl_method_name	rt_anl_mthd
	lab_matrix_code	rt_matrix
	prep_method	rt_std_prep_mthd
	subsample_amount_unit	rt_unit
	final_volume_unit	rt_unit
Result	lab_anl_method_name	rt_anl_mthd
	cas_rn	rt_analyte
	chemical_name	rt_analyte
	result_type_code	rt_result_type
	lab_qualifier	rt_qualifier
	result_unit	rt_unit
	detection_limit_unit	rt_unit
Batch	lab_anl_method_name	rt_anl_mthd

IV. EDP

The EDP data checker assists the **LABORATORY** in checking EDD files to ensure that they are error-free prior to submission to ARCADIS. All laboratories providing data to ARCADIS **must use** the EDP program to verify that EDDs are without error. The EDP error reports for each file **must be** submitted with each EDD.

The use of the EDDP helps to solve common data population problems including duplicate data, incorrectly populated fields, and incorrect methods, CAS #s, and other acceptable reference values. If an EDD is received by ARCADIS containing errors it will be rejected until the EDD report is acceptable for import into the EQuIS database. Invoice payment will not be made until the EDD is acceptable.

ARCADIS will provide laboratories with the most recent version of the EDP.

Appendix J

Green Remediation Metrics Form

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
 Address: _____ City: _____
 State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)

Start Date: _____

Current Reporting Period

Reporting Period From: _____ To: _____

Contact Information

Preparer's Name: _____ Phone No.: _____
 Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	Total to Date
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	Total to Date (tons)
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies and lab-supplied bottles, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	Total to Date (miles)
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service (bottle and sample delivery)		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	Total to Date (gallons)
Total quantity of water used on-site (not including treated water)		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	Total to Date (acres)
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Recommendations/Other:

CONTRACTOR CERTIFICATION	
I, _____ (Name) do hereby certify that I am _____ (Title) of _____ (Contractor Name), which is responsible for the work documented on this form. According to my knowledge and belief, all of the information provided in this form is accurate and the site management program complies with the DER-10, DER-31, and CP-49 policies.	
_____	_____
Date	Contractor

Appendix K

Remedial System Optimization – Table of Contents

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR NYSEG Binghamton Court Street Former MGP Site

- 1.0 Introduction
 - 1.1 Site Overview
 - 1.2 Project Objectives and Scope of Work
 - 1.3 Report Overview
- 2.0 Remedial Action Description
 - 2.1 Site Location and History
 - 2.2 Regulatory History and Requirements
 - 2.3 Clean-up Goals and Site Closure Criteria
 - 2.4 Previous Remedial Actions
 - 2.5 Description of Existing Site Remedy
 - 2.5.1 System Goals and Objectives
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 - 3.1 Subsurface Performance
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- 4.0 Recommendations
 - 4.1 Recommendations to Achieve or Accelerate Site Closure
 - 4.1.1 Source Reduction/Treatment
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 - 4.1.3 Conceptual Site Model (Risk Assessment)
 - 4.2 Recommendations to Improve Performance
 - 4.2.1 Maintenance Improvements
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 - 4.2.3 Process Modifications
 - 4.3 Recommendations to Reduce Cost
 - 4.3.1 Supply Management
 - 4.3.2 Process Improvements or Changes
 - 4.3.3 Optimize Monitoring Program
 - 4.3.4 Maintenance and Repairs
 - 4.4 Recommendations for Implementation

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