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REMEDIAL DESIGN WORK PLAN

Rensselaer Non-Owned Former
Manufactured Gas Plant Site
Rensselaer, New York
Site No. V00488

July 2016

Certification

I, Terry W. Young, certify that I am currently a New York State registered Professional Engineer and that this design 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 that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

July 13, 2016

Terry W. Young, P.E. Date

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ACRONYMS AND ABBREVIATIONS

AAR	Alternatives Analysis Report
ANSI	American National Standards Institute
BASE	Building Assessment and Survey Evaluation
BTEX	benzene, toluene, ethylbenzene, and xylene
CAMP	Community Air Monitoring Plan
CERP	Community Environmental Response Plan
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COC	constituent of concern
CPP	Citizens Participation Plan
CQAP	construction quality assurance plan
CSM	conceptual site model
cy	cubic-yards
DER	Division of Environmental Remediation
DNAPL	dense non-aqueous phase liquid
EAGLC	East Albany Gas Light Company
FEMA	Federal Emergency Management Agency
FSP	Field Sampling Plan
GPR	ground-penetrating radar
G-QAPP	Generic Quality Assurance Project Plan
HASP	Health and Safety Plan
HSA	hollow-stem auger
IDW	investigation-derived waste
ISS	in-situ soil solidification
LTTD	low-temperature thermal desorption
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity unit
NYCRR	New York Code of Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health

OCFS	Office of Children and Family Services
OPRHP	Office of Parks, Recreation, and Historic Preservation
PAHs	polycyclic aromatic hydrocarbons
PDI	pre-design investigation
PCBs	polychlorinated biphenyls
PID	photoionization detector
psi	pounds-per-square-inch
QA/QC	quality assurance/quality control
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RDWP	Remedial Design Work Plan
RI	remedial investigation
RQD	Rock Quality Designation
SCGs	standards, criteria, and guidance
SCO	soil cleanup objective
SMP	Site Management Plan
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	semi-volatile organic compounds
TCS	triaxial compressive strength
TCLP	toxicity characteristic leaching procedure
TOGS	Technical and Operational Guidance Series
UCS	unconfined compressive strength
USACE	United States Army Corp of Engineers
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VCO	Voluntary Consent Order
VCP	Voluntary Cleanup Program
VOC	volatile organic compound
WMP	Waste Management Plan

1 INTRODUCTION

This *Remedial Design Work Plan* (RDWP) presents the proposed activities associated with the preparation of the remedial design for the New York State Department of Environmental Conservation-(NYSDEC-) selected remedy for the National Grid Non-Owned Rensselaer former manufactured gas plant (MGP) site (the site) located in Rensselaer, New York (Site No. V00488). The selected remedy to address environmental impacts identified at the site is presented in the September 2015 NYSDEC-Voluntary Cleanup Program (VCP) Decision Document (NYSDEC, 2015). As identified therein, the selected remedy is referred to as the Source Removal, Cover System and Institutional Controls remedy.

This RDWP has been prepared by Arcadis of New York, Inc. (Arcadis) on behalf of National Grid in accordance with the 2002 Voluntary Consent Order (VCO) (Index #D0-0001-0011) between Niagara Mohawk (acquired by and now referred to as National Grid) and the NYSDEC. This RDWP has also been prepared in accordance with the NYSDEC's Division of Environmental Remediation (DER) *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010b) and includes a work plan for conducting the pre-design investigation (PDI) activities needed to support the remedial design, as well as the anticipated components of the remedial design.

1.1 RDWP Organization

The organization of this RDWP is presented in the following table.

Table 1-1. Report Organization

Section	Description
Section 1 – Introduction	Presents background information, a summary of site impacts; potentially applicable standards, criteria, and guidance; remedial action objectives (RAOs) identified for the site; and a summary of the NYSDEC-selected remedy.
Section 2 – Pre-Design Investigation Activities	Presents the scope and rationale for the PDI activities to be completed in support of the remedial design.
Section 3 – Remedial Design Activities	Presents a description of the remedial design activities to be completed in support of implementing the remedial construction activities.
Section 4 – Permits and Approvals	Identifies the anticipated permits and approvals necessary to implement the PDI and remedial action.
Section 5 – Remedial Design Documents and Schedule	Identifies the remedial design documents to be prepared in support of the remedial action, and presents the anticipated project schedule for implementing the PDI and preparing the remedial design.
Section 6 – Post-Construction Activities	Describes activities to be completed following remedial construction.
Section 7 – References	Presents a list of documents used to support the preparation of this RDWP.

1.2 Standards, Criteria, and Guidance

Chemical-, action-, and location-specific standards, criteria, and guidance (SCGs) that are potentially applicable to the design and implementation of the NYSDEC-selected remedy are presented in NYSDEC-approved *Alternatives Analysis Report* (AAR) (Arcadis, 2015). Primary SCGs that were considered during the development of this RDWP include the following:

- NYSDEC's DER-10 *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010b).
- Site-specific clean-up criteria identified in the September 2015 VCP Decision Document (i.e., visible tar or oil [tar coated or tar saturated] in material with total PAHs over 500 milligrams per kilogram [mg/kg]).
- Soil cleanup objectives (SCOs) relevant to the backfill design, based on Title 6 of the New York Code of Rules and Regulations (NYCRR) Part 375-6 (6 NYCRR Part 375-6).
- Resource Conservation and Recovery Act (RCRA) and New York State (NYS) regulations regarding the identification and listing of hazardous wastes outlined in 40 Code of Federal Regulations (CFR) 261 and 6 NYCRR Part 371, respectively.
- NYSDEC's *Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants* (DER-4) (NYSDEC, 2002).
- United States Department of Transportation (USDOT) and NYS rules for the transport of hazardous materials provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3, respectively.

1.3 Background

This section summarizes background information, including site location and physical setting, project area history and operation, and previous investigations conducted at the site.

1.3.1 Location and Physical Setting

The former MGP site is located on Washington Street in the City of Rensselaer, Rensselaer County, New York (Figure 1). The former MGP site is comprised by the former MGP area, including remnants of two gas holders, a tar well, and MGP facilities (Figure 2). The former MGP site is currently paved and used as a parking lot for the Capital View Office Park which houses the Albany Regional Office for the NYS Office of Children and Family Services (OCFS). Off-site areas surrounding the former MGP site include:

- Huyck Square to the north and Mill Creek/Huyck Pond, which is surrounded by undeveloped land.
- Academy Street to the west.

- Washington Street to the east and the Capital View Office Park.
- A private business and NYS Route 151 to the south.

For the purpose of this RDWP, the former MGP site and off-site areas are collectively referred to herein as the "project area." The project area and adjacent properties are located in an area zoned for downtown mixed-use (MU-2) and planned development district land use, as shown on the *City of Rensselaer Zoning Update 2012* map (http://www.rensselaerny.gov/Libraries/Planning_Department/Zoning_Map.sflb.ashx, accessed February 24, 2015).

1.3.2 Project Area History and Operation

The East Albany Gas Light Company (EAGLC) began gas manufacturing operations at the site circa 1876. In general, the former MGP initially consisted of a single gas holder and the former retort house, and used the coal carbonization process which did not use a petroleum feedstock (no information was identified during previous investigations to indicate that the carburetted water gas process was used at the site). Between 1900 and 1909, the site changed ownership three times: Kinderhook Light and Power Company took ownership in 1900; Hudson Railway & Power Company in 1902; and Albany & Southern Railroad Company in 1909. Additionally, according to the 1909 Sanborn® fire insurance map, the MGP was expanded to include an additional gas holder, coal shed, tar well, and meter, purifier and condenser rooms (Figure 2).

Between 1918 and 1925 the manufactured gas production ceased and the plant became part of the F.C. Huyck & Sons Felt Mill (located on the property east of the MGP). According to the 1925 Sanborn® fire insurance map, the coal shed was converted into a garage, a carpentry shop was built following demolition of the large gas holder, and the remaining MGP facilities were used as chemical laboratories. Additional Sanborn® fire insurance maps indicate that the remaining MGP structures were demolished between 1949 and 1967.

1.4 Project Area Characterization Summary

This section presents an overall characterization of the project area and a summary of the nature and extent of impacted environmental media based on the results obtained during the investigation activities conducted to date, including:

- Brown and Caldwell Associates (Brown and Caldwell) – Site Characterization (2005)
- Brown and Caldwell - Remedial Investigation (RI) (2008-2013)
- Arcadis – Monitoring well gauging (2014)

As presented in the AAR, the project area characterization consists of a summary of the topography, geology, hydrogeology, and the nature and extent of environmental impacts, as well as the conceptual site model (CSM) for the project area.

1.4.1 Project Area Topography and Drainage

The topography of the former MGP site slopes gently downward from the south to the north. The former MGP site primarily consists of a paved parking lot with minimal vegetation in the southern portion of the project area, and contains no distinctive surface water runoff pathways (e.g., drainage ditches or storm drains). The Hudson River is located approximately 800 feet west of the site and fluctuates approximately five to six feet due to high and low tides approximately every six to eight hours. A dam structure is present at Mill Creek/Huyck Pond (located to the north of the MGP site) and there is a general east to west flow in the pond, towards the Hudson River.

1.4.2 Geology

The overburden strata, in descending order from the ground surface, consists of the following:

- Fill – The fill unit is present at the ground surface with a thickness ranging from less than 1 foot to approximately 10 feet (in the southern portion of the project area). The fill unit is comprised of an anthropogenic heterogeneous mixture of reworked silt, clay, sand, gravel and cobbles, with varying amounts of ash, coal fragment, cinders, and bricks.

- Silt and Sand – The silt and sand unit is encountered below the fill unit throughout a vast majority of the project area, at depths of approximately 3 to 5 feet below grade, with a thickness ranging from approximately 5 to 25 feet. The silt and sand unit is comprised of grey to brown sand and silt with relatively thin zones of fine to medium gravel.

- Sand and Gravel – The sand and gravel unit is encountered below the silt and sand unit in the northern portion of the project area in the vicinity of the Mill Creek/Huyck Pond. Where present, this unit is encountered at depths of approximately 15 to 33 feet below grade with a thickness ranging from 2 to 15 feet. The sand and gravel unit is poorly sorted with a small amount of silt.

- Glacial Till – The glacial till unit is located above the bedrock throughout the project area. This unit is encountered below the sand and gravel unit in the northern portion of the project area and below the silt and sand unit in the southern portion of the project area. The glacial till unit is encountered at depths of approximately 8 feet to more than 20 feet below grade with a thickness ranging from approximately 4 to 18 feet. The glacial till unit is comprised of dense, poorly sorted silt, sand, and gravel.

- Bedrock – The bedrock unit is encountered below the glacial till unit at depths ranging from approximately 23 to 38 feet below grade.

1.4.3 Hydrogeology

The water table is generally encountered within the silt and sand unit. Groundwater in the project area generally flows north towards the Mill Creek/Huyck Pond, with an estimated horizontal hydraulic conductivity in the overburden ranging from 1.1 $X10^{-5}$ to 1.7 $X10^{-3}$ centimeters per second (cm/sec).

Water level data from monitoring locations indicate an upward vertical hydraulic gradient near the Mill Creek/Huyck Pond, causing groundwater to flow from the bedrock to the overburden units. However, this vertical gradient varies in both magnitude and direction in the overburden units, and no distinct continuous water bearing zones were identified in the shallow/uppermost bedrock. Additionally, tidal effects have been observed in deep overburden deposits and bedrock north of the Mill Creek/Huyck Pond.

Bedrock in the project area is shale with a very low porosity and permeability. Therefore, groundwater flow in bedrock is controlled by fractures. The upper or shallow bedrock (±18 to 30 feet below the top of bedrock surface) contains water-bearing fractures; however, these fractures do not appear to be laterally continuous across the project area.

1.4.4 Nature and Extent of Impacts

MGP byproducts, typically dense non-aqueous phase liquids (DNAPLs) (i.e., coal tar), often account for the majority of the impacts at former MGP sites. Principal components of MGP-related DNAPL include benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, which are VOCs; and polycyclic aromatic hydrocarbons (PAHs), which are semi-volatile organic compounds (SVOCs). Another MGP byproduct is gas purifier waste, which often contains cyanide. For the project area, MGP-related DNAPL, BTEX, PAHs, and (to a lesser extent) cyanide has been identified as the primary constituents of concern (COCs). A summary of the nature and extent of MGP-related environmental impacts identified for the project area based on these COCs and the presence of MGP-related non-aqueous phase liquid (NAPL) is presented below.

1.4.4.1 NAPL Distribution and Characterization

NAPL beneath the project area, primarily MGP-related DNAPL, is responsible for most of the environmental impacts resulting from the former MGP operations. Although tar-saturated or -coated subsurface material (i.e., visually impacted material) has been observed at isolated, sporadic locations throughout the project area, the vast majority of visually impacted material has been observed within or proximate to remnants of former subsurface MGP structures, including:

- the subsurface remnants of the tar well
- the subsurface remnants of the southern gas holder
- the subsurface remnants of the northern gas holder
- immediately north of the northern gas holder (i.e., at monitoring well MW-102-05)

At depths less than 10 feet below grade, visually impacted material is generally encountered within the former gas holders and tar well. At depths greater than 10 feet below grade (above the till), visually impacted material is limited to the following areas:

- immediately north of the northern gas holder and tar well
- at one location (i.e., monitoring well MW-106R-10) north of Huyck Square (where NAPL coating or sporadic NAPL was observed on the drilling equipment)
- a discrete area east of the MGP property where some NAPL was observed within a limited depth interval at two locations (i.e., soil borings B-116-09 and B-125-10)

Visually impacted material observed in the till was generally limited to the same areas, as well as two locations in the western portion of the MGP (i.e., soil boring B-106-05 and monitoring well MW-104R-10) where NAPL was observed in thin intervals (i.e., maximum 0.4-foot thickness) in the relatively shallow till.

Additionally, NAPL blebs were observed on the probe at monitoring well MW-102-05 during 2014 monitoring well gauging activities.

1.4.4.2 Soil Quality

PAH compounds at concentrations greater than their corresponding 6 NYCRR Part 375-6 SCOs were only detected at four out of the 10 sampling locations in the project area. Total PAH concentrations in surface soil samples ranged from 1.3 to 37 mg/kg. PAHs detected in surface soil were attributed to sources unrelated to the former MGP site, such as storm water runoff from roads and parking lots. Total cyanide was also not detected at concentrations exceeding the 6 NYCRR Part 375-6 SCOs. Therefore, surface soil was not identified as a medium of concern.

Subsurface soil containing individual BTEX compounds and PAHs at concentrations greater than the 6 NYCRR Part 375-6 SCOs is generally located within areas where visually impacted material has been observed. Subsurface soil containing total PAHs at concentrations greater than the 500 mg/kg SCO present in the CP-51 also coincide with the areas where the vast majority of visually impacted material has been identified (i.e., the subsurface remnants of the tar well, the southern gas holder, the northern gas holder, and immediately north of the northern gas holder at monitoring well MW-102-05). PAHs were also detected at concentrations greater than 500 mg/kg at one isolated location east of Washington Street (i.e., soil boring B-125-10[10-12']) where some NAPL-coated material was observed within the same sampling interval. Total cyanide was not detected above applicable SCOs in any of the subsurface soil samples.

1.4.4.3 Groundwater Quality

Groundwater analytical results for BTEX, PAHs (specifically naphthalene), and total cyanide were compared to the NYSDEC TOGS 1.1.1 Class GA standards and guidance values. Generally, the extent

of groundwater impacts has a strong correlation to the NAPL distribution. BTEX compounds and/or naphthalene have been detected at concentrations exceeding the NYSDEC TOGS 1.1.1 Class GA standards and guidance values in samples collected from five overburden wells, including:

- MW-102-05 and MW-106S-08 (located north of the northern gas holder)
- MW-103-05 and MW-105-08 (located north of the tar well)
- MW-107-08 (located along Washington Street, east of the northern gas holder)

The extent of overburden groundwater exceeding groundwater quality standards is generally limited and bounded by Academy Street to the west, monitoring wells MW-114-12 and MW-115-12 to the north, Washington Street (east side) to the east, and on-site monitoring well MW-101-05 to the south. Groundwater samples collected from bedrock wells MW-106R-10 MW-102R-10 have also contained BTEX compounds and naphthalene at concentrations exceeding the NYSDEC TOGS 1.1.1 Class GA standards and guidance values.

Total cyanide has been detected at concentrations exceeding the NYSDEC TOGS 1.1.1 Class GA standards and guidance values in groundwater samples collected from three overburden monitoring wells, including:

- MW-101-05 (located south of the southern gas holder)
- MW-103-05 (located north of the tar well)
- MW-105-08 (located north of the tar well across Huyck Square)

Total cyanide has not been detected at concentrations exceeding the NYSDEC TOGS 1.1.1 Class GA standards and guidance values in groundwater samples collected from bedrock monitoring wells.

1.4.4.4 Sediment Quality

Analytical results indicated that total BTEX and total PAH concentrations detected in sediment samples collected upstream of the project area were slightly greater than concentrations detected in sediment samples collected adjacent to the project area. Therefore, the COC concentrations detected adjacent to the project area were determined to be a result of background conditions of the project area (e.g., storm water run-off, soot, and/or atmospheric deposition).

1.4.4.5 Soil Vapor Quality

Results from soil vapor samples were compared to non-residential settings indoor air concentrations presented in the Guidance for Evaluating Vapor Intrusion in New York State. Non-residential setting indoor air concentrations are the 90th percentile values from the United States Environmental Protection Agency (USEPA) Building Assessment and Survey Evaluation (BASE). Soil vapor concentrations, with a few exceptions, were less than the New York State Department of Health (NYSDOH) and USEPA screening values. The exceptions appeared to have been associated with a non-MGP-related source on

or near the evaluated property. No further soil vapor or indoor air investigations during the RI were warranted in association with the former MGP.

Monitoring for vapor intrusion may be required for buildings developed on the site. This determination will be made, in accordance with the September 2015 VCP Decision Document, based on the Site Management Plan (SMP) to be developed after remedial construction activities are completed.

1.4.5 Conceptual Site Model

The CSM for subsurface soil and groundwater within the project area was developed based on the results of the RI and the 2014 monitoring well gauging. The CSM presented herein relates current conditions to the former MGP operations.

As with other MGP sites where coal carbonization processes were used, the tar encountered is typically a DNAPL. In general, tar-saturated or -coated subsurface material (i.e., visually impacted material) has been observed at isolated, sporadic locations throughout the project area; however, the vast majority of tar-saturated or -coated materials containing total PAHs greater than 500 mg/kg have been observed within or proximate to remnants of former subsurface MGP structures, including:

- Tar well – The walls of the former tar well are constructed of ¼-inch steel plates. The top of walls were encountered at approximately 4.8 feet below grade during the RI (the base of the well was not encountered at the terminal depth of 10 feet below grade for a test pit excavated during the RI). Viscous black tar was observed in the interior of the tar well; and weeping from a perforation in the steel wall. One of three subsurface samples collected from the tar well (collected from 4-5’ below grade) contained total PAHs at a concentration greater than 500 mg/kg.

- Southern gas holder – The walls of this former gas holder are constructed of brick. The holder contains fill material consisting of sand, gravel, brick, concrete, cinder and slag. Tar-saturated material was observed within this holder. Water saturation was encountered at approximately 7 feet below grade both within and outside of the southern gas holder, potentially indicating that water within the holder is in hydraulic connection with the surrounding groundwater. Two of the four subsurface soil samples collected from this holder (collected at 5-7 and 10-12 feet below grade) contained total PAHs at a concentration greater than 500 mg/kg.

- Northern gas holder – The walls of this former gas holder, consistent with the southern gas holder, are constructed of brick. The holder contains fill material consisting of sand, gravel, brick fragments, slag, coke and cinders. Tar-saturated soil was encountered within the northern holder during the RI with a greater degree of tar saturation observed in the lower portion of the holder. Total PAHs were detected at a concentration greater than 500 mg/kg in the sample collected within this holder (collected 8-10 feet below grade). The approximate depth to water measured within the northern gas holder was several feet above saturated conditions observed immediately outside of subsurface structure, potentially indicating that water in the holder has little or no hydraulic connectivity with surrounding groundwater.

- Area immediately north of the northern gas holder – Tar-saturated or -coated materials were observed north of the northern gas holder at depths below 10 feet below grade (including depths within the glacial till unit that overlies bedrock). Total PAHs at a concentration greater than 500 mg/kg was detected in only one soil sample collected from this area at a depth of 12-14 feet below grade.

As described in Section 1.6, to address cleanup criteria presented in the 2015 VCP Decision Document (i.e., visible tar or oil [tar coated or tar saturated] in material with total PAHs at concentrations greater than 500 mg/kg), the tar well and holder areas will be addressed through excavation. The area immediately north of the northern gas holder will be further investigated to determine the extent (if any) remedial action is required in this area.

The water table is encountered in the lowermost portion of the fill and within the silt and sand unit. Groundwater flow beneath the project area is primarily within the silt and sand and deeper overburden units. Groundwater flow direction is generally towards Mill Creek/Huyck Pond.

The extent of groundwater affected by the MGP impacts has a strong correlation to the NAPL distribution at the project area. NAPL has been observed at times to have entered four of the overburden monitoring wells (MW-102-05, MW-106S-08, MW-106D-08, and MW-107-08). These observations are adjacent to areas where NAPL was identified in subsurface soil. The only indications of NAPL observed during the most recent (August 2014) monitoring well gauging event were the NAPL blebs observed on the probe at monitoring well MW-102-05.

Constituent concentrations in overburden groundwater were measured at levels above the New York State Class GA groundwater quality standards or guidance values for one or more constituents in samples from five overburden wells, located downgradient and side-gradient of former MGP operations. The dissolved-phase groundwater impacts significantly decrease with distance from the tar-saturated or -coated materials. Accordingly, the extent of overburden groundwater exceeding groundwater quality standards is limited and generally bounded by Academy Street to the west, monitoring wells MW-114-12 and MW-115-12 to the north, Washington Street (east side) to the east, and on-site monitoring well MW-101-05 to the south.

Concentrations of BTEX and naphthalene in bedrock groundwater exceed the Class GA groundwater quality standards or guidance values at two locations (MW-102R-10 and MW-106R-10), both of which are north of the northern gas holder. No continuous water-bearing zones were identified in the bedrock and; therefore, it appears that: 1) the exceedances are related to NAPL present in local, discontinuous bedrock fractures; 2) these concentrations are isolated and not migrating from this area.

Based on groundwater quality sampling during the RI, there is no impact to surface water on Mill Creek/Huyck Pond as a result of discharge of groundwater to surface water. Additionally, the results of the sediment sampling and analyses indicate that there are no site-related impacts in the surficial sediments in Mill Creek/Huyck Pond.

1.5 Remedial Action Objectives

As presented in the VCP Decision Document, the site-specific RAOs for soil, groundwater, and soil vapor consist of the following:

Soil

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.
- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of groundwater or surface water contamination.

Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the site.

1.6 Description of Selected Remedy

As presented in the NYSDEC's September 4, 2015 VCP Decision Document, the selected remedy for the Rensselaer former MGP site consists of the following components (Figure 2):

- Implementing a remedial design program to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program.

- Excavating and transporting for off-site treatment/disposal the structures and contents of the former MGP holders and the former tar well structure and contents, and contaminated soils containing visible tar or oil in material with total PAHs greater than 500 mg/kg. Approximately 2,300 cubic-yards (cy) of materials will be removed and treated/disposed off site. Removal areas will be backfilled with imported fill that meets the applicable requirements specified in 6 NYCRR Part 375-6.7(d).

  A PDI will be conducted in the area immediately north of the northern gas holder and tar well to further evaluate the potential for NAPL to migrate. Based on the results of this investigation, this area will be addressed, as necessary, by excavation and off-site disposal and/or in-situ solidification (ISS).

- Installing a site cover to allow for restricted residential use of the project area. The cover will consist either of asphalt pavement, structures such as buildings, pavement, sidewalks comprising the

development of the project area or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable SCOs.

- Establishing an institutional control for the site in the form of an environmental easement to achieve the following:
  - Require to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8(h)(3).
  - Allow for the use/redevelopment of project area properties for restricted-residential, commercial, and industrial use as defined by 6 NYCRR Part 375-1.8(g); although land use is subject to local zoning laws.
  - Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County Department of Health.
  - Require compliance with an SMP.
- Preparing and implementing an SMP that includes the following:
  - An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the project area and details the steps and media-specific requirements necessary to ensure the institutional and/or engineering controls remain in place and effective. Note that institutional controls shall also include an agreement with the off-site property owner(s) necessary to implement the remedy and future site management of the off-site properties.
  - A Monitoring Plan to assess the performance and effectiveness of the remedy.

On February 10, 2016, NYSDEC submitted a letter to National Grid, requesting that an environmental easement be established for the site. As documented in NYSDEC's March 24, 2016 email to National Grid and Arcadis, NYSDEC clarified that the environmental easement was to be established on the parcel that comprises the former MGP site only and that agreement(s) with the off-site property owner(s) would be required to implement the remedy and necessary future SMP.

Therefore, for purpose of this RDWP, references to institutional controls consist of the environmental easement to be established on the former MGP site, as well as the agreement(s) between National Grid and the off-site property owner(s).

2 PRE-DESIGN INVESTIGATION ACTIVITIES

This section describes the PDI activities to be conducted at the project area to address additional data needs necessary to support the remedial design for the NYSDEC-selected remedy. PDI activities will be conducted in a phased-approach and will generally consist of the following:

Phase I

- Cultural Resources Investigation
- Utility Coordination and Markout
- NAPL Investigation
- Soil Investigation
- Investigation-Derived Waste (IDW) Management
- Site Survey

Phase II

- Representative Media Sampling
- ISS Bench-Scale Testing

Methodologies and protocols to be followed during the completion of the PDI activities are presented in the *Field Sampling Plan* (FSP) included as Appendix A. Health and safety protocols to be followed by field personnel during investigation activities are presented in the *Health and Safety Plan* (HASP) included as Appendix B. The air monitoring activities to be conducted during intrusive PDI activities are presented in the *Community Air Monitoring Plan* (CAMP) included as Appendix C. Note that the CAMP only covers community air monitoring activities to be conducted during the PDI and a separate CAMP will be prepared as part of the remedial design, to support remedial construction activities. Analytical procedures and requirements to be followed for the laboratory analysis of samples collected during investigation activities are presented in National Grid's *Generic Quality Assurance Project Plan* (G-QAPP) included as Appendix D.

2.1 Phase I PDI Activities

The Phase I PDI activities will generally be conducted to support the excavation design, as well as to further assess the absence/presence of mobile NAPL immediately north of the northern gas holder and tar well (i.e., near or within Huyck Square). Phase I PDI activities are described in the following subsections.

2.1.1 Cultural Resources Investigation

As part of the RI and in accordance with the National Historic Preservation Act (16 USC 470), a Phase IA Cultural Resources Investigation was performed to assess whether or not cultural resources of concern are present in the project area and to determine if a Phase IB subsurface investigation (e.g., excavation

of small test pits at close, fixed intervals to verify the presence or absence of archeological or historic artifacts) for the project area is warranted. The Phase IA evaluation was conducted by Panamerican Consultants, Inc. of Buffalo, New York (Panamerican); and their August 2012 report was provided in Appendix C of the *Remedial Investigation Report* (Brown and Caldwell, 2014). National Grid submitted Panamerican's Phase IA Report to the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) on March 5, 2013 and subsequently submitted an April 9, 2013 letter responding to comments received from OPRHP (in a letter dated March 18, 2013). The OPRHP concurred with National Grid (in a letter dated May 3, 2013) that the overburden strata between the fill and the glacial till has the potential to contain cultural materials.

As part of the PDI, National Grid will coordinate with the OPRHP and NYSDEC to determine what (if any) additional cultural resource information activities are required.

2.1.2 Utility Coordination and Markout

The presence and location of utilities that may impact the proposed Phase I PDI activities and remedial construction of the selected remedy will be identified in coordination with National Grid, the City of Rensselaer, and other parties (as appropriate). Both a public and a private utility locator will markout the approximate location of subsurface utilities and obtain invert elevations for any sewer lines/manholes within the project area. Additionally, a non-intrusive survey will be conducted using ground-penetrating radar (GPR) to evaluate the potential presence of subsurface utilities, as well as to confirm the location of the former gas holders/tar well prior to test pit excavation (as discussed in Section 2.1.4.2). The locations of subsurface utilities will be considered during the evaluation and design of potential support system(s) to be used to facilitate the excavation activities described in Section 3.1.

Current known utilities at the site are shown on Figure 2, including overhead electrical transmission lines, south of Huyck Square, west of Washington Street, and east of Academy Street; subsurface storm and sanitary sewers, and potable water lines, and overhead telecommunication lines within Huyck Square, Washington Street, and Academy Street.

2.1.3 NAPL Investigation

As indicated in Section 1.4, visually impacted material was observed in the area immediately north of the northern gas holder and the tar well (i.e., near or within Huyck Square). However, immediately north of the gas holder, NAPL was only generally observed on drilling equipment and sporadically/occasionally during the installation of monitoring wells in this area. Additionally, recoverable quantities of NAPL were rarely encountered in the monitoring wells immediately north of the northern gas holder; although some wells were not constructed with a sump (to collect NAPL).

Therefore, NAPL investigation activities will be conducted to further assess the absence/presence of mobile NAPL in this area. NAPL investigation activities, including decommissioning of select existing monitoring wells, installation of new NAPL monitoring wells, and conducting NAPL monitoring activities, are described below.

2.1.3.1 Monitoring Well Decommissioning

Existing monitoring wells MW-102-05 and MW-103-05 located immediately north of the northern gas holder and the tar well were not constructed to collect NAPL (i.e., constructed without a sump) and will be abandoned. Existing monitoring well decommissioning activities will be completed in accordance with NYSDEC's guidance CP-43 Groundwater Monitoring Well Decommissioning Policy (NYSDEC, 2009). Consistent with NYSDEC's policy, monitoring wells MW-102-05, and MW-103-05 will be decommissioned via pulling the upper five feet of well casing and grouting the wells in place (to ground surface) with a non-shrink grout. NYSDEC Well Decommissioning Records will be completed for the decommissioned monitoring wells and submitted to the NYSDEC as part of a Phase I PDI Summary Report letter (described in Section 2.1.7).

2.1.3.2 New Monitoring Well Installation

A total of three new NAPL monitoring wells (i.e., MW-116 to MW-118 will be installed to collect and facilitate the recovery of potentially mobile NAPL (if any) in the area immediately north of the northern gas holder and the tar well. Two of the new NAPL monitoring wells (i.e., MW-116 and MW-118) will be installed adjacent to the previously decommissioned monitoring wells (i.e., MW-102-05 and MW-103-05); the third new NAPL monitoring well will be installed in-between these locations. The soil borings drilled for installation of the new NAPL monitoring well MW-118 will serve as a geotechnical soil boring as described in Section 2.1.4.1. New NAPL monitoring well locations are shown on Figure 3.

The upper five feet of the soil borings completed to facilitate the installation of the new NAPL monitoring wells will be cleared using air knife/vacuum technologies (or other appropriate methods) to confirm that no utilities are present at the proposed well location. New NAPL monitoring wells will be installed using hollow-stem auger (HSA) techniques to the top of till (depths ranging from approximately 20 to 22 feet below grade). Soil recovered from each soil boring will be visually characterized for color, texture, and moisture content. The presence of visible staining, sheen, NAPL, and obvious odors encountered in the soil (if any) will be documented. The new monitoring wells will be constructed using 2-inch diameter schedule 40 PVC and will be equipped with a 10-foot long 0.02-inch well screen and a 2-foot long sump. The new monitoring wells will be completed at the ground surface with a flush-mount curb box. The final location and depth of the new NAPL monitoring wells will be determined based on field observations.

At least 24 hours following installation, the NAPL monitoring wells will be developed by surging/purging using a positive displacement pump and dedicated polyethylene tubing or new, disposable polyethylene bailers. The well will be developed by alternately surging and purging the well screen until the water removed from the well is reasonably free of visible sediment (50 nephelometric turbidity units [NTUs]), or until the turbidity levels stabilize following the removal of 10 well volumes.

Following installation and development of the new monitoring wells, groundwater and NAPL level measurements will be collected from the new NAPL monitoring wells, as described in the following subsection.

2.1.3.2 NAPL Monitoring

Following installation of the new NAPL monitoring wells (i.e., MW-116 to MW-118), periodic NAPL monitoring will be conducted using the existing well monitoring network and the newly installed wells to assess the absence/presence of mobile NAPL in the area immediately north of the northern gas holder and the tar well. NAPL in quantities greater than one foot will be removed from the monitoring wells, to the extent practicable, by manual bailing or periodically pumping (with a portable pump) NAPL from the wells. Recovered NAPL (if any) will then be containerized and transported off-site for treatment/disposal by National Grid's waste disposal vendor after the completion of each NAPL monitoring event. NAPL monitoring activities will be initially conducted approximately one week following the installation and development of the new NAPL monitoring wells and then on a monthly basis for a period of one year. The frequency of the NAPL monitoring events or the NAPL monitoring duration may be modified based on the quantity of NAPL observed at the monitoring wells.

If significant quantities of NAPL are collected during NAPL monitoring activities (i.e., NAPL is determined to be potentially mobile), ISS treatment or targeted excavation activities could be implemented to address the potentially mobile NAPL north of the northern gas holder and tar well. National Grid, in conjunction with the NYSDEC, will determine the additional measures (if any) that would be required to address NAPL in this area based on the results of the NAPL monitoring activities, and observations/field measurements obtained during installation of the new NAPL monitoring wells, and previous site investigations.

2.1.4 Soil Investigation

Soil investigation activities will be conducted in support of developing and completing the remedial soil excavation plans and activities. Specifically, soil investigation activities will be conducted to:

- Obtain geotechnical data necessary to evaluate and design potential soil excavation support systems.
- Confirm holder and tar well locations.
- Obtain waste characterization data to support profiling for off-site treatment/disposal (and facilitate direct-loading) of excavated materials during the remedial design.

A summary of the soil investigation activities to be completed is presented below.

2.1.4.1 Geotechnical Sampling

A total of four geotechnical soil borings (B-134 to B-137) will be completed, at the locations shown on Figure 3, to support the design of the required excavation activities. Note that the soil boring completed to facilitate the installation of new NAPL monitoring well MW-118 will also serve as geotechnical soil boring B-135. Geotechnical soil borings will be completed using HSA methods to depths up to 30 feet below grade (i.e., to refusal). Soil sampling will be performed continuously at each geotechnical soil boring to

the top of bedrock using 2-inch diameter split spoon sampling devices. Standard Penetration Testing will be conducted to assess the relative density of the in-place soils following ASTM D1586. Each soil boring sample will be visually characterized for soil type and the presence or absence of visible staining, sheen, NAPL, and obvious odors.

Soil samples collected from geotechnical soil borings will be submitted for the following geotechnical testing:

- Grain size distribution by ASTM D422
- Atterberg limits by ASTM D4318
- Specific gravity by ASTM D854
- Moisture content by ASTM D2216

The total number of samples to be submitted for geotechnical testing and specific geotechnical analyses to be performed will be determined based on field conditions.

Additionally, a minimum of five (5) feet of bedrock coring (ASTM D2113) will be completed at borings B-137 and MW-118/B-135. Bedrock will be continuously cored using HQ-sized coring equipment resulting in a 3.8-inch diameter corehole. Recovered bedrock cores will be observed and described by a geologist, and screened for VOCs using a PID. Rock Quality Designations (RQD's), in accordance with ASTM D6032, of each core run will also be calculated in the field during the program. Additionally, a subset of core samples will be chosen for laboratory analysis of triaxial compressive strength (TCS) by ASTM D7012-10 based on lithology changes and physical appearance. The rock core information generated will be used to evaluate rock strength to support the design of excavation support systems. Once completed, each borehole will be grouted to the existing grade, unless the borehole will facilitate the installation of a monitoring well. Soil cuttings generated during the fieldwork will be staged on-site in an appropriate container (e.g., drum) to facilitate investigation-derived waste (IDW) disposal.

2.1.4.2 Test Pits

Test pits will be completed to confirm the location of the former gas holders/tar well, as well as locate/identify shallow foundations obstructions, and/or other subsurface features that may potentially impact the design and implementation of the remedial construction activities (e.g., soil removal, installation of excavation support systems). A total of five test pits (i.e., TP-106 through TP-110) will be completed using a rubber-tired backhoe or small excavator at the locations shown on Figure 3. Final test pit locations will be determined based on the results of the GPR survey. Prior to excavating the test pits, the asphalt pavement will be saw-cut to minimize the damage to the surrounding pavement. Test pits will be excavated to depths ranging from 5 to 10 feet below grade, or as allowable by soil conditions. Excavated material will be visually examined and logged by a geologist and temporarily staged on polyethylene sheeting adjacent to the test pits. The excavations will be sketched and photographed, as appropriate, to record pertinent subsurface features. Additionally, the location and elevation of subsurface foundations and/or obstructions (if any) will be surveyed.

Each test pit will be backfilled by replacing the excavated material in the reverse order that it was removed (i.e., excavated materials will be placed back into the test pits at approximately the same depths and locations from which they were removed). Visually clean soils will be used to cover visually impacted material (if encountered). Observations of subsurface structures/conditions and visual impacts (if present) will be considered during preparation of the remedial design. Following the completion of the test pits, removed pavement will be replaced with a hot or cold mix, as available.

2.1.4.3 Waste Characterization Sampling

Materials excavated during the remedial construction activities are anticipated to be transported off-site for treatment and/or disposal as follows:

- Soil containing visual MGP-related impacts and/or is characteristically hazardous for benzene is anticipated to be sent for off-site treatment via low-temperature thermal desorption (LTTD) (i.e., at ESMI's Fort Edward facility).

- Excavated materials that do not contain visual impacts are anticipated to be sent for off-site disposal as non-hazardous solid waste (i.e., at the City of Albany Landfill).

To support profiling for off-site treatment/disposal and facilitate direct-loading of the excavated materials during the remedial construction of the selected remedy, a total of ten waste characterization samples are anticipated to be collected. In general, two waste characterization samples will be collected from each test pit location; one composite soil sample will be collected from the upper half of the test pit (anticipated to contain non-visually impacted material) and one composite soil sample will be collected from the lower portion of the test pit (anticipated to contain visually impacted material). Sample depth intervals may be modified in the field, based on the presence/absence of visual impacts and subsurface obstructions, to meet treatment/ disposal facility analytical and sampling frequency requirements. The need for additional waste characterization samples (e.g., from soil borings) will be evaluated based on field observations.

Waste characterization samples containing visually impacted material will be submitted for chemical analysis in accordance with the ESMI's Fort Edward, New York facility analytical requirements, including:

- Total petroleum hydrocarbons (USEPA Method 8015)
- Total VOCs (USEPA Method 8260B)
- Total SVOCs (USEPA Method 8270C)
- Total polychlorinated biphenyls (PCBs) (USEPA Method 8080)
- Total Metals (USEPA Method 6010B), plus antimony, beryllium, nickel, thallium, vanadium, and zinc.
- Total cyanide (USEPA Method 9010)
- Percent sulfur (USEPA Method D129-64)
- BTU content (ASTM D240-87)

Waste characterization samples containing non-visually impacted material will be submitted for chemical analysis in accordance with the City of Albany Landfill analytical requirements, including:

- Toxicity characteristic leaching procedure (TCLP) VOCs (USEPA Method 8260)
- TCLP SVOCs (USEPA Method 8270)
- TCLP Metals (USEPA Method 6010)
- Mercury (USEPA Method 7470)
- Total PCBs (USEPA Method 8082)
- Pesticides (USEPA Method 8081)
- Herbicides (USEPA Method 8151)

2.1.5 Investigation-Derived Waste Management

All IDW generated during PDI activities will be containerized on-site. Soil cuttings, personal protective equipment, spent disposable sampling materials, and water generated during sampling and decontamination activities will be segregated by waste type and placed in DOT-approved fifty-five (55)-gallon steel drums. Additionally, NAPL (if any) generated during PDI activities will be containerized in DOT-approved 5-gallon steel containers. Each drum/container will be appropriately labeled (i.e., with the contents, generator, location, and date).

Drums/containers will be secured (e.g., in a box truck or other container) at the Capital View Office Park parking lot (for the duration of the PDI activities). At the end of the PDI activities, National Grid's waste disposal vendor, Clean Harbors, will transport the generated IDW for off-site treatment/disposal in accordance with state and federal regulations. NAPL and IDW generated during the periodic NAPL monitoring activities will be removed from the site the same day that it is generated.

2.1.6 Site Survey

A land survey will be conducted in the project area to document the location of the Phase I PDI sampling activities described in Section 2.1 and to facilitate the preparation of the remedial design as presented in Section 3. Following the completion of the Phase I PDI activities (e.g., soil borings, test pits, monitoring well installations, etc.), a survey will be completed by a New York State Licensed Surveyor to identify the location and ground surface elevation for each of the PDI locations. Additional topographic survey information will also be obtained to establish a pre-construction baseline that will facilitate restoration of the site to pre-construction conditions following remedial construction, including property boundaries, easements, and right-of-ways; existing site features (e.g., buildings, roadways/sidewalks, monitoring wells, paved/ vegetated surfaces, etc.); and one-foot contours.

2.1.7 Phase I PDI Documentation

The results from the Phase I PDI will be documented in a *Phase I PDI Summary Report*. Those results, along with existing site information, will be used to support the basis for the Phase II PDI (if necessary) and the remedial design. The *PDI Summary Report* will include the following:

- A summary of the PDI activities including health and safety monitoring, CAMP monitoring, field observations, sampling results, problems encountered, and other pertinent information necessary to document that the site activities were performed pursuant to this RDWP.
- Boring, test pit, and monitoring well construction logs.
- Summary tables presenting the analytical testing results.
- An updated site plan(s) showing the locations of the soil borings, test pits, and new monitoring wells, as well as the locations of identified above- and below-ground utilities and pertinent subsurface features identified.
- An updated CSM (as necessary).
- An evaluation of the need to implement the Phase II PDI.
- An updated schedule for the completion of the remedial design.

2.2 Phase II PDI Activities

If the PDI activities indicate that, in the area north of the northern gas holder and tar well, the potential exists for NAPL to further migrate (i.e., tar coated or saturated material is present), excavation and or ISS treatment may be required. If ISS treatment is determined to be necessary, bench-scale testing would be conducted as part of the Phase II PDI activities to determine the feasibility of effectively solidifying impacted soils through an evaluation of potential ISS mix designs. The Phase II PDI activities presented in the following subsections summarize the general scope of the bench-scale testing, which may be refined/modified based on the results obtained during Phase I of the PDI.

2.2.1 Representative Media Sampling

Bench-scale testing would include drilling soil borings to facilitate the collection of samples of representative media, including obtaining two 5-gallon composite soil samples (collected from the most heavily impacted material encountered at the soil boring locations) and a 5-gallon sample of site groundwater. Additionally, a 5-gallon sample of potable (municipal) water will also be collected from a source that would likely be used during the remedial construction. These samples will be submitted for bench-scale testing to the Arcadis geotechnical laboratory located in Durham, North Carolina. The location of the soil borings that would be completed to facilitate the collection of samples of representative media will be determined based on the results of the Phase I NAPL monitoring activities and will be presented in the Phase I PDI Summary Report.

Samples of representative media may be collected during the installation of new monitoring wells MW-116 through MW-118 depending on field observations (e.g., if significant quantities of NAPL are observed

during the installation of the new monitoring wells), and held Arcadis geotechnical laboratory at for bench-scale testing following NAPL monitoring activities.

2.2.2 Bench-Scale Testing

The samples of representative site media will be used during bench-scale testing to identify solidification mixtures that will successfully immobilize site-related constituents in impacted materials while achieving sufficient strength. Solidification mixtures will be evaluated based on the following criteria:

- *Reduction in the hydraulic conductivity of the soil matrix resulting from treatment.* The reduction in hydraulic conductivity of the treated soil matrix will result in a corresponding reduction in the potential leachability of COCs within the stabilized soil matrix. The target hydraulic conductivity for the treated soil matrix following addition of mixing reagents will be approximately 1 x 10^{-6} cm/sec or less.

- *Physical properties of the treated soil.* The treated soil matrix will need to have suitable physical properties to withstand anticipated future site activities and surface/subsurface loads without settling or deterioration. The targeted 28-day unconfined compressive strength (UCS) of the treated soil matrix will be greater than 50 pounds-per-square-inch (psi). UCS requirements (i.e., maximum allowable UCS) may be updated based on further evaluation of future site use.

Once at the geotechnical laboratory, composite soil samples will be visually characterized within the 5-gallon containers, and then homogenized (based on material type and extent of impacts, whether lightly impacted or heavily impacted) to prepare representative samples for bench-scale testing. Subsamples will be collected from each representative sample and analyzed as described below:

- Chemical Analyses:
  - Two samples for total VOCs (SW-846 Method 8260)
  - Two samples for total SVOCs (SW-846 Method 8270)
  - One sample for Synthetic Precipitation Leaching Procedure (SPLP) VOCs (Method 1312 for extraction)
  - One sample for SPLP SVOCs (Method 1312 for extraction)

- Geotechnical Analyses:
  - pH (Hach Test Kit)
  - Grain Size (ASTM D422)
  - Atterberg Limits (ASTM D4318)
  - Classification (ASTM D2487)
  - Loss on Ignition (ASTM D2974)
  - Total Organic Carbon (USEPA Lloyd Kahn Method)
  - Ash Content (ASTM D2974)
  - Moisture Content (ASTM D2216)

The results of these analyses will be used as a baseline to identify a “worst case” soil sample for further testing and development of an optimal mix design.

Following physical characterization of the soil samples, ISS mix designs containing a combination of site soils, groundwater, on-site potable water, and various reagents (e.g., Portland cement, bentonite, organo-clay, fly ash, and/or blast furnace slag) will be prepared and bench-scale testing activities will then be conducted to develop a mixture that achieves a reduced hydraulic conductivity and suitable physical properties. Up to ten soil/grout mix designs will be developed and tested for the following physical properties:

- Slump and Density (ASTM D143 Modified)
- pH and Temperature (API RP 13B)
- Moisture Content (ASTM D 2216/2937)
- Penetration Resistance (after 1, 3, and 5 days of curing) (ASTM D1558)
- Hydraulic Conductivity – tested at 7 and 28 days (ASTM D5084)
- Unconfined Compressive Strength – tested at 7 and 28 days (ASTM D1633/D4832)

Mix designs will be optimized (as appropriate) to formulate at a minimum one final mix design that is suitable and meet the hydraulic conductivity and strength targets for ISS treatment for the site.

Based on the results of the mix design testing, up to two mix designs will selected for leachability testing. The leachability goal for the bench-scale study is for concentrations in leachate obtained from the solidified soil to be reduced over baseline conditions.

The leachability test will be conducted by placing each stabilized monolithic sample in a vessel constructed of nonreactive materials and designed for the extraction of organic chemicals. A known quantity of deionized water compliant with the surface area to liquid ratio presented in the American National Standards Institute (ANSI) method ANSI/ANS-16.1-2003; R2008 (Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-Term Test Procedure) will be added to the container creating a zero headspace condition. The ANSI leaching vessel will then sit quiescently in the dark for 24 hours. After the 24-hour leaching interval, the aqueous contents of the leaching vessel will be poured off, preserved, and stored according to USEPA Methods 8260 and 8270. This process will be repeated daily for a minimum of 20 days. Leachate samples collected on the 1st, 5th, 10th, 15th, and 20th days will be submitted for laboratory analysis for total VOCs and total SVOCs (via Methods 8260 and 8270, respectively) to demonstrate a reduction in leachability over time. Arcadis’ Standard Operating Procedure for the monolith leaching method is included as Attachment 1.

The monolith leaching procedure is considered more representative of field conditions than alternative testing procedures including the TCLP and the Synthetic Precipitation Leaching Procedure. TCLP analysis is intended to characterize the mobility of contaminants from wastes that are to be disposed of in a landfill setting. SPLP analysis is intended to characterize the mobility of contaminants from wastes that will be subjected to acid rain recharge. Both the TCLP and SPLP methods require crushing to particle sizes that do not exceed 3/8-inch. The protocols associated with these leachability tests, including the

requirement for crushing of the sample, are not representative of the conditions under which the full-scale monolith will be exposed.

The results of the analyses/testing listed above will be used to identify the optimal ISS mix design that will be presented in the remedial design. Once a final mix design has been determined based on the performance criteria presented above, the selected grout will be tested for the following parameters:

- Viscosity, Density, pH, Temperature (API RP 13B)
- Grout Bleed (ASTM C940)
- Set Time (ASTM D403/C953)

A treatability study report will be prepared to document the results of bench-scale testing activities, including mix ingredients, observations and results of the various tests.

3 REMEDIAL DESIGN ACTIVITIES

This section presents a description of the remedial design activities to be completed to prepare the design for the selected site remedy. Work activities associated with preparing the remedial design will be conducted under the following general tasks:

- Soil Excavation
- In-Situ Soil Solidification (if necessary)
- Backfilling
- Site Cover Installation
- Post-Remediation Groundwater Monitoring

A description of each task associated with the preparation of the remedial design is presented below. Note that additional supporting remediation tasks (e.g., site preparation, waste management, etc. will be developed as part of the remedial design). The remedial design will also present proposed locations for temporary remediation support structures (e.g., temporary water treatment system, staging areas, etc.); requirements for soil and sediment erosion control; monitoring and mitigating procedures for dust, odor, and vapors; and traffic control measures.

3.1 Soil Excavation

The results of the geotechnical sampling and test pitting (described in Sections 2.1.4.1 and 2.1.4.2) will be used during the remedial design to evaluate potential excavation support system(s). Excavation activities are anticipated to be completed to depths ranging from approximately 10 to 13 feet below grade (the final depths will be determined based on the results of the Phase I PDI activities) using pre-fabricated excavation support systems (e.g., slide rail). The final excavation support system(s) will be designed in a manner that will protect potential utilities located near or within the project area. The final type, location, and design of the excavation support system(s) will be presented in the remedial design. Additionally, the remedial design will describe the requirements for handling and off-site transportation/disposal of excavated soil (based on the results of the waste characterization sampling described in Section 2.1.4.3).

Based on the anticipated excavation depths, excavation activities will be conducted below the water table. Groundwater will be removed from the excavation areas to facilitate excavation activities. Dewatering rates, appropriate means and methods to dewater excavation areas, and disposal/treatment options for water generated during dewatering activities will be evaluated in the remedial design.

3.2 In-Situ Soil Solidification

As discussed in Section 2.2, ISS treatment could be conducted to address tar coated or saturated material in the area immediately north of the northern gas holder and the tar well. National Grid, in conjunction with the NYSDEC, will determine if ISS treatment (or additional soil removal) will be required, as well as the extent of treatment (or removal), based on observations made during installation of the new NAPL monitoring wells and the results of the NAPL monitoring activities.

An optimal mix design(s) will be identified during bench-scale testing (described in Section 2.2.2) to best meet the ISS performance criteria. Mixing will be performed by mechanically turning the soil with the excavator bucket or auger until the grout is evenly distributed throughout the soil (i.e., the mixture is homogenized). ISS treatment methods will be further assessed as part of the remedial design. Additionally, requirements for quality assurance/quality control (QA/QC) sampling and analysis (to be performed during ISS treatment) will be established during the remedial design to verify that performance criteria are met.

Groundwater flow modeling will also be conducted during the remedial design to determine the feasibility of implementing ISS treatment in the area immediately north of the northern gas holder and the tar well. Groundwater flow modeling will consist of completing predictive simulations using a three-dimensional MODFLOW groundwater flow model (MODFLOW model) to assess potential changes to site hydraulics that would occur as the result of the implementation of ISS treatment. If the results of the MODFLOW model predictive simulations indicate that implementing ISS would cause significant hydrogeologic site impacts (e.g., groundwater mounding/flooding above ground surface and adverse changes to groundwater flow patterns as a result of reduced soil permeability in the area targeted for treatment), this area would be addressed via excavation.

3.3 Backfilling

Following the completion of soil removal activities, excavated areas, as well as the ISS treatment area (if implemented), will be backfilled with imported fill that meets the requirements set-forth in Section 5.4 of DER-10. Disturbed surfaces would be restored, in kind, with asphalt pavement, concrete, etc.

Appropriate materials to be used as backfill following the soil removal activities will be identified during the remedial design. The remedial design will include specifications (i.e. gradations, material types, and analytical criteria) for imported fill materials to reflect existing site soils, as appropriate. Review of geotechnical data collected during the PDI activities will be used to identify the fill material(s) to be used during remedial construction. Backfilling and grading protocols (e.g., lift thickness, compaction requirements, etc.) will also be specified in the remedial design.

3.4 Site Cover

As indicated in the VCP Decision Document (NYSDEC, 2015), a site cover is required to allow for restricted residential use. The existing asphalt pavement and structures (such as buildings, sidewalks, etc.) that comprise the site serve as a cover. Hard surfaces (i.e., asphalt and concrete) removed/ damaged during remedial construction will be restored in kind. Vegetated surfaces disturbed during remedial construction will be restored with a minimum of two feet of material that meets 6 NYCRR Part 375-6 SCOs for restricted residential use. Soil cover material will be placed over a demarcation layer and the upper six inches will be vegetated. As indicated in the VCP Decision Document, areas subject to ISS treatment (if any) will be covered with a minimum of 4 feet of material that meets the 6 NYCRR Part 375-6 SCOs for residential use. The remedial design will include specifications for the various surface cover materials and provide a grading plan for the final site cover.

3.5 Post-Remediation Groundwater Monitoring

As indicated in Section 1, site groundwater contains BTEX, PAHs, and cyanide at concentrations greater than NYSDEC Class GA groundwater standards and guidance values. Although there are no current users of groundwater or exposures to impacted groundwater, and the dissolved phase groundwater impacts significantly decrease with distance from tar-saturated or -coated materials, the NYSDEC-selected remedy includes conducting periodic groundwater and NAPL monitoring to assess the performance and effectiveness of the selected remedy.

Groundwater monitoring activities would include collecting groundwater samples from select monitoring wells. The specific wells to be sampled and the frequency of sampling events will be preliminarily determined during the remedial design based on the results of previous site investigations and the PDI. Groundwater samples would be submitted for laboratory analysis for BTEX, PAHs, and cyanide. The results of the groundwater monitoring would be presented to NYSDEC in a periodic report.

Groundwater monitoring activities would also include assessing select monitoring wells for the absence/presence of NAPL and manually removing measurable NAPL (if any), to the extent practicable. Recovered NAPL would be containerized and transported off-site for treatment/disposal in accordance with applicable rules and regulations.

Note that post-remediation groundwater/NAPL monitoring requirements will be generally discussed in the remedial design. However, the exact number of wells and monitoring frequency will be presented in the SMP that will be prepared following the conclusion of the remedial construction activities.

4 PERMITS AND APPROVALS

The remedial design will be developed to meet applicable SCGs, permits, and approvals. In addition to NYSDEC approval of the remedial design, permits and approvals will be necessary to conduct the PDI field activities and to implement the NYSDEC-selected remedy.

4.1 PDI Permits and Approvals

At a minimum, National Grid will extend the existing access agreement with Capital View Office Park to gain access to the project area in order to conduct PDI activities. In support of the PDI, National Grid will also assess the need for any street work permits required by the City of Rensselaer.

4.2 Remedial Design Permits and Approvals

Permits and approvals necessary to complete the remedial construction activities include (but are not limited to) access agreements to facilitate access to and/or conduct remediation construction activities on non-owned properties. National Grid will extend the existing access agreement with Capital View Office Park prior to conducting the remedial construction activities. Additionally, National Grid would coordinate with the City of Rensselaer to evaluate the need for permits for temporary lane/road closures in Washington Street, Academy Street, and/or Huyck Square during remedial construction activities.

Based on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, Community-Panel Number 361032-0001-B (effective March 18, 1980), the site is located within a 100-year flood plain. The need to obtain construction permits for conducting work within a flood plain will be evaluated during the remedial design through consultation with the NYSDEC and/or the United States Army Corp of Engineers (USACE).

A final list of permits necessary to implement the remedy will be identified during the remedial design.

5 REMEDIAL DESIGN DOCUMENTS AND SCHEDULE

Consistent with the requirements set forth in DER-10 (NYSDEC, 2010b), the following remedial design submittals will be prepared:

- Preliminary Remedial Design Report
- Draft Final Remedial Design Report
- Final Remedial Design Report

The contents of each remedial design document are presented below.

5.1 Preliminary Remedial Design Report

The *Preliminary Remedial Design Report* will generally include the following information:

- A summary of the remedy with a basis of design that describes the proposed remedial design and presents information used to develop the design and construction components of the project.

- A set of engineering design drawings that represent an accurate identification of existing site conditions and an illustration of the work proposed. Each engineering design drawing will include a north arrow (where applicable), scale, legend, definitions of all symbols and abbreviations and sheet number. The engineering design drawings are anticipated to include, at a minimum, the following:

  - Title Sheet – to include at least the title of the project, key map, date prepared, sheet index and NYSDEC project identification.

  - Existing Site Plan – to include pertinent property data including owners of record for all properties adjacent to the site (as necessary); site survey including the distance and bearing of all property lines that identify and define the project site; all easements, right-of-ways and reservations (as necessary); existing buildings and structures, wells, facilities and equipment; a topographic survey of existing contours and spot elevations within the project limits of disturbance, based on United States Geological Survey (USGS) datum; all known existing underground and aboveground utilities; and location and identification of significant natural features, including, among other things, wooded areas, water courses, wetlands and flood hazard areas.

  - Site Remediation Plan – to include limits of soil excavation and ISS treatment (if necessary), and relocation of utilities (if any).

  - Restoration Plan – to include limits of the final surface cover, location of new structures and/or wells, and other final restoration features.

- Draft Technical specifications. Technical specifications are anticipated to include:

  - A description of site controls for protecting the public health, safety, welfare and environment and to maintain the effectiveness of the remedial action.

  - The regulatory and permitting requirements associated with implementing the remedial construction activities.

  - A general description of the various components associated with completing the remedial construction activities.

- A summary of the PDI activities and results.

5.2 Draft Final Remedial Design Report

In addition to the items identified for the *Preliminary Remedial Design Report*, the *Draft Final Remedial Design Report* will include the following information:

- Revisions to the *Preliminary Remedial Design Report* based on NYSDEC comments, as appropriate.

- Final Engineering Design Drawings, including but not limited to the following, in addition to the design drawings prepared for the *Preliminary Remedial Design Report*:

  - Site Preparation Plan – to include minimum requirements for temporary erosion and sedimentation controls; identification of other site features to be protected during remedial construction activities; and site facilities (parking areas, decontamination area, equipment/material lay down areas).

  - Excavation Plan – to include limits of soil excavation to be completed in the project area.

  - Excavation Support Profile and Details (if necessary) – to include a profile of excavation support system, structural details related to the type of support to be used, and other miscellaneous details related to the excavation support system.

  - ISS Plan (if necessary) – to include limits of ISS treatment to be completed in the project area.

  - Miscellaneous Details – to include details related to the surface cover profiles, temporary erosion and sedimentation controls, and decontamination area.

- Final Technical Specifications.

- A Waste Management Plan (WMP) that describes the characterization, handling, treatment, and disposal requirements for various waste materials to be generated as a result of the remedial activities.

- A Community Air Monitoring Plan (CAMP) that describes the monitoring activities that will be conducted to detect potential airborne releases of constituents of concern during the implementation of remedial activities.

- A Construction Quality Assurance Plan (CQAP) that describes the materials, procedures, and testing necessary for proper construction, evaluation, and documentation during remedial activities.

- A Community Environmental Response Plan (CERP) that presents a summary of the site monitoring and work practices that will be completed to address potential short-term impacts to the surrounding community and/or environmental resources.

- A Contingency Plan that provides responses to potential emergencies that may arise as a result of the remediation activities that will be completed at the site.

- A Citizen Participation Plan (CPP) which incorporates appropriate activities outlined in the NYSDEC's *Draft Citizen Participation Handbook for Remedial Programs* (DER-23) (NYSDEC, 2010a).

The *Draft Final Remedial Design Report* will not be stamped and signed by Professional Engineer licensed in the State of New York.

5.3 Final Remedial Design Report

Following NYSDEC review and approval of the *Draft Final Remedial Design Report,* the *Final Remedial Design Report* will be produced. The *Final Remedial Design Report* will be stamped and signed by Professional Engineer licensed in the State of New York and will be of biddable quality.

5.4 Remedial Design Schedule

The anticipated schedule for completing the PDI activities identified in this RDWP and a preliminary schedule for completion of the remedial design and construction of the selected remedy for the site is presented below.

Table 5-1. Preliminary Project Schedule

Schedule Component	Date
NYSDEC Approval of this RDWP	July 2016
Conduct Phase I PDI activities	September 2016 – August 2017
Submit Phase I PDI Summary Report	October 2017
Submit Preliminary Remedial Design Report to NYSDEC	February 2018
Receive NYSDEC comments	May 2018
Submit Draft Final Remedial Design Report to NYSDEC	October 2018
Receive NYSDEC comments	December 2018
Submit Final Remedial Design Report to NYSDEC	January 2019
Bid Document Preparation and Remedial Contractor Procurement	January – May 2019
Remedial Construction	Summer/Fall 2019

This schedule for conducting PDI activities and preparing remedial design documents is dependent on several factors, including time required to gain property access and receipt of NYSDEC comments on project submittals. Additionally, the timing of the remedial design and remedial construction components presented the preliminary project schedule may be altered if Phase II PDI activities are required.

6 POST-CONSTRUCTION ACTIVITIES

Following remedial construction activities, future site activities will be conducted in accordance with a Site Management Plan and institutional controls to be established for the site. The anticipated components of the SMP and institutional controls are presented below.

As indicated in Section 1.6, for purpose of this RDWP, references to institutional controls consist of the environmental easement to be established on the former MGP site, as well as the agreement(s) between National Grid and the off-site property owner(s) necessary to implement the remedy and future site management of the off-site properties.

6.1 Site Management Plan

As indicated in the VCP Decision Document (NYSDEC, 2015), the primary components of the SMP will consist of an *Institutional and Engineering Control Plan* and *Monitoring Plan*. These plans will consist of the following:

- *Institutional and Engineering Control Plan* describing the use restrictions and engineering controls that have been established at the site and off-site properties (i.e., the project area).
- *Monitoring Plan* to assess the performance and effectiveness of the remedial activities.

As indicated in Section 3.5, the SMP will include requirements for post-remedial action groundwater and NAPL monitoring, as well as site inspection schedules, and NYSDEC submittal requirements. The SMP will also include a provision for evaluating the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures (if any) related to soil vapor intrusion.

6.2 Institutional Controls

Institutional controls in the form of an environmental easement will be established for the former MGP site to:

- Require National Grid to provide a periodic certification of institutional and engineering controls to the NYSDEC in accordance with Part 375-1.8(h)(3).
- Limit the land use and development of the site to restricted-residential, commercial, or industrial as defined by 6 NYCRR Part 375-1.8(g) and local zoning laws.
- Restrict the use of groundwater for potable or process water purposes, unless proper water quality treatment is conducted, as determined by NYSDOH.
- Require compliance with the NYSDEC-approved SMP.

Institutional controls will also include an agreement with the off-site property owner(s) to implement the remedy and NYSDEC-approved SMP.

7 REFERENCES

Arcadis, 2015. Alternatives Analysis Report, Rensselaer Manufactured Gas Plant Site, prepared for National Grid, April 2015.

Brown and Caldwell, 2014. Remedial Investigation Report, Rensselaer Manufactured Gas Plant Site, prepared for National Grid, May 2014.

NYSDEC. 2002. DER-4, Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants, January 2002.

NYSDEC 2004. Technical & Operational Guidance Series (TOGS) 1.1.1 - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 2004.

NYSDEC, 2009. CP-43, Groundwater Monitoring Well Decommissioning Policy, November 2009.

NYSDEC, 2010a. DER-23, Citizen Participation Handbook for Remedial Programs, January, 2010.

NYSDEC, 2010b. DER-10, Technical Guidance for Site Investigation and Remediation, May 2010.

NYSDEC, 2015. Voluntary Cleanup Program Decision Document, NM - Rensselaer Manufactured Gas Plant, Site No. V00488, September 1, 2015.

APPENDIX A

Field Sampling Plan

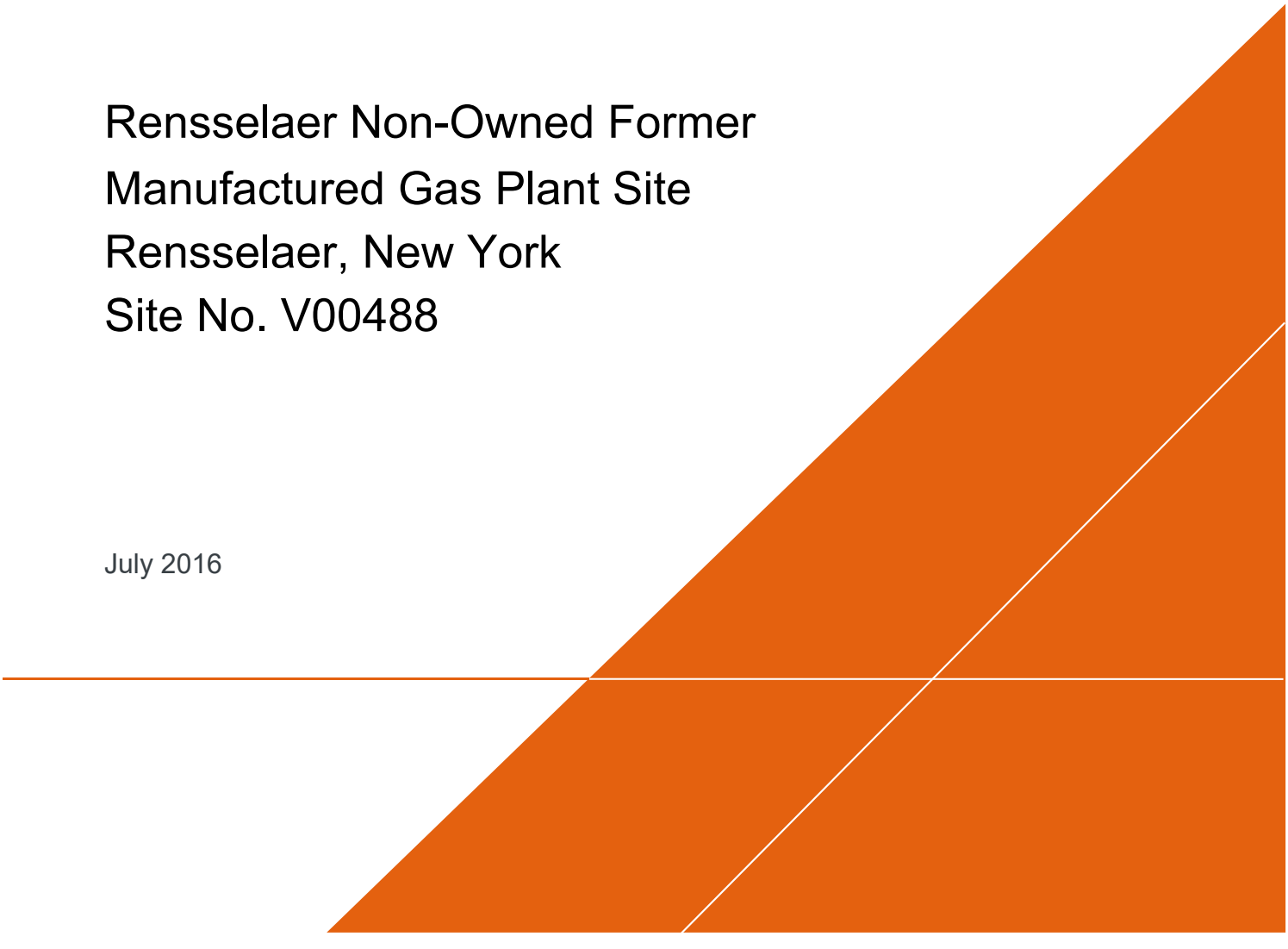
ARCADIS Design & Consultancy for natural and built assets

nationalgrid

FIELD SAMPLING PLAN

Rensselaer Non-Owned Former
Manufactured Gas Plant Site
Rensselaer, New York
Site No. V00488

July 2016



FIELD SAMPLING PLAN

Rensselaer Non-Owned Former

Manufactured Gas Plant Site

Prepared for:

National Grid

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Our Ref.:

B003673.0002 #10

Date:

July 2016

CONTENTS

1 INTRODUCTION

1.1 General

This *Field Sampling Plan* (FSP) was prepared on behalf of National Grid to support the Remedial Design Work Plan (RDWP) for the Rensselaer Non-Owned Former Manufactured Gas Plant (MGP) Site in Rensselaer New York.

This FSP describes the field procedures and sample collection methods to be used during implementation of the PDI field activities. The FSP should be used in conjunction with the RDWP, the Quality Assurance Project Plan (QAPP), and the Health and Safety Plan (HASP) that have been prepared for the site. The RDWP presents the site background and defines the scope of the PDI field activities. The QAPP presents the quality assurance/quality control (QA/QC) procedures to be used during implementation of the RDWP, as well as a description of the general field and laboratory procedures. The QAPP and HASP are provided in Appendices B and C of the RDWP, respectively.

1.2 Overview of Field Investigation Activities

The following field activities will be conducted as part of the PDI:

- Drilling soil borings
- Excavating test pits
- Collecting soil samples
- Installing monitoring wells
- Measuring water table/ non-aqueous phase liquid (NAPL) elevations

The sample locations and number of samples to be collected are described in the RDWP.

2 FIELD ACTIVITIES

This section describes in detail the field procedures and methodology potentially used for site monitoring.

2.1 General Field Guidelines

2.1.1 Utilities

All underground utilities will be identified prior to any drilling or subsurface sampling. Public and privately owned utilities will be located by contacting responsible agencies by phone so that underground utilities can be marked at the site.

2.1.2 Equipment

The following is a general list of equipment necessary for sample collection.

- stainless steel spoons and bowls for compositing soil samples
- appropriate sample containers provided by the laboratory (kept closed and in laboratory supplied coolers until the samples are collected)
- Reagent grade preservatives and pH paper (or pre-preserved sample containers) for aqueous samples
- chain of custody record forms
- log book, field sampling records, and indelible ink pens and markers
- laboratory grade soap (such as Alconox), reagent grade solvents, and distilled water to be used for decontaminating equipment between sampling stations
- buckets, plastic wash basins, and scrub brushes for decontaminating equipment
- digital camera
- stakes to identify sampling locations
- shipping labels and forms
- knife
- packing/shipping material for sample bottles
- strapping tape
- clear plastic tape
- duct tape
- aluminum foil
- re-closable plastic bags

- portable field instruments, including a photoionization detector (PID), water quality parameter meter, conductivity meter, and water-level indicator

2.1.3 Field Book

Field log books 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 log books. The books will be bound with consecutively numbered pages. Entries in the log book 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 log books 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.

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 (USDOT) and International Air Transport Association (IATA) 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

2.3.1 Drill Rig Decontamination

A decontamination pad will be lined with plastic sheeting on a surface sloped to a sump. The sump must also be lined and of sufficient volume to contain approximately 20 gallons of decontamination water. All drilling equipment including rear-end of drilling rig, augers, bits, rods, tools, split spoon samplers, and tremie pipe will be cleaned on the decontamination pad with a high pressure hot water "steam cleaner" unit and scrubbed with a wire brush, as needed, to remove dirt, grease, and oil before beginning work in the project area. If heavy accumulations of tars or oils are present on the downhole tools, a citrus-based cleaner (e.g., Citra-Solu®) may be used to aid in equipment cleaning. Tools, drill rods, and augers will be placed on sawhorses, decontaminated pallets, or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided. All down-hole drilling tools will be decontaminated between each drilling location according to the above procedures. Decontamination water will be contained in a dedicated plastic tank or 55-gallon open-top drums located on site. All open-top drums will remain closed when not in use.

Following decontamination of all heavy site equipment, the decontamination pad will be decommissioned. The decommissioning will be completed by:

- Transferring the bulk of the remaining liquids and solids into the drums, tanks, and roll-offs to be provided by National Grid or the drilling subcontractor for these materials.
- Rolling the sheeting used in the decontamination pad onto itself to prevent discharge of the remaining materials to the ground surface. Once rolled up, the polyethylene sheeting will be placed in the roll-off or drums used for disposal of personal protective equipment (PPE) and disposable equipment.

2.3.2 Sampling Equipment Decontamination

The following equipment will be required for use during sampling equipment cleaning procedures:

- Appropriate PPE, as required in the site HASP
- Distilled water
- Non-phosphate detergent such as Alconox (or equivalent)
- Tap water
- Rinsate collection plastic containers
- United States Department of Transportation- (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

Prior to every entry into each borehole, 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 percent "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 percent "ultra pure-grade" nitric acid followed by a distilled water 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 be either be used immediately or wrapped in plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

2.4 Soil Boring and Sample Collection

The following materials will be available during soil boring and sampling activities, as required:

- Site Plan with proposed soil boring/well locations
- RDWP, FSP, and HASP
- PPE, as required by the HASP
- drilling equipment required by the American Society for Testing and Materials (ASTM) D 1586, when performing split-spoon sampling
- disposable plastic liners, when drilling with direct-push equipment
- appropriate soil sampling equipment (e.g., stainless steel spatulas, knife)
- equipment cleaning materials
- appropriate sample containers and labels
- chain-of-custody forms
- insulated coolers with ice, when collecting samples requiring preservation by chilling
- Photoionization detector (PID) or flame ionization detector (FID)
- field notebook

2.4.1 Drilling Procedures

The drilling contractor or Arcadis drill rig operator will be responsible for obtaining accurate and representative samples; informing the supervising geologist of changes in drilling pressure; and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil

sampling drive weight [140 pounds] required to drive the split-barrel sampler in 6-inch increments). Records will also be kept of occurrences of premature refusal due to boulders or construction materials that may have been used as fill. Where a boring cannot be advanced to the desired depth, the boring will be abandoned and an additional boring will be advanced at an adjacent location to obtain the required sample. Where it is desirable to avoid leaving vertical connections between depth intervals, the borehole will be sealed using cement and/or bentonite. Multiple refusals may lead to a decision by the supervising geologist to abandon that sampling location.

2.4.2 Soil Sampling Procedures

Samples of subsurface materials encountered while drilling soil borings will be collected using 2-inch or 3-inch split-barrel (split-spoon) sampler, if using the ASTM D 1586 – Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.

Soil samples are typically field screened with an FID or PID at sites where volatile organic compounds are present in the subsurface. Field screening is performed using one of the following methods:

- Upon opening the sampler, the soil is split open and the PID or FID probe is placed in the opening and covered with a gloved hand. Such readings should be obtained at several locations along the length of the sample
- A portion of the collected sample is placed in a re-sealable plastic bag or jar, which is covered with aluminum foil, sealed, and allowed to warm to room temperature. After warming, the cover is removed, the foil is pieced with the FID or PID probe, and a reading is obtained.

Samples selected for laboratory analysis will be handled, packed, and shipped in accordance with the procedures outlined in the this FSP. A geologist will be on-site during drilling and sampling operations to describe each soil sample on the soil boring log, including:

- percent recovery
- soil type
- color
- moisture condition
- density
- grain-size
- consistency
- other observations, particularly relating to the presence of potential impacts

The supervising geologist or scientist will be responsible for documenting drilling events using a bound field notebook to record all relevant information in a clear and concise format. The record of drilling events will include:

- start and finish dates of drilling
- name and location of project

- project number, client, and site location
- sample number and depths
- blow counts and recovery
- depth to water
- type of drilling method
- drilling equipment specifications, including the diameter of drilling tools
- documentation of any elevated organic vapor readings
- names of drillers, inspectors, or other people onsite
- weather conditions

2.5 Test Pit Excavation

Test pits/trenches will be excavated using a backhoe equipped with a bucket or a small excavator. The following materials will be available, as required, during test pit excavation:

- backhoe with bucket
- shovel
- plastic sheeting
- stainless steel hand trowel
- stainless steel pan
- appropriate sample containers and packing materials, if required
- potable water
- steam cleaning equipment
- appropriate health and safety equipment, as required by the HASP
- PID
- camera/video camera
- test pit/trench log

The following procedures will be used to excavate test pits.

1. Identify the test pit/trench number on an appropriate log or in the designated field notebook, as well as with the temperature, weather, date, time, and personnel at the site.
2. Set up a decontamination station and decontaminate the backhoe, bucket, shovel, and other sampling apparatus with a high-pressure steam rinse using a tap water source.
3. Put on appropriate health and safety equipment.

4. Place the plastic sheeting on the ground next to the test pit/trench location.
5. Position the backhoe and personnel at upwind (to the extent feasible) locations of the test pit/trench area.
6. Turn on the PID. Measure and record on the test pit/trench log background PID readings on the log or in the field book.
7. Excavate the soil with the backhoe in approximately 1 foot increments. At each interval, examine and classify the soils according to applicable standards. Record these observations in the test pit/trench log or field book. Also, screen the soil samples with a PID. These measurements will also be recorded in the test pit/trench log (or field book).
8. If the contents of the test pit/trench visually appear to consist of site residues, the test pit/trench contents may be sampled. If sampling is required, the test pit/trench will be sampled with a shovel if the test pit/trench is less than 3 feet deep. If the test pit/trench is greater than 3 feet deep, then the test pit/trench will be sampled with the backhoe bucket. The contents of the bucket will then be sampled with a cleaned stainless steel hand trowel.
9. If sampling is required, the samples will be collected in the appropriate containers and placed immediately in a cooler of wet ice to maintain a 4ºC temperature for preservation. Volatile organic samples will be collected immediately after sample retrieval. Next, a sufficient amount of the remaining soil will be removed from the sampling device and homogenized by mixing thoroughly in a clean stainless steel pan with a clean stainless steel trowel. Samples will be selected for analytical characterization only if visible residues are present and/or relatively high PID screening readings are measured.
10. The test pit/trench will be terminated when significant residues are encountered, the top of the water table is reached, or to the maximum reach of the backhoe, whichever occurs first.
11. Soils generated during test pitting will be staged on plastic during excavation, monitored for PID readings and visual observations, and then placed back into the test pit/trench. Clean fill will be placed at the surface.
12. A labeled stake will be placed at the test pit/trench location.
13. A photograph of each location before, during, and after each test pit/trench is excavated will be taken.
14. The backhoe, backhoe bucket, and all tools used at the test pit/trench area will be decontaminated using a high-pressure steam rinse using a tap water source. Decontamination water and residual materials associated with decontamination will be contained.

2.6 Water Level Gauging

The following materials, as required, shall be available during fluid level measurements at monitoring wells that do not contain NAPL:

- PID
- appropriate health and safety equipment, as specified in the HASP

- laboratory-type soap (Alconox or equivalent), methanol/hexane rinse, potable water, distilled water, and/or other equipment that may be needed for decontamination purposes
- electronic water-level meter
- 6-foot engineer's rule
- portable containers
- plastic sheeting
- field logbook
- indelible ink pen
- digital camera

If there is any uncertainty regarding the accuracy of the tape or cable associated with the electronic water-level probe, it should be checked versus a standard length prior to use to assess if the tape or cable above the meter has been correctly calibrated by the manufacturer, and to identify evidence of tape or cable stretching, etc.

1. Measure the lengths between markers on the cable with a 6-foot engineer's rule or a fiberglass engineer's tape. The tape or cable associated with the electronic water-level probe should be checked for the length corresponding to the deepest total well depth to be monitored during the data collection event.
2. If the length designations on the tape or cable associated with the electronic water-level probe are found to be incorrect, the probe will not be used until it is repaired by the manufacturer.
3. Record verification of this calibration process in field logbook.
4. The detailed procedure for obtaining fluid level depth measurements is as follows. Field notes on logs will be treated as secured documentation and indelible ink will be used. As a general rule, the order of measuring should proceed from the least to most contaminated monitoring wells, based on available data.
5. Identify site and well number in field logbook using indelible ink, along with date, time, personnel, and weather conditions.
6. Field personnel will avoid activities that may introduce contamination into monitoring wells. Activities such as dispensing gasoline into vehicles or generators should be accomplished well in advance of obtaining field measurements.
7. Use PPE as required by the HASP.
8. Clean the water-level probe and cable in accordance with the appropriate cleaning procedures. Down-hole instrumentation should be cleaned prior to obtaining readings at the first monitoring well and upon completion of readings at each well.
9. Clean the water-level probe and cable with a soapy (Alconox) water rinse followed by a solvent rinse (if appropriate based on site-specific constituents of concern) an analyte-free water rinse. Contain rinse water in a portable container that will be transferred to an on-site container.

10. Put clean plastic sheeting on the ground next to the well.
11. Unlock and open the well cover while standing upwind from the well. Place the well cap on the plastic sheeting.
12. Locate a measuring reference point on the well casing. If one is not found, initiate a reference point at the highest discernable point on the inner casing (or outer if an inner casing is not present) by notching with a hacksaw, or using an indelible marker. All down-hole measurements will be taken from the reference point established at each well on the inner casing (on the outer only if an inner casing is not present).
13. Measure to the nearest hundredth of a foot and record the height of the inner and outer casings (from reference point, as appropriate) to ground level.
14. Record the inside diameter of the well casing in the field log.
15. Lower the probe until it emits a signal (tone and or light) indicating the top of the water surface. Gently raise and lower the instrument through this interface to confirm its depth. Measure and record the depth of the water surface, and the total well depth, to the nearest hundredth of a foot from the reference point at the top of the well. Lower the probe to the bottom of the well to obtain a total depth measurement.
16. Clean the water-level probe and cable in accordance with the appropriate cleaning procedures.
17. Compare the depth of the well to previous records, and note any discrepancy.
18. Lock the well when all activities are completed.

Fluid level measurement data will be recorded legibly on “write-in-the-rain” field notebook in indelible pen. Field situations such as apparent well damage or suspected tampering, or other observations of conditions that may result in compromised data collection will be photographically documented where practicable.

2.7 NAPL Monitoring and Collection

NAPL will be measured and collected from the NAPL recovery wells and additional “sentinel” 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 overtopping out of the well sump. The recovered volumes of NAPL will be recorded.

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, robe, 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 light non-aqueous phase liquid (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 dense non-aqueous phase liquid (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 NAPL: 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.

2.8 Air Monitoring

Air monitoring will be conducted with a PID and dust monitor during all land-based intrusive activities. The PID will be used to monitor organic vapors in the breathing zone and borehole and to screen samples for

analysis. The dust monitoring will be used to monitor particulate concentration in the breathing zone for particulates less than 10 microns in diameter. In addition, air monitoring during the PDI activities will be consistent with the New York State Department of Health's (NYSDOH's) community air monitoring plan, as described in the HASP.

The PID and dust monitor readings will be recorded in the field book during land based trenching and drilling activities. The instruments will be calibrated at least once each day and more frequently, if needed.

2.9 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. 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 the IDW is

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 National Grid 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

2.9.1 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*.

2.9.2 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 log book

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.

2.9.3 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-97-7) 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.

2.9.4 Preparing Waste Shipment Documentation (Hazardous and Non-Hazardous)

Waste profiles will be prepared by Arcadis and forwarded, along with laboratory analytical data to the National Grid for approval/signature. National Grid 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 National Grid for approval. Upon approval of the manifest, National Grid 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.

2.9.5 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 National Grid or Arcadis has knowledge of a spill that has reached surface water, National Grid 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.

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 Portable Photoionization Detector

The PID will be a MiniRae (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.

3.3 Dust Monitor

The dust monitor will be an MIE DataRAM (or equivalent) and will be calibrated at the start of each day of use. Calibration and maintenance of the dust monitor will be conducted in accordance with the manufacturer’s specifications. The calibration data will be recorded in field notebooks.

APPENDIX B

Health and Safety Plan

ARCADIS Design & Consultancy for natural and built assets

Site Specific Health and Safety Plan

Revision 12 7/1/2014

Project Name: National Grid Rensselaer Non-Owned Former MGP Site

Project Number: B0036730.0000.00002
Client Name: National Grid
Date: 1/4/2016
HASP Expires 1/3/2017
Revision:

Approvals:

HASP Developer: Josh Sinay

Project Manager: Jason Golubski

HASP Reviewer: Dave Groff

Secondary HASP Reviewer: David Rodriguez

Emergency Information

Site Address: Washington Street
Rensselaer County, New York 12144

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
Emergency Other (specify)		
Client Contact	Jim Morgan	315-428-3101
WorkCare (non-lifethreatening injury/illness)		315-671-9442
Project H&S	Dave Groff	315-671-9657
Task Manager	Jason Golubski	315-671-9437
Project Manager	Jason Golubski	315-671-9437
Corporate H&S Specialist	Julie Santaniello	978-551-0033
Corporate H&S Director	Denis Balcer	614-778-9171

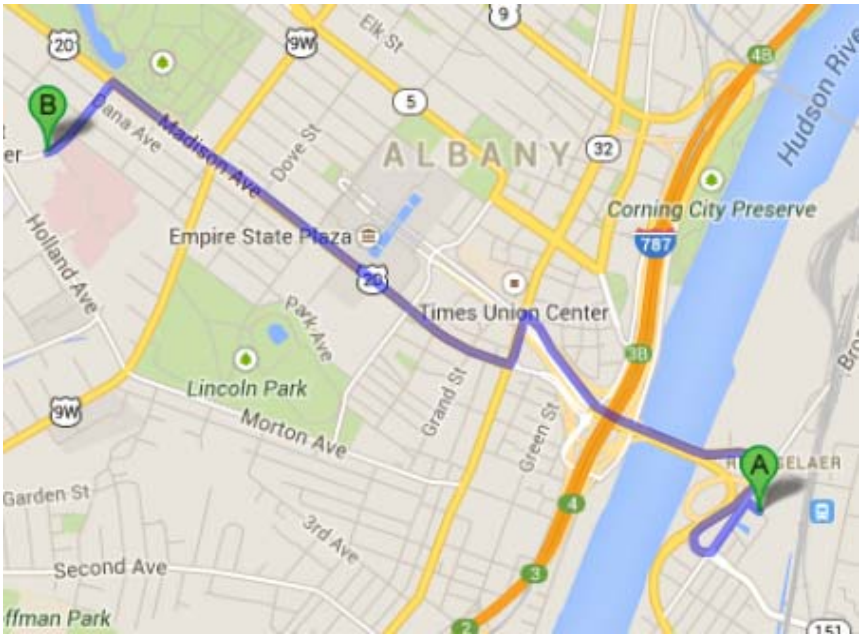
Hospital Name and Address: Albany Medical Center Hospital
43 New Scotland Ave
Albany, NY 12208

Hospital Phone Number: 518-262-3125

Incident Notification Process

1	Dial 911/Facility Emergency Number/WorkCare as applicable	
2	Contact PM/Supervisor	Jason Golubski
3	Contact Corporate H&S	Denis Balcer
4	Contact Client	Jim Morgan

Route to the Hospital



A Washington St, Rensselaer, NY 12144

	1. Head **northwest** on **4th Ave** toward **Broadway**	go 187 ft total 187 ft
	2. Turn left onto **Broadway** About 53 secs	go 0.1 mi total 0.2 mi
	3. Turn right to merge onto **US-20 W/U.S. 9 N/Dunn Memorial Bridge/Rte 9 N** toward **I-787** Continue to follow US-20 W/Dunn Memorial Bridge About 1 min	go 0.7 mi total 0.9 mi
	4. Take the **NY-32/So Pearl St/US-20 W** ramp	go 0.3 mi total 1.1 mi
	5. Turn left onto **NY-32 S/US-20 W/S Pearl St**	go 0.1 mi total 1.2 mi
	6. Take the 3rd right onto **Madison Ave** About 4 mins	go 1.1 mi total 2.3 mi
	7. Turn left onto **New Scotland Ave** Destination will be on the right About 1 min	go 0.2 mi total 2.5 mi

B **Albany Medical Center Hospital**
43 New Scotland Ave, Albany, NY 12208

General Information

Site Type (select all applicable where work will be conducted):

☐	Active	☐	Railroad
☐	Bridge	☐	Remote Area
☐	Buildings	☑	Residential
☑	Commercial	☐	Retail
☐	Construction	☐	Roadway (public, inlcuding right-of-way)
☐	Military Installation	☐	Water Treatment Plant
☐	Inactive Industrial	☐	Unknown
☐	Active Industrial	☐	Unsecured
☐	Landfill	☐	Utility
☐	Marine	☐	Other (specify): _____
☐	Mining		
☑	Parking Lot/Private Roadway		

Work with exposure to vehicular traffic on private property requires preparation of a Site Traffic Awareness and Response (STAR) Plan.

Surrounding Area and Topography (select one):

☐ Surrounding area and topography are presented in the project work plan
☑ Surrounding area and topography (*briefly describe*):

The site is located on the east side of the Hudson River, within the Hudson Lowlands physiographic province. The majority of the project area is paved parking lot. The northern portion of the project area, north of Huyck Street, is grassy land bisected by Huyck (Mill) Creek. The eastern portion of the site (the east side of Washington Street) contains structures that were part of a felt mill, while the western portion (the east side of Academy Street) is comprised of the backyards of nineteenth century houses.

Simultaneous Operations (SimOps)

☑ Not applicable
☐ SimOps will exist on this project

Site Background (select one):

☐ Site background is presented in the project work plan
☑ Site background (*briefly describe)* :

MGP operations began in the 1860's and continued into the 1920's. Manufactured gas at the site was produced via the coal carbonization process. Remnants of some former MGP structures are present at the Site, primarily in the subsurface, including the base of two gas holders and a tar well. Historical MGP operations produced byproducts including coal/MGP tar, spent purifier waste, coal slag, cinders and ash.

Project Tasks

The following tasks are identified for this project:

Examples: "Drilling/soil sampling", "Surveying", "General Inspections", "Construction Management/Inspections"

1. Survey
2. Excavation/Test Pitting
3. Installation of Monitoring Wells
4. Abandonment of Monitoring Wells
5. NAPL/Groundwater Monitoring
6. Soil Boring-Sampling

☐ Subcontractor H&S information is attached

☐ ARCADIS Standards apply to augment JSA *[list standard(s) below in "Comments"]*

☑ Utility clearance required.

☐ FHSHB sections apply *(list below in "Comments")*

☐ Journey Management Plan attached

☐ State specific H&S required:

Comments:

II.H - Stop Work Authority; III.A - Daily Safety Meetings, III.L - Noise, III.R - Personal Protective Equipment; III.MM - Utility Location; IV.D - Excavation/Trenching

Roles and Responsibilities

	Name	*Role*	*Additional Responsibilities (Describe)*
1	Jason Golubski	PM	Overall management of project
2	Jason Golubski	TM	Coordinate all field work
3	TBD	Field Lead	
4	TBD	SSO	
5			
6			

Training

All ARCADIS employees are required to have the following training:	*Selected ARCADIS employees are required to have the following additional training:*	Names or Numbers from above
Hazwoper 40 Hour	First Aid/CPR	All onsite personnel
PPE	DOT HazMat #1	All onsite personnel
Defensive Driving - Smith On-Line		
H&S Program Orientation		

Hazard Analysis

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
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	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

Division

Environment

Business Unit

All Categories

Task 1: Survey

Hazardous Activity #1

Field-Ambient environment - exposure heat, cold, sun, weather, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	L
Environmental	L	Gravity	H	Mechanical	-	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

12/11/2015

Overall Unmitigated Risk: 12/10/2016 Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Field H&S Handbook Secondary: H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Control - Use a tent or vehicle to protect workers from the elements during breaks
Admin Control - Rotation of workers if necessary based on hot or cold conditions

Hazardous Activity #2

Field-Walking - uneven or slippery terrain

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	M	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Housekeeping PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Control - Use cones and reflective tape to mark out trip hazards
Admin Control - Familiarize workers with the site layout and tripping hazards or locations of slippery terrain during daily safety meeting

Hazardous Activity #3

General-Lifting and movement of equipment of varying weights at varying frequencies by manual methods

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Job Rotation Secondary: JSAs Job Briefing/Site Awareness Specialized Equipment (specify below) Admin. Controls (specify below) Engineering Controls (specify below)

Enter Required Controls:

Engineering Control - Use field vehicle to facilitate moving equipment when possible. Set up site to reduce the risk of bending and reaching for equipment
Admin Control - Ensure workers are trained in proper lifting techniques (lifting with the legs and not the back, use 2 people to carry heavy equipment)

Hazardous Activity #4

Field-Traffic - parking lots

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	H
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK STAR Plan Engineering Controls (specify below) Secondary: Job Briefing/Site Awareness

Enter Required Controls: Engineering Control - Use field vehicle to to protect staff from traaffic. Use traffic cones (as necessary) to limit traffic to work area.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
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	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

Task 2: Excavation/Test Pitting

Hazardous Activity #1

Field-Utilities - drilling, digging or excavating in the vicinity of subsurface utilities

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	H
Environmental	-	Gravity	-	Mechanical	-	Motion	L
Personal Safety	-	Pressure	M	Radiation	-	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Inspections Specialized Equipment (specify below) Secondary: JSAs Field H&S Handbook Job Briefing/Site Awareness Cont/Emerg. Planning Engineering Controls (specify below) Admin. Controls (specify below)

Enter Required Controls:

Engineering Control - Ensure workers use proper PPE and site marking on utilities is done.
Admin Control - Ensure workers are trained in proper utility clearance.

Hazardous Activity #2

General-Lifting and movement of equipment of varying weights at varying frequencies by manual methods

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Job Rotation Secondary: JSAs Job Briefing/Site Awareness Specialized Equipment (specify below) Admin. Controls (specify below) Engineering Controls (specify below)

Enter Required Controls:

Engineering Control - Use field vehicle to facilitate moving equipment when possible. Set up site to reduce the risk of bending and reaching for equipment
Admin Control - Ensure workers are trained in proper lifting techniques (lifting with the legs and not the back, use 2 people to carry heavy equipment)

Hazardous Activity #3

Field-Excavation - soil removal, installation or removal piping, tanks or utilities, geologic investigations, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	H	Mechanical	H	Motion	H
Personal Safety	-	Pressure	-	Radiation	-	Sound	M

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Excavation Awareness Training Excavation Competent Person Training (designated person) Engineering Controls (specify below) Secondary: JSAs HASP Job Briefing/Site Awareness Client Training/Briefing Cont/Emerg. Planning PPE (see HASP "PPE" section) Specialized Equipment (specify below) Housekeeping Inspections

Enter Required Controls:	Admin Control - Ensure all workers are aware of site utilities. Engineering Control - Enrure all workers use proper PPE.

Hazardous Activity #4

Field-Equipment - working on ground in the vicinity of heavy equipment

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	H	Mechanical	H	Motion	H
Personal Safety	-	Pressure	-	Radiation	-	Sound	M

Overall Unmitigated Risk: High Mitigated Risk: Medium. if utilizing:

Controls that should be Considered:	Primary: TRACK JSAs Job Briefing/Site Awareness Site Awareness Secondary: HASP H&S Standards Field H&S Handbook Engineering Controls (specify below) Admin. Controls (specify below) Specialized Equipment (specify below) Inspections
Enter Required Controls:	Engineering Control - Wear proper PPE and Check all tools and equipment for possible failure sources.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
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	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

Task 3: Installation of Monitoring Wells

Hazardous Activity #1

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	M	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards HASP Admin. Controls (specify below) HAZWOPER Training PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Controls - Use proper PPE to avoid any contaminated media

Hazardous Activity #2

Field-Ambient environment - exposure heat, cold, sun, weather, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	L
Environmental	L	Gravity	H	Mechanical	-	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Field H&S Handbook Secondary: H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Control - Use a tent or vehicle to protect workers from the elements during breaks
Admin Control - Rotation of workers if necessary based on hot or cold conditions

Hazardous Activity #3

Field-Utilities - drilling, digging or excavating in the vicinity of subsurface utilities

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	H
Environmental	-	Gravity	-	Mechanical	-	Motion	L
Personal Safety	-	Pressure	M	Radiation	-	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Inspections Specialized Equipment (specify below) Secondary: JSAs Field H&S Handbook Job Briefing/Site Awareness Cont/Emerg. Planning Engineering Controls (specify below) Admin. Controls (specify below)

Enter Required Controls: Engineering Controls - Check all tools and equipment for possible failure sources.

Hazardous Activity #4

Field-Drilling - Mechanical method (drill rig, DPT, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	L	Driving	-	Electrical	M
Environmental	-	Gravity	H	Mechanical	H	Motion	H
Personal Safety	-	Pressure	M	Radiation	-	Sound	H

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered:
Primary: TRACK Engineering Controls (specify below) Admin. Controls (specify below) JSAs Inspections
Secondary: Job Briefing/Site Awareness H&S Standards Cont/Emerg. Planning PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering controls use field vehicles to move equipment when possible. Plan equipment location ahead of times to avoid moving once placed.
Admin Controls - Ensure workers are trained in proper lifting techniques (lifting with the legs and not the back, and use 2 people to lift when equipment is heavy.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
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	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

Task 4: Abandonment of Monitoring Wells

Hazardous Activity #1

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	M	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards HASP Admin. Controls (specify below) HAZWOPER Training PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Controls - Use proper PPE to avoid any contaminated media

Hazardous Activity #2

Field-Ambient environment - exposure heat, cold, sun, weather, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	L
Environmental	L	Gravity	H	Mechanical	-	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Field H&S Handbook Secondary: H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Control - Use a tent or vehicle to protect workers from the elements during breaks
Admin Control - Rotation of workers if necessary based on hot or cold conditions

Hazardous Activity #3

Field-Construction- well repairs or decommissioning

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	M	Mechanical	M	Motion	M
Personal Safety	-	Pressure	L	Radiation	-	Sound	L

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Work Plan Engineering Controls (specify below) Secondary: Job Briefing/Site Awareness Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Controls - Check all tools and equipment for possible failure sources.

Hazardous Activity #4

Field-Drilling - Mechanical method (drill rig, DPT, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	L	Driving	-	Electrical	M
Environmental	-	Gravity	H	Mechanical	H	Motion	H
Personal Safety	-	Pressure	M	Radiation	-	Sound	H

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered:
Primary: TRACK Engineering Controls (specify below) Admin. Controls (specify below) JSAs Inspections
Secondary: Job Briefing/Site Awareness H&S Standards Cont/Emerg. Planning PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering controls use field vehicles to move equipment when possible. Plan equipment location ahead of times to avoid moving once placed.
Admin Controls - Ensure workers are trained in proper lifting techniques (lifting with the legs and not the back, and use 2 people to lift when equipment is heavy.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
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	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

Task 5: NAPL/Groundwater Monitoring

Hazardous Activity #1

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	M	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards HASP Admin. Controls (specify below) HAZWOPER Training PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Controls - Use proper PPE to avoid any contaminated media

Hazardous Activity #2

Field-Sampling - monitoring well sampling with electric, pneumatic or other non-manual pump

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	L	Driving	-	Electrical	L
Environmental	-	Gravity	L	Mechanical	-	Motion	M
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Inspections Secondary: Job Briefing/Site Awareness PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Control - Wear proper nitrile gloves while handling sampling equipment.

Hazardous Activity #3

Field-Ambient environment - exposure heat, cold, sun, weather, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	M	Electrical	L
Environmental	L	Gravity	H	Mechanical	-	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Field H&S Handbook Secondary: H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls: Engineering Control - Use a tent or vehicle to protect workers from the elements during breaks
Admin Control - Rotation of workers if necessary based on hot or cold conditions

Hazardous Activity #4

Chemical-Corrosives - working with or exposure to corrosives in laboratory work, sample bottle preservatives, decon chemicals, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	L	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards Job Briefing/Site Awareness Hazcom Training MSDS/SDS (see also HASP Hazcom/GHS section) Admin. Controls (specify below) Specialized Equipment (specify below) Housekeeping PPE (see HASP "PPE" section)

Enter Required Controls:

Admin Control - Ensure proper HazMat training is current with workers.
Engineering Control - Use proper protective Nitrile gloves when handling lab equipment and sampling equipment.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
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	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

Task 6: Soil Boring-Sampling

Hazardous Activity #1

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	M	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Low if utilizing:

Primary Controls: TRACK JSAs Engineering Controls PPE (see HASP "PPE" section)

Secondary Controls: H&S Standards HASP Admin. Controls HAZWOPER Training

Hazardous Activity #2

Chemical-Sensitizers - working with and exposure to sensitizers during laboratory work, sample bottle preservatives, decon chemicals, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	M	Driving	-	Electrical	-
Environmental	L	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Primary Controls: TRACK JSAs Engineering Controls PPE (see HASP "PPE" section)

Secondary Controls: HASP Job Briefing/Site Awareness Hazcom Training MSDS (see also HASP Hazcom section) Admin. Controls Specialized Equipment Housekeeping

Hazardous Activity #3

Field-Walking - uneven or slippery terrain

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	M	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Primary Controls: TRACK PPE (see HASP "PPE" section)

Secondary Controls: Engineering Control - Use cones and reflective tape to mark out trip hazards
Admin Control - Familiarize workers with the site layout and tripping hazards or locations of slippery terrain during daily safety meeting

Hazardous Activity #4

General-Lifting and movement of equipment of varying weights at varying frequencies by manual methods

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Primary Controls: TRACK Engineering Controls Job Rotation

Secondary Controls: JSAs Job Briefing/Site Awareness Specialized Equipment Admin. Controls Engineering Controls

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

☐ HAZCOM/GHS for this project is managed by the client or general contractor

List the chemicals anticipated to be used by ***ARCADIS*** *on this project per HazCom/GHS requirements.*
(Modify quantities as needed)

	Acids/Bases	Qty
☑	Not applicable	
☐	Hydrochloric acid	<500 ml
☐	Nitric acid	<500 ml
☐	Sulfuric acid	<500 ml
☐	Sodium hydroxide	<500 ml
☐	Zinc acetate	<500 ml
☐	Ascorbic acid	<500 ml
☐	Acetic acid	<500 ml
☐	Other:	

	Decontamination	Qty
☐	Not applicable	
☑	Alconox	≤ 5 lbs
☐	Liquinox	≤ 1 gal
☐	Acetone	≤ 1 gal
☐	Methanol	≤ 1 gal
☐	Hexane	≤ 1 gal
☐	Isopropyl alcohol	≤ 4 gal
☐	Nitric acid	≤ 1 L
☐	Other:	

	Calibration	Qty.
☐	Not applicable	
☑	Isobutylene/air	1 cyl
☐	Methane/air	1 cyl
☐	Pentane/air	1 cyl
☐	Hydrogen/air	1 cyl
☐	Propane/air	1 cyl
☐	Hydrogen sulfide/air	1 cyl
☐	Carbon monoxide/air	1 cyl
☐	pH standards (4,7,10)	≤ 1 gal
☐	Conductivity standards	≤ 1 gal
☐	Other:	

	Fuels	
☑	Not applicable	
☐	Gasoline	
☐	Diesel	
☐	Kerosene	≤ 5 gal
☐	Propane	1 cyl
☐	Other:	

	Kits	Qty.
☑	Not applicable	
☐	Hach (specify):	1 kit
☐	DTECH (specify):	1 kit
☐	EPA 5035 Soil (specify kit):	1 kit
☐	Other:	

	Remediation	Qty.
☐	Not applicable	
☐		
☐		
☐		
☐		
☐		

	Other:	Qty.
☐	Not applicable	
☑	Spray paint	≤ 6 cans
☐	WD-40	≤ 1 can
☐	Pipe cement	≤ 1 can
☐	Pipe primer	≤ 1 can
☐	Mineral spirits	≤ 1 gal

		Qty.
☐		
☐		
☐		
☐		
☐		
☐		

Material safety data sheets (MSDSs)/Safety Data Sheets (SDSs) must be available to field staff.
Indicate below how MSDS information will be provided:

☐ Not applicable
☑ Printed copy in company vehicle
☐ Printed copy in the project trailer/office
☑ Printed copy attached
☐ Electronic copy on field computer

☐ Contractor MSDSs/SDSs are not applicable
☑ Contractor MSDSs/SDSs are attached
☐ Contractor MSDSs/SDSs will be on site and located: _____

☐ Bulk quantities of the following materials will be stored: _____

Contact the project H&S contact for information in determining code and regulatory requirements associated with bulk storage of materials.

Monitoring

☐ Chemical air monitoring is not required for this project.

For projects requiring air monitoring, list the relevant constituents representing a hazard to site workers.

Constituent	Max. Conc.	Units	TWA	Units	STEL	Units	IDLH	Units	LEL/UEL (%)	VD Air=1	VP (mm Hg)	IP (eV)
Acetone	0.1	mg/kg	500	p	750	p	2500	p,N	2.5/12.8	0 NA	180	9.69
Benzene	5.6	mg/kg	0.5	p	2.5	p	500	p,N	1.2/7.8	0 NA	75	9.24
Ethylbenzene	110	mg/kg	20	p	125	p	800	p,N	0.8/6.7	0 NA	7	8.76
Xylene	38	mg/kg	100	p	150	p	900	p,N	1.1/7.0	0 NA	9	8.44
Toluene	0.97	mg/kg	20	p	150	p,N	500	p,N	1.1/7.1	0 NA	21	8.82
None			9999	-	0	-	0	-	0	0 0	0	0

Notes: TWAs are ACGIH 8 hr-TLVs unless noted.

p-ppm m-mg/m3
s- skin c-ceiling
r- resipirable i-inhalable

c2- ceiling (2 hr) se-sensitizer
"9999" - NA O-OSHA PEL
N-NIOSH 10 hr REL

"#N/A" -Constituent is not in database, manually enter information

Monitoring Equipment and General Protocols

Air monitoring is required for any task or activity where employees have potential exposure to vapors or particulates above the TWA. Action levels below are appropriate for most situations. Contact the project H&S contact for all stop work situations. Select monitoring frequency and instruments to be used.

Monitoring Frequency: Hourly

Indicator Tube/Chip Frequency: Indicator tube/chip monitoring not required

	Instrument	Action Levels	Actions
☑	Photoionization Detector	< 0.250	Continue work
		0.250 - 0.500	Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
	Lamp (eV): 11.7	> 0.500	Sustained >5 min. stop work, contact SSO
☐	Flame Ionization Detector (FID)	< 0.0	Continue work
		0.0 - 0.0	Sustained >5 min. continuous monitor, review eng. controls and PPE, use caution
		> 0.0	Sustained >5 min. stop work, contact SSO
☐	LEL/O2 Meter	0-5% LEL	Continue work
		>5-10% LEL	Continuous monitor, review eng. controls, proceed with caution
		>10% LEL	Stop work, evacuate, contact SSO
		19.5%-23.5% O2	Normal, continue work
		<19.5% O2	O2 deficient, stop work, evacuate, cont. SSO
		>23.5% O2	O2 enriched, stop work, evacuate, contact SSO
☐	Indicator: tube chip	≤PEL/TLV	Continue work
		>PEL/TLV	Stop work, review eng. controls and PPE, contact SSO
	Compound(s):		
☐	Particulate Monitor (mists, aerosols, dusts in mg/m^3)	< 2.5	Continue work
		2.5 - 5.000	Use engineering controls, monitor continuously
		> 5.000	Stop work, review controls, contact SSO
☐	Other:	Specify:	Specify:

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:		Leather
☐	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:

Comments:

Medical Surveillance (*check all that apply*)

- ☐ Medical Surveillance is not required for this project.
- ☑ HAZWOPER medical surveillance applies to all ARCADIS site workers on the project.
- ☐ HAZWOPER medical surveillance applies to all subcontractors on the project.
- ☐ HAZWOPER medical surveillance applies to all site workers on the project except:

- ☐ Other medical surveillance required (describe type and who is required to participate):

- ☐ Client drug and/or alcohol testing required.

Hazardous Materials Shipping and Transportation (*check all that apply*)

- ☐ Not applicable, no materials requiring a Shipping Determination (SD) will be transported or shipped
- ☐ A SD has been reviewed and provided to field staff
- ☐ A SD is attached
- ☑ All HazMat will be transported under Materials of Trade by ARCADIS (see generic MOT SD Form)
- ☐ Other (specify):

Roadway Work Zone Safety (*check all that apply*)

- ☐ Not applicable for this project
- ☐ All or portions of the work conducted under a TCP
- ☑ All or portions of the work conducted under a STAR Plan
- ☑ TCP or STAR Plan provided to field staff
- ☑ TCP or STAR Plan attached
- ☐ Other (specify):

ARCADIS Commercial Motor Vehicles (CMVs)

This section is applicable to ARCADIS operated vehicles only

- ☑ This project will **not** utilize CMV drivers
- ☐ This project will utilize CMV drivers

Site Control (*check all that apply*)

- ☐ Not applicable for this project.
- ☐ Site control protocols are addressed in JSA or other supporting document (attach)
- ☐ Maintain an exclusion zone of _____ ft. around the active work area
- ☑ Site control is integrated into the STAR Plan or TCP for the project
- ☐ Level C site control - refer to Level C Supplement attached
- ☐ Other (specify):

Decontamination (*check all that apply*)

- ☐ Not applicable for this project.
- ☐ Decontamination protocols are addressed in JSA or other governing document (attach)
- ☑ Level D work- wash hands and face prior to consuming food, drink or tobacco.
- ☑ Level D Modified work- remove coveralls and contain, wash hands and face prior to consuming food, drink or tobacco. Ensure footwear is clean of site contaminants
- ☐ Level C work - refer to the Level C supplement attached.
- ☐ Other (specify):

Sanitation *(check all that apply)*

- ☐ Mobile operation with access to off-site restrooms and potable water
- ☐ Restroom facilities on site provided by client or other contractor
- ☑ Project to provide portable toilets (1 per 20 workers)
- ☐ Potable water available on site
- ☑ Project to provide potable water (assume 1 gal./person/day)
- ☐ Project requires running water (hot and cold, or tepid) with soap and paper towels

Safety Briefings (*check all that apply*)

- ☑ Safety briefing required daily
- ☐ Safety briefing required twice a day
- ☐ Safety briefings required at the following frequency: _____
- ☐ Subcontractors to participate in ARCADIS safety briefings
- ☐ ARCADIS to participate in client/contractor safety briefings
- ☐ 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 (Check all that apply):*

- ☑ First aid kit
- ☐ Bloodborne pathogens kit
- ☑ Fire extinguisher
- ☐ Eyewash (ANSI compliant)
- ☑ Eyewash (bottle)
- ☑ Drinking water
- ☐ Other: Flashlight
- ☑ Insect repellent
- ☑ Sunscreen
- ☐ Air horn
- ☑ Traffic cones
- ☐ 2-way radios
- ☐ Heat stress monitor
- Barricades

Behavior Based Safety Program (*check all that apply*)

☑ TIP required at the following frequency on this project:
Select One: _____ mhrs 1 time(s) _____ Define: _____

☐ H&S Field Assessment required at the following frequency on this project:
Select One: _____ mhrs _____ time(s) _____ Define: _____

☐ Other (specify):

List tasks anticipated for TIP activity:

NAPL Monitoring
Soil Boring/Drilling

Near miss reporting enhances our H&S program. Take the time to enter near misses into 4-Sight.

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.

Printed Name	Signature	Date

Add additional sheets if necessary

☐ Subcontractor Acknowledgement Form attached

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

JOB SAFETY ANALYSIS

Job Safety Analysis

General

JSA ID	13426	**Status**	(3) Completed
Job Name	Environmental-Drilling, soil sampling, well installation	**Created Date**	12/10/2015
Task Description	Installation of Monitoring Wells	**Completed Date**	01/04/2016
Template	False	**Auto Closed**	False

Client / Project

Client	NATIONAL GRID
Project Number	B00367300000
Project Name	Rensselaer Non-Owned MGP Site
PIC	YOUNG, TERRY
Project Manager	GOLUBSKI, JASON

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Sinay, Josh E	12/31/2015	12/17/2015	Brien, Jason D	☑
HASP Reviewer	Groff, David F	12/31/2015	1/4/2016	Hendrickson, Kelly R	☑
Reviewer	Rodriguez Alcocer, David J	12/31/2015	12/29/2015	Brien, Jason D	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Set up necessary traffic and public access controls	1	Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	Employee H&S Fieldbook. Section lll subpart R and LL.
2	Utility Clearance	1	Potential to encounter underground or above ground utilities while drilling.	Complete utility clearance in accordance with the ARCADIS Utility Clearance H&S Standard.	ARCADIS H&S Standard ARCHSFS019. Employee H&S Fieldbook. Section lll subpart MM.
3	General drill rig operation	1	Excessive noise is generated by rig operation.	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	Employee H&S Fieldbook. Section lll subpart H, R,and MM. Section IV subpart E and Q.
		2	During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
		3	Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig.	
		4	Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling operation as practicable. Wear appropriate gloves to protect from COCs.	
		5	Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	

3	General drill rig operation	6	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Clearance H&S Standard for guidance.	
4	Monitoring well installation	1	Same hazards as in Step 3 with general drill rig operation	See step 3	Employee H&S Fieldbook. Section lll subparts R and EE. Section IV subpart E.
		2	Monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	
		3	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		4	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	
		5	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	
5	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perfrom TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	Drum Handling JSA. Employee H&S Fieldbook. Section lll subpart R and EE. Section IV C and E.

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
	safety goggles		Recommended
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear muffs		Recommended
	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III	Class II	Required
Respiratory Protection	dust mask		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Driller to provide and manage	Recommended
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Recommended
Personal	eye wash (specify type)	bottle	Required
	water/fluid replacement		Recommended
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Revise 12/14/2015	add Rodriguez Well pack material also poses an inhalation hazard, respiratory protection (dust mask) should be required Long pants and shirt are also required Consider using goggles for personnel mixing well pack materials
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Approve 1/4/2016	
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Revise 12/17/2015	Comprehensive JSA. I agree with Dave Groff comments.
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Approve 12/29/2015	

Job Safety Analysis

General

JSA ID	13428	**Status**	(3) Completed
Job Name	Environmental-Groundwater Sampling and free product recovery	**Created Date**	12/10/2015
Task Description	NAPL/ groundwater monitoring	**Completed Date**	01/04/2016
Template	False	**Auto Closed**	False

Client / Project

Client	NATIONAL GRID
Project Number	B00367300000
Project Name	Rensselaer Non-Owned MGP Site
PIC	YOUNG, TERRY
Project Manager	GOLUBSKI, JASON

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Sinay, Josh E	1/12/2016	12/29/2015	Brien, Jason D	☑
HASP Reviewer	Groff, David F	1/12/2016	1/4/2016	Hendrickson, Kelly R	☑
Reviewer	Rodriguez Alcocer, David J	1/12/2016	12/29/2015	Brien, Jason D	☑

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.	Employee H&S Fieldbook. Section lll subpart H and LL.
		2	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.	Employee H&S Fieldbook. Section lll subparts R,EE, H, and LL.
		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.	ARCADIS H&S Field book section lll subsection E.
		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.	
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.	ARCADIS H&S Field book section lll subsection C and E.
		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.	ARCADIS H&S Field book section lll subsection C and E.

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		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Recommended
	traffic vest--Class II or III	Class II	Required

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 repellant		Recommended
	sunscreen		Recommended
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Revise 12/14/2015	long pants and hard hat required add hazards associated with exposure to COCs add hazards associated with using bailer add Rodriguez
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Revise 12/16/2015	revise to read long pants and hard hat required
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Approve 1/4/2016	
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Revise 12/29/2015	Hard hat should be required.
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Approve 12/29/2015	

Job Safety Analysis

General

JSA ID	13429	**Status**	(3) Completed
Job Name	Environmental-Soil sampling/well installation - manual	**Created Date**	12/10/2015
Task Description	Soil Boring - Sampling	**Completed Date**	12/17/2015
Template	False	**Auto Closed**	False

Client / Project

Client	NATIONAL GRID
Project Number	B00367300000
Project Name	Rensselaer Non-Owned MGP Site
PIC	YOUNG, TERRY
Project Manager	GOLUBSKI, JASON

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Sinay, Josh E	12/29/2015	12/15/2015	Brien, Jason D	☑
HASP Reviewer	Groff, David F	12/29/2015	12/16/2015	Hendrickson, Kelly R	☑
Quality Reviewer	Kassel, Chris	12/17/2015	12/17/2015	McCune, William T	☑
Reviewer	Rodriguez Alcocer, David J	12/29/2015	12/17/2015	Brien, Jason D	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Sampling set-up	1	Underground utilities could be encountered during hand augering	Follow the Utility Clearance HS Standard	Utility Clearance HS Standard ARCHSF019. Employee H&S Fieldbook. Section lll subpart H, EE, and MM
		2	Muscle fatigue can occur from lifting heavy equipment in and out of vehicle	Park as close as possible to the sample locations. Use lifting techniques outlined in the Field H&S Handbook	
		3	Slips/trips/falls could occur from uneven walking and working surfaces	Remove any gravel or debris from sampling location. Gravel will get stuck in auger and continue to fall back down in hole. A five gallon bucket with the bottom cut out will retain gravel from falling back down in the hole.	
2	Installation of hand auger boring	1	Muscle strains from pulling/pushing could occur when installing the boring, and when removing the auger from the hole	Stretch out arms/back/shoulder muscles prior to beginning. Using firm grip on handle, slowly turn auger and progress downward in 6" increments. Slowly pull auger from hole-use legs to pull auger out of hole. If water is encountered, a suction will be created when trying to remove the auger. Ask for assistance from another worker if you can't remove safely on your own.	Employee H&S Fieldbook. Section lll subpart EE.
		2	Hand strain and blisters could develop from prolonged hand augering	Select proper gloves for task, usually leather type work gloves or mechanics style gloves. If hot spots develop on hands (Hot Spots are where blisters start to form) readjust gloves or change to better padded glove. If blisters begin to form, stop work so as not to worsen blistering.	
		3	Over-exertion could occur when trying to force an auger forward if there is refusal.	If refusal occurs, Stop Work. Remove auger from hole and check hole with flashlight if possible. DO NOT overexert by using excessive force.	
		4	Fatigue can occur due to strenuous nature of hand augering activities	Take rest breaks as needed or switch out task with another employee.	
3	Collect Sample Soil Sample	1	Staff can come into contact with impacted soils	Wear chemical protective gloves as outlined in the HASP, and wear safety glasses.	Employee H&S Fieldbook. Section lll subpart R and EE.

3	Collect Sample Soil Sample	2	Sharp edges and broken glassware can cause lacerations	Discard any broken sample containers or glass. Do not overtighten sample containers.	
		3	Containerizing and moving soil cuttings can cause muscle strains	Dispose of left over soil cuttings in a drum or bucket and dispose properly. Only fill buckets half full due to weight and strength of bucket. Wear leather work gloves and use good lifting techniques when handling buckets.	
4	Decon Hand Auger	1	Exposure to COCs while deconing equipment.	Wear chemical protective gloves as outlined in the HASP, and wear safety glasses.	Employee H&S Fieldbook. Section lll subpart R.
		2	Cleaning solutions can splash while deconing equipment	Use PPE as outlined in the HASP, and try to minimize splashing.	
		3	The end of the hand auger has sharp edges, and lacerations can occur	Use brush to scrub off soils and not hands. Do not reach into the nose (the end with teeth) of the auger with hand.	
5	Fill in Sample Location	1	Open boreholes are a trip hazard	Fill in hole with sand or bentonite. Pack down chips as best as possible. Add a bit of DI Water to make chips swell and fill hole completely.	Employee H&S Fieldbook. Section lll subparts F, H, and R
		2	Muscle strain can occur from lifting bags of sand and/or bentonite.	Use proper lifting techniques as detailed in the Field H&S handbook	

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		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	Leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III	Class II/ Traffic safety vest	Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Revise 12/14/2015	long pants are required add traffic safety vest to required PPE add Rodriguez
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Approve 12/16/2015	
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Approve 12/17/2015	
Employee: **Role** **Review Type** **Completed Date**	Kassel, Chris Quality Reviewer NA 12/17/2015	Looks good. In the last step you could consider adding the slipping hazard caused by wet bentonite at the surface if you backfill to grade with bentonite or spill any.

Job Safety Analysis

General

JSA ID	13424	**Status**	(3) Completed
Job Name	Environmental-Geophysical survey	**Created Date**	12/10/2015
Task Description	Site Survey of sample locations	**Completed Date**	12/17/2015
Template	False	**Auto Closed**	False

Client / Project

Client	NATIONAL GRID
Project Number	B00367300000
Project Name	Rensselaer Non-Owned MGP Site
PIC	YOUNG, TERRY
Project Manager	GOLUBSKI, JASON

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Sinay, Josh E	12/29/2015	12/15/2015	Brien, Jason D	☑
HASP Reviewer	Groff, David F	12/29/2015	12/16/2015	Hendrickson, Kelly R	☑
Quality Reviewer	Gabriel, Jing S	12/18/2015	12/18/2015	Voscott, Hoa T	☑
Reviewer	Rodriguez Alcocer, David J	12/29/2015	12/17/2015	Brien, Jason D	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Mobilization of equipment to survey area	1	Lifting hazards (heavy or bulky equipment)	Use TRACK to plan lifts and routes to work location. Use proper lifting techniques.	Employee H&S Fieldbook. Section lll subpart E, EE, and LL.
		2	Awkward body positions and twisting	Plan activity to avoid twisting of body or awkward body positions. Use buddy system or job rotation to reduce exposure to conditions that cannot be avoided.	
		3	Trip and fall hazards from uneven ground or restricted view when carrying equipment	Break loads down to manageable size that does not obstruct view of ground. Plan route and use TRACK, wear footwear with good tread and ankle support. Use buddy system for large or bulky items when carrying.	
2	Set up survey grid and control	1	Slip trip and fall hazards from wet, uneven ground or over vegetation.	See step one controls.	Employee H&S Fieldbook. Section lll subpart A, E, R, EE, and LL.
		2	Crush hazard or contact stress to hands/fingers from inserting pins or stakes.	Wear leather gloves when inserting pins, flagging, or stakes into the ground. Do not hurry task if hammering.	
		3	Struck by hazards by vehicles if working in traffic area.	Establish traffic control and wear a Class II traffic vest if in traffic area. Use vehicles to block work area when practical.	
		4	Repetitive stress from repeated bending or squatting during grid construction	Use job rotation when hazard exists, stretch before performing work activity. Use paint device that allows employee to stand up while spraying.	
		5	Chemical exposure from using spray paint	Stand up wind of paint spraying activities	
3	Performing survey	1	Slips trips and falls on wet, uneven or steep sloped surfaces	See step one controls.	Employee H&S Fieldbook. Section lll subpart H, R, EE,DD, and LL.
		2	Scrapes or cuts to hands, arms or legs from equipment or vegetation in area.	Wear leather or other suitable gloves when performing survey, wear long pants, wear heavy long sleeve shirt if arm hazard exists.	
		3	Noise hazards from survey equipment using percussion devices	Wear hearing protection, keep unnecessary workers away from devices when activated.	
		4	Ergonomic injury form improper or prolonged use of carried devices that are long or bulky.	Use job rotation to reduce potential for injury.	

4	Demobilization and clean up	1	Muscle strain from removing pins or stakes	Use devices that maintain neutral body positions to remove pins when practical. Do not bend at waist when removing.	Employee H&S Fieldbook. Section lll subpart H, R, EE,DD, and LL.
		2	Pinch hazards to fingers from equipment cases	Identify hazard and avoid, pack equipment properly so that no wires or cables protrude from case requiring fingers to push into case when closing.	
		3	Lifting hazards from demobilizing equipment from work area	See step one controls.	
		4	Slip, trip and falls carrying equipment that obstructs view or on wet or uneven surfaces.	See step one controls.	
5	Preparation and return shipment of equipment	1	Cuts to hands and forearms from cutting strapping tape	Do not hurry during package preparation, Use TRACK, Use the right cutting tool for the task activity, use cutting tools with self retracting blades	Employee H&S Fieldbook. Section lll subpart R, J, and EE.
		2	Pinch hazards to fingers from equipment cases and placement of equipment in boxes	See step 4 controls.	
		3	Lifting hazards from completed shipping packages	See step 1 controls	
		4	Fire hazard form improperly packed spare batteries	Cover battery terminals or keep in original packaging when shipping, protect batteries from other metal objects in packages, perform shipping determination for number of spare batteries permitted to be shipped in package or consignment.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	boots	supportive with good tread	Required
	steel-toe boots		Required
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Recommended
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required
	flashlight		Recommended
Personal	eye wash (specify type)	Water Bottle	Recommended
	insect repellant		Recommended
	sunscreen		Recommended
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Revise 12/14/2015	add Rodríguez
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Approve 12/16/2015	
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Approve 12/17/2015	Great JSA. Remember to monitor traffic condition during surveying activities to reduce the potential of being struck by vehicles.
Employee: **Role** **Review Type** **Completed Date**	Gabriel, Jing S Quality Reviewer NA 12/18/2015	Nice details and procedure references.

Job Safety Analysis

General

JSA ID	13425	**Status**	(3) Completed
Job Name	Construction-Excavation and trenching	**Created Date**	12/10/2015
Task Description	Testing Pit Excavations	**Completed Date**	12/17/2015
Template	False	**Auto Closed**	False

Client / Project

Client	NATIONAL GRID
Project Number	B00367300000
Project Name	Rensselaer Non-Owned MGP Site
PIC	YOUNG, TERRY
Project Manager	GOLUBSKI, JASON

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Sinay, Josh E	12/29/2015	12/15/2015	Brien, Jason D	☑
HASP Reviewer	Groff, David F	12/29/2015	12/16/2015	Hendrickson, Kelly R	☑
Quality Reviewer	DeMarco, Matthew J	12/21/2015	12/21/2015	Hill, Christopher P	☑
Reviewer	Rodriguez Alcocer, David J	12/29/2015	12/17/2015	Brien, Jason D	☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Site preparation	1	Improper utility clearance may result in utility/equipment damage or injury.	Perform utility clearance with a minimum of 3 lines of evidence. Document utility clearance for reference including any ticket numbers or phone numbers of utilities.	Employee H&S Fieldbook. Section lll subpart H, R, EE, DD, and MM.
		2	Clearing vegetation may result in impact hazards.	Stand at least 25 ft from clearing operations using manual or mechanized methods. Larger vegetation like trees may be under stress and may break and wood parts my fly in any direction.	
		3	Slip trip and fall hazards from walkover activities (vegetation, uneven surfaces, etc and applies to all job steps in this JSA)	Plan route and focus on the task at hand (walking). Do not walk while looking at utility maps/drawings or talking on cell phones.	
2	Excavation and backfilling	1	Struck by equipment during excavation.	Stay at least 10 feet beyond the reach of excavation equipment unless establishing communication with operator. Wear PPE required by this JSA for increased visibility. Keep unneccessary workers away from the excavation area.	Employee H&S Fieldbook. Section lll subpart H, R,and MM. Section IV subpart D, E, and Q.
		2	Equipment/worker falls into excavations from edge collapse	Stand at least 6 ft from edge of excavation. Competent person to oversee sloping, benching, bracing excavation to ensure stability.	
		3	Worker entrapment/suffocation/chemical overexposure/engulfment in excavation	Entry into excavations are prohibited unless approved by a Competent Person. Keep spoil piles at least 2 ft from excavation edge. Ensure proper slope/bench/shielding is in place prior to entry. Air monitor for toxic vapors and oxygen deficiency. Ensure proper means of access and egress.	
		4	Chemical exposure to site contaminants.	Wear protective clothing specified in this JSA, avoid skin contact with soil materials or any liquids in the excavation. Use air monitoring to ensure TLVs are not exceeded. Wash hands and face prior to eating, drinking or consuming tobacco.	
		5	Noise from excavation equipment	Keep distance from equipment to reduce noise levels. If levels cannot be controlled wear hearing protection appropriate for the hazard.	

3	Excavation equipment decontamination	1	Slips and falls on wet surfaces.	Wear footwear appropriate for wet environments. Reduce amount of pressure washing required by removing soils using dry methods to extent practical	Employee H&S Fieldbook. Section lll subpart R and F.
		2	Flying particles from cleaning activities.	Wear eye and skin protection during decontamination activities. Use face shield if overspray or flying debris is a persistent problem. Avoid cleaning (pressure washing) in direction of other nearby workers, keep unneccessary workers clear of decontamination activity.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)	Tyvek per SSO	Required
Eye Protection	faceshield	During decontamination (per SSO)	Required
	safety glasses		Required
Foot Protection	boots	Steal Toe	Required
	rubber boots	Wet environments (per SSO)	Required
	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile when handling impacted soils	Required
	work gloves (specify type)	leather or equivalent (per SSO)	Required
Head Protection	hard hat		Required
Hearing Protection	ear muffs		Recommended
	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III	Class II	Required
Respiratory Protection	dust mask		Recommended

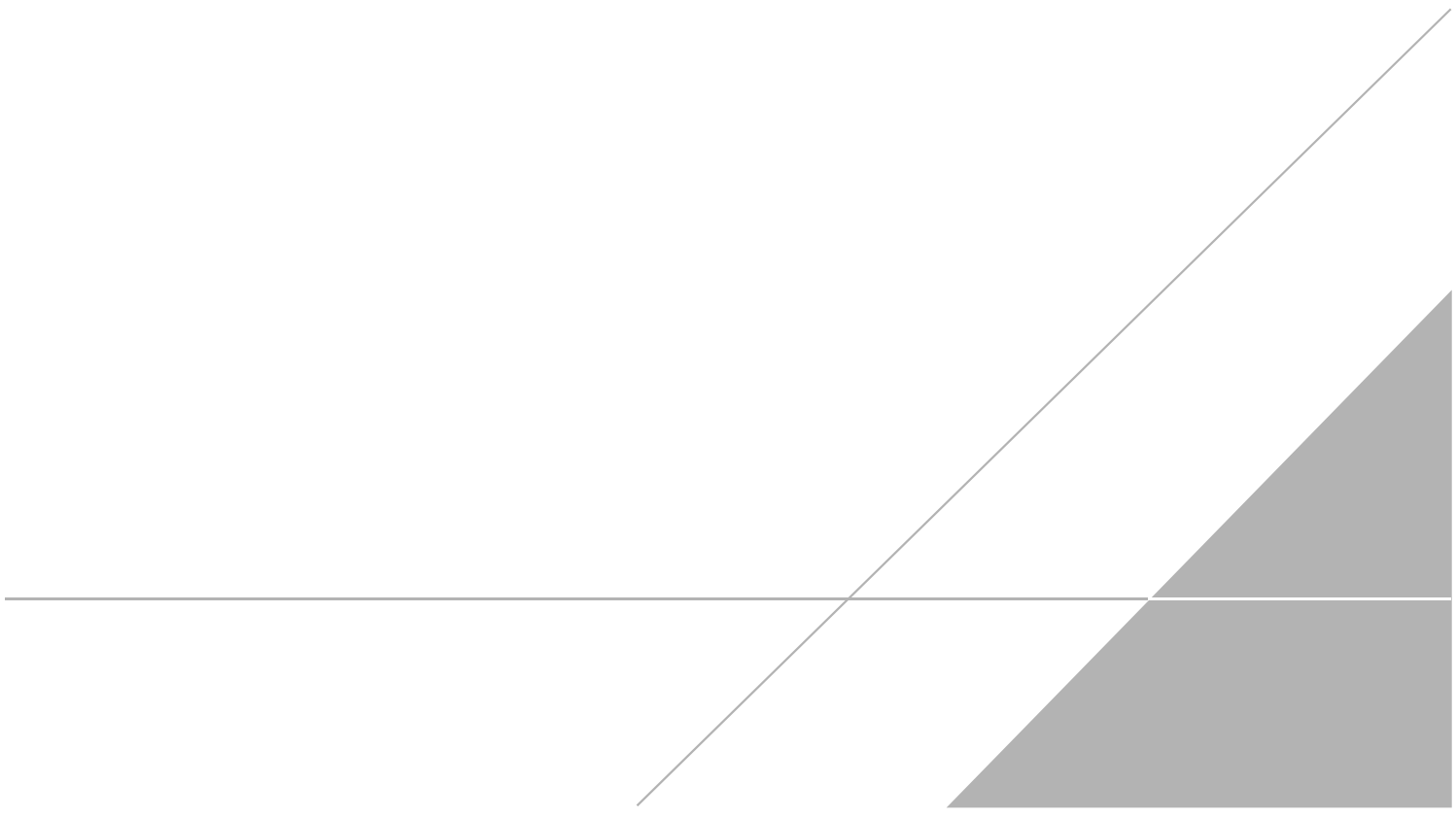
Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	walkie talkie		Required
Miscellaneous	auxilary lighting	Light plant for night work	Required
	fire extinguisher	ABC 10 pound minimum	Required
	first aid kit		Required
Personal	eye wash (specify type)	Bottle	Required
	insect repellant		Recommended
	sunscreen		Recommended
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Revise 12/14/2015	add Rodriguez
Employee: **Role** **Review Type** **Completed Date**	Groff, David F HASP Reviewer Approve 12/16/2015	
Employee: **Role** **Review Type** **Completed Date**	Rodriguez Alcocer, David J Reviewer Approve 12/17/2015	Good JSA.
Employee: **Role** **Review Type** **Completed Date**	DeMarco, Matthew J Quality Reviewer NA 12/21/2015	Good JSA, here are some things to consider adding. In the site preparation section please include the survey and clearance of dangerous critters (snakes, stinging insects etc) or plants (poison ivy etc.). In the excavation, section please include consideration for alternative digging techniques in area of known (including abandoned) utilities such as hydro-vac or hand dig until visually identified location and depth. In the trenching section, the stability of slopes should be reevaluated after any rain events or overnight weather changes. Utilities should be remarked if excavation work or equipment erodes the marking. Unidentified utilities encountered should be marked and investigated by a competent person.

MATERIAL SAFETY DATA SHEETS



Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date 25.05.2012 Revision: 24.05.2012

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

· **1.1 Product identifier**

· **Trade name: ALCONOX**
· **Application of the substance / the preparation** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**
· **Manufacturer/Supplier:**
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

· **Further information obtainable from:** Product Safety Department
· **1.4 Emergency telephone number:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards identification

· **2.1 Classification of the substance or mixture**
· **Classification according to Regulation (EC) No 1272/2008**


GHS05 corrosion

Eye Dam. 1 H318 Causes serious eye damage.


GHS07

Skin Irrit. 2 H315 Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

Xi; Irritant

R38-41: Irritating to skin. Risk of serious damage to eyes.
· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.

· **2.2 Label elements**
· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.
· **Hazard pictograms**


GHS05

· **Signal word** Danger

· **Hazard-determining components of labelling:**
Benzenesulfonic Acid, Sodium Salts

(Contd. on page 2)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date 25.05.2012 Revision: 24.05.2012

Trade name: ALCONOX

(Contd. of page 1)

· **Hazard statements**
H315 Causes skin irritation.
H318 Causes serious eye damage.
· **Precautionary statements**

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P264	Wash thoroughly after handling.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.
P321	Specific treatment (see on this label).
P362	Take off contaminated clothing and wash before reuse.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.

· **Hazard description:**
· **WHMIS-symbols:**
D2B - Toxic material causing other toxic effects

· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**		
CAS: 68081-81-2	Benzenesulfonic Acid, Sodium Salts Xi R38-41 Eye Dam. 1, H318 Skin Irrit. 2, H315	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	sodium carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%

(Contd. on page 3)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date 25.05.2012 Revision: 24.05.2012

Trade name: ALCONOX

(Contd. of page 2)

CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38	2,5-10%
	Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Do not induce vomiting; call for medical help immediately.
Rinse out mouth and then drink plenty of water.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
· **5.2 Special hazards arising from the substance or mixture**
No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.

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See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **7.1 Precautions for safe handling**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **Information about fire - and explosion protection:** No special measures required.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

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· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**

Safety glasses

· **Body protection:** Protective work clothing

9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20°C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not selfigniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20°C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.

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· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Segregation coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

10 Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions**
Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **on the skin:** Irritant to skin and mucous membranes.
· **on the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

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12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability** No further relevant information available.
· **12.3 Bioaccumulative potential** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **12.6 Other adverse effects** No further relevant information available.

13 Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number**	
· **DOT, ADR, ADN, IMDG, IATA**	N/A
· **14.2 UN proper shipping name**	
· **DOT, ADR, ADN, IMDG, IATA**	N/A
· **14.3 Transport hazard class(es)**	
· **DOT, ADR, ADN, IMDG, IATA**	
· **Class**	N/A
· **14.4 Packing group**	
· **DOT, ADR, IMDG, IATA**	N/A
· **14.5 Environmental hazards:**	
· **Marine pollutant:**	No

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· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	N/A

15 Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**
None of the ingredients is listed.

· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.

· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.

· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.

· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

· **Canada**

· **Canadian Domestic Substances List (DSL)**
All ingredients are listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**
None of the ingredients is listed.

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· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	sodium carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H302 Harmful if swallowed.
H312 Harmful in contact with skin.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H319 Causes serious eye irritation.

R21/22 Harmful in contact with skin and if swallowed.
R36 Irritating to eyes.
R36/38 Irritating to eyes and skin.
R38 Irritating to skin.
R41 Risk of serious damage to eyes.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)

GAS INNOVATIONS

MATERIAL SAFETY DATA SHEET (MSDS) ISOBUTYLENE

PRODUCT IDENTIFICATION	▪D.O.T. SHIPPING NAME	Isobutylene
	▪SYNONYM (S)	Liquefied Petroleum Gas, Isobutene, 2 Methylpropene
	▪D.O.T. I.D. NUMBER	UN-1055
	▪D.O.T. HAZZARD CLASS	2.1 Flammable Gas
	▪D.O.T. LABEL (S)	Flammable Gas
	▪C.A.S. NUMBER	115-11-7
	▪CHEMICAL FORMULA	C_4H_8 or $(CH_3)_2C{:}CH_2$
PHYSICAL DATA	▪MOLECULAR WEIGHT	56.108
	▪FREEZING POINT	-140.4°C, -220.6°F
	▪BOILING POINT	-6.9°C, 19.6°F
	▪VAPOR PRESSURE	168 kPa (gauge), 24.3 psig @21.1°C
	▪SPECIFIC VOLUME	0.418m_3/kg, 6.7 ft_3/lb @ 1 atm, 21.1°C
	▪RELATIVE DENSITY, (air=1)	1.947 @ 1 atm, 25°C
	▪SOLUBILITY IN WATER	Negligible
	▪DESCRIPTION	At room temperature and atmospheric pressure isobutene is a colorless, flammable gas, with an unpleasant odor. It is shipped as a liquefied gas under its own vapor pressure.
FIRE AND EXPLOSION HAZARD DATA	▪FLAMMABLE LIMITS IN AIR	1.8 – 9.6 % by volume
	▪AUTO-IGNITION TEMPERATURE	465°C, 869°F
	▪ FIRE FIGHTING PROCEDURES	The only safe way to extinguish an isobutylene fire is to stop the flow of gas. If the flow cannot be stopped, let the fire burn out while cooling the cylinder and the surroundings using a water spray. Personnel may have to wear approach type protective suits and positive pressure self-contained breathing apparatus. Firefighters' turnout gear may be inadequate. Small secondary fires may be brought under control by using carbon dioxide or a dry chemical fire extinguisher and stopping the flow.

Date prepared: September 7, 2007

18005 E. Hwy 225 La Porte, TX 77571 www.gasinnovations.com Ph: 281-471-2200 Fax: 281-471-2201

	▪UNUSUAL HAZARDS	1. Cylinders exposed to fire may rupture with violent force. Extinguish surrounding fire and keep cylinders cool by applying water from a maximum possible distance with a water spray. 2. Flammable gases may spread from a spill after the fire is extinguished and be subject to re-ignition.
HEALTH HAZARD DATA	▪ PERMISSIBLE EXPOSURE LIMITS	OSHA TWA None established. ASGIH TWA None established.
	▪ ACCUTE EFFECTS OVEREXPOSURE	Isobutylene is a simple asphyxiant. Inhalation of high concentrations may cause rapid respiration, dizziness, fatigue, and nausea. Massive exposure may cause unconsciousness and death. Contact with the liquid phase or with the cold has escaping from a cylinder may cause frostbite.
	▪ CHRONIC EFFECTS OF OVEREXPOSURE	None known.
FIRST AID INFORMATION	▪ INHALATION	Move victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.
	▪ CONTACT	Treat for frostbite.
REACTIVITY DATE	▪ STABILITY	(X) Stable. ( ) Unstable.
	▪ INCOMPATIBILITY	Oxidizing materials and compounds that can add across double bonds.
	▪ HAZARDOUS DECOMPOSITION/ OXIDATION PRODUCTS	Carbon monoxide, carbon dioxide.
	▪ POLYMERIZATION	(X) Will not occur ( ) May occur
SPILL OR LEAKAGE PROCEDURE	Shut off all ignition sources and ventilate the area. For controlling large flow, personnel may have to wear approach-type protective suits and positive pressure self-contained breathing apparatus.	

Date prepared: September 7, 2007

PRECAUTIONS

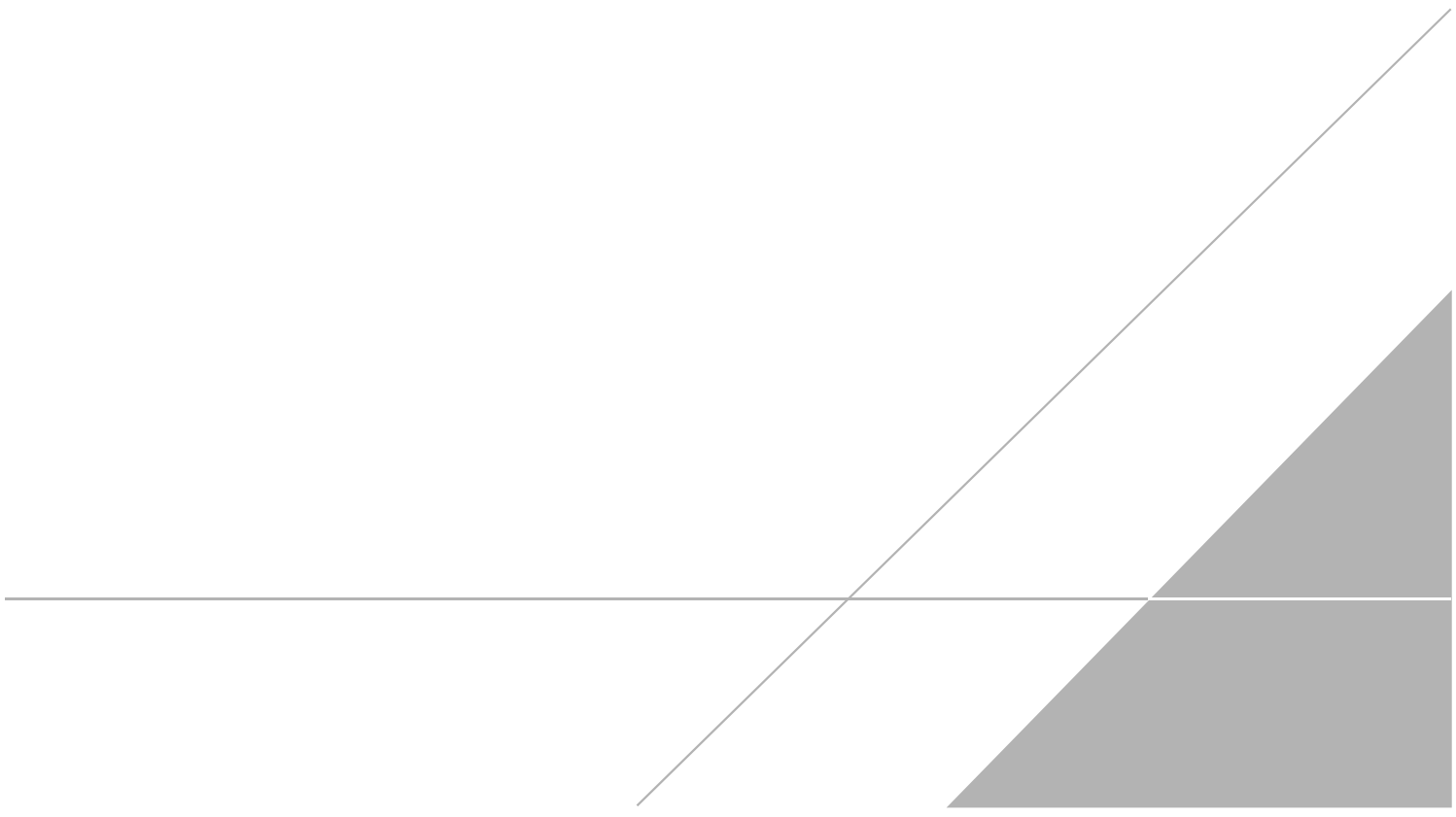
▪ STORAGE RECOMMENDATIONS	Cylinders should be stored and used in dry, cool, well-ventilated areas away from sources of heat or ignition. Do not store with oxidizers
▪ PERSONAL PROTECTIVE EQUIPMENT	1. Eye protection – Safety glasses should be worn. 2. Respiratory protection – Approved respiratory equipment must be worn when airborne concentrations exceed safe levels. 2. Skin protection – No specific equipment is required. Gloves are recommended for cylinder handling.
▪ BEFORE USING THE GAS	1. Secure the cylinder to prevent it from failing or being Knocked over. 2. Leak check the lines and equipment. 3. Have an emergency plan covering steps to be taken in the event of an accidental release.

DISCLAIMER

The information, recommendations, and suggestions herein were compiled form reference material and other sources believed to be reliable. However, the MSDS's accuracy or completeness is not guaranteed by Gas Innovations or its affiliates, nor is any responsibility assumed or implied for any loss or damage resulting from inaccuracies or omissions. Since conditions of use are beyond our control, no warranties of merchantability or fitness for a particular purpose are expressed or implied. This MSDS is not intended as a license to operate under, or recommendation to infringe on, any patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Date prepared: September 7, 2007

HASP FORMS



ARCADIS

Document Control Number:TGM - _____

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

TAILGATE HEALTH & SAFETY MEETING FORM

This form documents the tailgate meeting conducted in accordance with the Project HASP. Personnel who perform work operations on-site during the day are required to attend this meeting and to acknowledge their attendance, at least daily.

Project Name:			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**
Client:		**Client Contact:**	**Subcontractor companies:**

TRACKing the Tailgate Meeting

Think through the Tasks (list the tasks for the day):

1 _____ 3 _____ 5 _____

2 _____ 4 _____ 6 _____

Other Hazardous Activities - Check the box if there are any other ARCADIS, Client or other party activities that may pose hazards to ARCADIS operations ☐ If there are none, write "None" here: _____

If yes, describe them here: _____

How will they be controlled? _____

Prework Authorization - check activities to be conducted that require permit issuance or completion of a checklist or similar before work begins:

	Doc #		Doc #		Doc #
☐ Not applicable		☐ Working at Height		☐ Confined Space	
☐ Energy Isolation (LOTO)		☐ Excavation/Trenching		☐ Hot Work	
☐ Mechanical Lifting Ops		☐ Overhead & Buried Utilities		☐ Other permit	

Discuss following questions (for some review previous day's post activities). **Check if yes :**

☐ Incidents from day before to review?	☐ Lessons learned from the day before?	☐ Any Stop Work Interventions yesterday?
☐ Any corrective actions from yesterday?	☐ Will any work deviate from plan?	☐ If deviations, notify PM & client
☐ JLAs or procedures are available?	☐ Field teams to "dirty" JLAs, as needed?	☐ All equipment checked & OK?
☐ Staff has appropriate PPE?	☐ Staff knows Emergency Plan (EAP)?	☐ Staff knows gathering points?

Comments: _____

Recognize the hazards (check all those that are discussed) (Examples are provided) and **A**ssess the Risks (Low, Medium, High - circle risk level) - Provide an overall assessment of hazards to be encountered today and briefly list them under the hazard category.

☐ Gravity (i.e., ladder, scaffold, trips) (L M H)	☐ Motion (i.e., traffic, moving water) (L M H)	☐ Mechanical (i.e., augers, motors) (L M H)
☐ Electrical (i.e., utilities, lightning) (L M H)	☐ Pressure (i.e., gas cylinders, wells) (L M H)	☐ Environment (i.e., heat, cold, ice) (L M H)
☐ Chemical (i.e., fuel, acid, paint) (L M H)	☐ Biological (i.e., ticks, poison ivy) (L M H)	☐ Radiation (i.e., alpha, sun, laser) (L M H)
☐ Sound (i.e., machinery, generators) (L M H)	☐ Personal (i.e. alone, night, not fit) (L M H)	☐ Driving (i.e. car, ATV, boat, dozer) (L M H)

Continue TRACK Process on Page 2

TAILGATE HEALTH & SAFETY MEETING FORM - Pg. 2

Control the hazards (Check all and discuss those methods to control the hazards that will be implemented for the day): Review the HASP, applicable JLAs, and other control processes. Discuss and document any additional control processes.

- [X] **STOP WORK AUTHORITY** (Must be addressed in every Tailgate meeting - (*See statements below*)

[ ] Elimination	[ ] Substitution	[ ] Isolation
[ ] Engineering controls	[ ] Administrative controls	[ ] Monitoring
[ ] General PPE Usage	[ ] Hearing Conservation	[ ] Respiratory Protection
[ ] Personal Hygiene	[ ] Exposure Guidelines	[ ] Decon Procedures
[ ] Emergency Action Plan (EAP)	[ ] Fall Protection	[ ] Work Zones/Site Control
[ ] JLA to be developed/used ***(specify)***	[ ] LPO conducted ***(specify job/JLA)***	[ ] Traffic Control
[ ]	[ ]	[ ] Other ***(specify)***
[ ]	[ ]	[ ]

Signature and Certification Section - Site Staff and Visitors

Name/Company/Signature	Initial & Sign in Time	Initial & Sign out Time	I have read and understand the HASP

Important Information and Numbers

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 1.800.455.6155 and then notify the field supervisor who will, in turn, notify Corp H&S at 1.720.344.3844.

In the event of a motor vehicle accident, employees will notify the field supervisor who will then notify Corp H&S at 1.720.344.3844 and then Corp Legal at 1.720.344.3756.

In the event of a utility strike or other damage to property of a client or 3rd party, employees will immediately notify the field supervisor, who will then immediately notify Corp Legal at 1.678.373.9556 and Corp H&S at 1.720.344.3500

Visitor Name/Co - not involved in work

In	Out
In	Out
In	Out
In	Out

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.

Post Daily Activities Review - Review at end of day or before next day's work (Check those applicable and explain:)

- [ ] Lessons learned and best practices learned today: _____
- [ ] Incidents that occurred today: _____
- [ ] Any Stop Work interventions today? _____
- [ ] Corrective/Preventive Actions needed for future work: _____
- [ ] Any other H&S issues: _____

Keep H&S 1st in all things

WorkCare - 1.800.455.6155
Near Loss Hotline - 1.866.242.4304

Real Time Exposure Monitoring Data Collection Form

Document all air monitoring conducted on the Site below. Keep this form with the project file.

Site Name: _____ Date: _____

Instrument: _____ Model: _____ Serial #: _____

Calibration Method: (Material used settings, etc.)	
Calibration Results:	
Calibrated By:	

Activity Being Monitored	Compounds/Hazards Monitored	Time	Reading	Action Required? Y/N

Describe Any Actions Taken as a Result of this Air Monitoring and Why (does it match Table 5-1):

_____

_____

Employee Signature Form

I certify that I have read, understand, and will abide by the safety requirements outlined in this HASP.

Printed Name	Signature	Date

Subcontractor Acknowledgement: Receipt of HASP Signature Form

ARCADIS claims no responsibility for the use of this HASP by others although subcontractors working at the site may use this HASP as a guidance document. In any event, ARCADIS does not guarantee the health and/or safety of any person entering this site. Strict adherence to the health and safety guidelines provided herein will reduce, but not eliminate, the potential for injury at this site. To this end, health and safety becomes the inherent responsibility of personnel working at the site.

Printed Name	Company	Signature	Date

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.

Name	Company	Reason for Visit	Date/Time On Site	Date/Time Off Site

Hazardous Materials Transportation Form

	Vehicle (place X in box)	Type (pick-up, car, box truck, etc.)
Personal		
Rental		
ARCADIS owned/leased		
Government owned		
Trailer		

Materials Transported	Quantity	Storage/Transport Container

List Trained Drivers:

_____

_____

Hazardous Materials Shipment Form

Material Description and Proper Shipping Name (per DOT or IATA)	Shipment Quantity	DOT Hazard Classification	Shipment Method (air/ground)

List Shipper (i.e., who we are offering the shipment to):

_____

_____

List Trained Employee(s):

_____

_____

ARCADIS UTILITY AND STRUCTURES CHECKLIST

Project: RG&E Front Street
Project Number: B0007453.0020.00042
Date: 8/4/2014

Work locations applicable to this clearance checklist **(Photo Document Work Locations)**:

THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Pre-Field Work

One Call or "811" notified 48-72 hours in advance of work? ☐ Yes ☐ No
Utility companies notified during the One Call process ☐ See attached ticket

List any other utilities requiring notification: ☐ None

Private Locator Contacted ☐ Yes ☐ No

Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities

Client provided utility maps or "as built" drawings showing utilities? Yes ☐ No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities

Lines of Evidence - Must have **3 Reliable Lines of Evidence** Prior to Starting any Intrusive Work

☐ One Call/"811"
Utility Markings Present: ☐ Paint ☐ Pin flags/stakes ☐ Other ☐ None
☐ Client Provided Maps/Drawings **OR** ☐ Maps/Drawings requested but not provided
☐ Client Clearance Name(s)/Affiliation(s)
☐ Interview(s): Name(s)/Affiliation(s)

Did person(s) interviewed indicate depths of any utilities in the subsurface?
☐ Yes, depths provided:
☐ Did not know or refused to answer
Additional Comments:

☐ Site Inspection & Complete Site Sketch **(Photo Document Marked Utilities & Utility Structures)**
☐ GPR
☐ Air-Knife
☐ Hydro-Knife
☐ Public Records/Maps
☐ Radiofrequency
☐ Metal Detector
☐ Handauger
☐ Potholing
☐ Probing
☐ Private Locator: Name and Company:
☐ Marine Locator: Name and Company:
☐ Other:

Tips for Successful Utility Location:
1. Don't forget to look up
2. Be on site when utilizing private utility locators
3. Select alternate/backup locations during clearance process
4. Mark out all known utilities. Leave nothing to question
5. No hammering- no pickaxes-no digging bars-no hurrying or shortcutting
6. No excessive turning or downward force of handaugers/shovels, etc.
7. Utilities may run directly under asphalt/concrete or be > 5 ft. in depth

T R A C K

Site Inspection

During the site inspection look for the following **("YES" requires additional investigation and must be marked properly prior to performing intrusive work)**:

		Utility Color Codes		
a)	Natural gas line present (evidence of a gas meter)?	Yellow	☐ Yes	☐ No
b)	Evidence of electric lines:	Red		
i)	Conduits to ground from electric meter or along wall?		☐ Yes	☐ No
ii)	Light poles, electric devices with no overhead lines?		☐ Yes	☐ No
iii)	Overhead electric lines present?		☐ Yes	☐ No
c)	Evidence of sewer drains:	Green		
i)	Restrooms or kitchen on site?		☐ Yes	☐ No
ii)	Sewer cleanouts present?		☐ Yes	☐ No
iii)	Combined sewer /storm lines or multiple sewer lines?		☐ Yes	☐ No
d)	Evidence of water lines:	Blue		
i)	Water meter on site or multiple water lines?		☐ Yes	☐ No
ii)	Fire hydrants in vicinity of work?		☐ Yes	☐ No
iii)	Irrigation systems? (Sprinkler heads, valve boxes, controls in building)		☐ Yes	☐ No
e)	Evidence of storm drains:	Green		
i)	Open curbside or slotted grate storm drains		☐ Yes	☐ No
ii)	Gutter down spouts going into ground		☐ Yes	☐ No
f)	Evidence of telecommunication lines:	Orange		
i)	Fiber optic warning signs in areas?		☐ Yes	☐ No
ii)	Lines from cable boxes running into ground?		☐ Yes	☐ No
iii)	Conduits from power poles running into ground?		☐ Yes	☐ No
iv)	Aboveground boxes or housings or wires in work area?		☐ Yes	☐ No
g)	Underground storage tanks:			
i)	Tank pit present?		☐ Yes	☐ No
ii)	Product lines running to dispensers/buildings?		☐ Yes	☐ No
iii)	Vent present away from tank pit?		☐ Yes	☐ No
h)	Do utilities enter or exit existing structures/buildings?		☐ Yes	☐ No
	If Yes, confirm the utility markings outside of structure/building match up.			
i)	Proposed excavation marked in white?	White	☐ Yes	☐ No
j)	Overhead Utilities/Communication Lines **Look Up**:			
i)	Overhead electrical conduit, pipe chases, cable trays ?		☐ Yes	☐ No
ii)	Overhead fire sprinkler system?		☐ Yes	☐ No
iii)	Other overhead lines/utilities, product lines, AC condenser lines?		☐ Yes	☐ No
k)	Aboveground Power lines in or near the work area:			
i)	< 50 kV within 10 ft. of work area?		☐ Yes	☐ No
ii)	>50 - 200 kV within 15 ft. of work area?		☐ Yes	☐ No
iii)	>200-350 kV within 20 ft. of work area?		☐ Yes	☐ No
iv)	>350-500 kV within 25 ft. of work area?		☐ Yes	☐ No
v)	>500-750 kV within 35 ft. or work area?		☐ Yes	☐ No
vi)	>750-1000 kV within 45 ft. of work area?		☐ Yes	☐ No
l)	Other:			
i)	Evidence of linear asphalt or concrete repair?		☐ Yes	☐ No
ii)	Evidence of linear ground subsidence or change in vegetation?		☐ Yes	☐ No
iii)	Unmarked manholes or valve covers in work area?		☐ Yes	☐ No
iv)	Warning signs ("Call Before you Dig", etc.) on or adjacent to site?		☐ Yes	☐ No
v)	Utility color markings not illustrated in this checklist?		☐ Yes	☐ No

Do not initiate intrusive work if utilities are suspected to be present in area and are not located, if markings are over 14 days old, or if clearance methods provide incomplete or conflicting information. Do not perform intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S .

Name and Signature of person completing the checklist: _____

Date: _____ _____

Air Monitoring Documentation Form

PID Model: _____ Monitor Frequency: _____

LEL/O_2 Model: _____

CIT Model: _____

Dust Mon. Model: _____

Air Monitoring Results

Date	Time	PID (units)	O_2 (%)	LEL (% LEL)	CIT (ppm)	Dusts (mg/m^3)	Location

PID	Photoionization Detector	ppm	Part per million
LEL	Lower Explosive Limit	%	Percent
O2	Oxygen	mg/m3	Miligram per cubic meter
CIT	Colorimetric Indicator Tube		

ARCADIS Weekly Vehicle Inspection Form

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												
Jack and Lug Wrench present												
Exterior[1] Lights and Signals operational												
Tires properly inflated/good tread depth												
Spare Tire properly inflated												
Doors operational												
Windows Not Cracked/Damaged												
Side View Mirrors												
Body Panels and Bumpers												
Engine & Brakes Engine Start & Running Smoothly												
Fluid Levels, No Noticeable Leaks												
Belts tight, no cracks												
Brakes operational, no squeaking												
Emergency Equipment[2] First Aid Kit, inspected weekly												
Fire Extinguisher properly secured												
Fire Extinguisher inspected weekly												
Orange/Yellow emergency warning light												
Roadside Assistance Information												
Recommend spotter cones available												
Cargo Cargo Secure and Properly Distributed												
Securing Devices in Good Condition												
Registration 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**

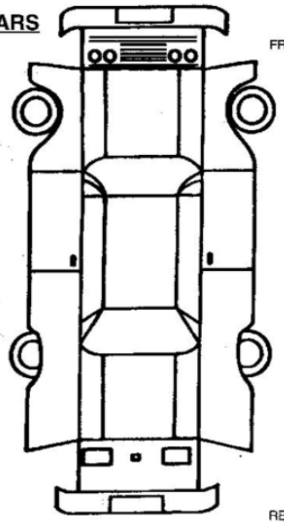
Note All Vehicle Damage Below

All Vehicle Damage must be reported to Sue Berndt (Corporate Legal), Andrew McDonald (Corporate H&S), and Roger Elliot (Corporate Fleet Manger)

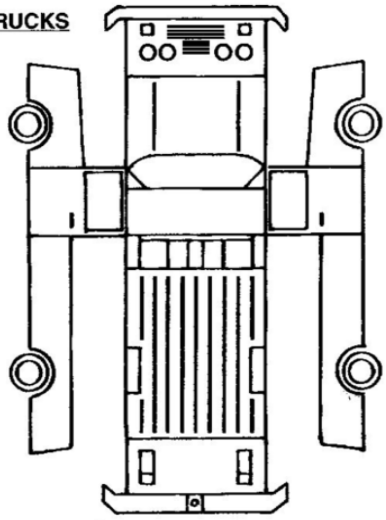
CODES:

B-BENT
BR-BROKEN
BU-BULGE
C-CHAFED
CH-CHIPPED
CPM-COVERED WITH PROTECTIVE MATERIAL-UNABLE TO DETERMINE DEFECTS IF ANY
CSA-CHAFED AND SCRATCHED ALL OVER
CR-CRACKED
D-DENTED
DMC-DUST AND MUD COVERED UNABLE TO DETERMINE OTHER DEFECTS IF ANY
G-GOUGED OR CUT
GC-GLASS CRACKED
HS-HAIRLINE SCRATCH
M-MISSING
P-PUNCTURED
R-RUSTY
S-SCRATCHED
SC-SCRAPED
SM-SMASHED
ST-STAINED AND/OR SOILED
T-TORN

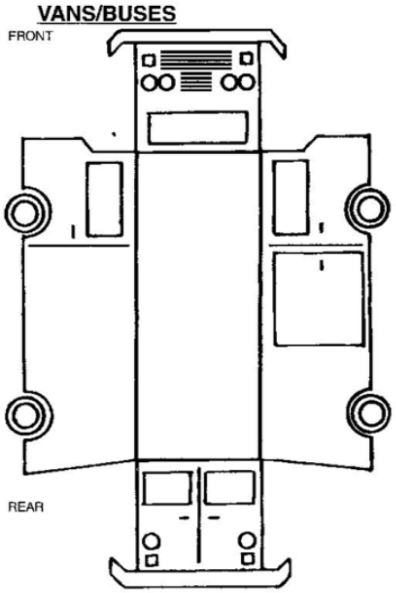
CARS



TRUCKS



VANS/BUSES



-INDICATE ON DIAGRAM-
-GIVE DIMENSIONS-
-CIRCLE WHERE APPLICABLE-

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

Utilities and Structures Checklist

THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project: _____
Project Number: _____
Form Completion Date: _____ Form Expiration Date: _____
(15 business days post form completion date)

Pre-Field Work

Required: One Call or "811" notified 48-72 hours in advance of work? #: _____
Ticket Expiration Date _____ (Review State Requirements)
Utility companies notified during the One Call process ☐ See attached ticket

_____ _____ _____ _____
_____ _____ _____ _____

List any other utilities requiring notification: ☐ None

_____ _____ _____ _____

Private Locator Contacted ☐ Yes ☐ No

Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities. When possible re-clear 811 markings to confirm utility locations.

Client provided utility maps or "as built" drawings showing utilities? ☐ Yes ☐ No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities. Review Check list with PM or designee prior to beginning intrusive work.

List Soil Boring / Well IDs or Excavation Locations applicable to this clearance checklist:

3 Reliable Lines of Evidence Required Prior to Starting any Subsurface Intrusive Work

☐ One Call/"811" (Reliable as a line of evidence when working in public right of way or easement)
Utility Markings Present: ☐ Paint ☐ Pin flags/stakes ☐ Other ☐ None

☐ Client Provided Maps/Drawings **OR** ☐ Maps/Drawings requested but not provided
☐ Client Clearance Name(s)/Affiliation(s) _____
☐ Interview(s): Name(s)/Affiliation(s) _____
_____
_____

Did person(s) interviewed indicate depths of any utilities in the subsurface?
☐ Yes, depths provided: ☐ Did not know or refused to answer
Additional Comments:

☐ Site Inspection (**Complete Page 2 & Photo Document Marked Utilities & Utility Structures**)
☐ Public Records / Maps / Asbuilits
☐ Private Locator: (Name and Company) _____
☐ Ground Penetrating Radar (GPR)
☐ Radiofrequency (RFLoc)
☐ Electromagnetic (EM)
☐ Metal Detector

Soft Dig Methods
☐ Termination Depth _____ft. bgs
☐ Potholing / Vacuum Extraction
☐ Air-Knife ☐ Hydro-Knife
☐ Probing
☐ Hand Auguring

Tips for Successful Utility Location:
1. Don't forget to look up
2. Be on site with Private Utility Locators
3. Ask Private Locators to "confirm" other's markings
4. Select alternate/backup locations during clearance process
5. Mark out all known utilities. Leave nothing to question
6. No hammering - no pickaxes - no digging bars - no shortcutting
7. No excessive turning or downward force of hand augers/shovels
8. Utilities may run in or directly under asphalt/concrete

☐ Other: _____
☐ Marine Locator: (Name and Company) _____

During the site inspection look for the following: **("YES" requires additional investigation and the utility**

Utilities and Structures Checklist

must be marked properly prior to beginning subsurface intrusive work):

Site Inspection	**Utility Color Codes**	**Present**	
a) Natural gas line present (evidence of a gas meter)?	Yellow	☐ Yes	☐ No
i) Feeder Lines to buildings or homes?		☐ Yes	☐ No
b) Evidence of electric lines:	Red		
i) Conduits to ground from electric meter or along wall?		☐ Yes	☐ No
iii) Conduits from power poles running into ground?		☐ Yes	☐ No
ii) Light poles, electric devices with no overhead lines?		☐ Yes	☐ No
iii) Overhead electric lines present? (See Section l)		☐ Yes	☐ No
c) Evidence of sewer drains:	Green		
i) Restrooms or kitchen on site?		☐ Yes	☐ No
ii) Sewer cleanouts present?		☐ Yes	☐ No
iii) Combined sewer /storm lines or multiple sewer lines?		☐ Yes	☐ No
d) Evidence of water lines:	Blue		
i) Water meter on site or multiple water lines?		☐ Yes	☐ No
ii) Fire hydrants in vicinity of work?		☐ Yes	☐ No
iii) Irrigation systems? (Sprinkler heads, valve boxes, controls in building)		☐ Yes	☐ No
e) Evidence of storm drains:	Green		
i) Open curbside or slotted grate storm drains		☐ Yes	☐ No
ii) Gutter down spouts going into ground		☐ Yes	☐ No
f) Evidence of telecommunication lines:	Orange		
i) Fiber optic warning signs in areas?		☐ Yes	☐ No
iv) Aboveground cable boxes or housings or wires in work area?		☐ Yes	☐ No
g) Underground storage tanks:			
i) Tank pit present, tank vent present?		☐ Yes	☐ No
ii) Product lines running to dispensers/buildings?		☐ Yes	☐ No
h) Do utilities enter or exit existing structures/buildings?			
If Yes, confirm the utility markings outside of structure/building match up.		☐ Yes	☐ No
i) Proposed excavation marked in white?	White	☐ Yes	☐ No
j) Unclassed utilities / anomalies marked in pink?	Pink	☐ Yes	☐ No
k) **Overhead** Utilities/Communication Lines - **Look Up**:			
i) Overhead electrical conduit, pipe chases, cable trays, product lines?		☐ Yes	☐ No
ii) Overhead fire sprinkler system?		☐ Yes	☐ No
l) **Overhead** Power lines in or near the work area:			
i) < 50 kV within 10 ft. of work area?		☐ Yes	☐ No
ii) >50 - 200 kV within 15 ft. of work area?		☐ Yes	☐ No
iii) >200-350 kV within 20 ft. of work area?		☐ Yes	☐ No
iv) >350-500 kV within 25 ft. of work area?		☐ Yes	☐ No
v) >500-750 kV within 35 ft. or work area?		☐ Yes	☐ No
vi) >750-1000 kV within 45 ft. of work area?		☐ Yes	☐ No
m) Other:			
i) Evidence of linear asphalt or concrete repair?		☐ Yes	☐ No
ii) Evidence of linear ground subsidence or change in vegetation?		☐ Yes	☐ No
iii) Unmarked manholes or valve covers in work area?		☐ Yes	☐ No
iv) Warning signs ("Call Before you Dig", etc.) on or adjacent to site?		☐ Yes	☐ No
v) Utility color markings not illustrated in this checklist?	i.e. Purple	☐ Yes	☐ No
n) Has the Utilities & Structures Checklist been reviewed by the PM or Designee		☐ Yes	☐ No
PM or Designee Name: _____			

Name and Signature of person completing the checklist: _____

Date: _____

Do not perform **mechanized** intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S .

Traffic Control Plan/Site Traffic Awareness and Response Plan
Revision 8, 10/15/2015

1.0 General

Plan type	STAR
Project Name:	Rensselaer Non-owned Former MGP Site
Project Number:	B0036730.0000.00002
Developer Name:	David Rodriguez
Duration of Project (in hours or days):	4 days
Time Restrictions (Y/N, if Y descibe below):	None
Not Applicable	
Not Applicable	
Not Applicable	
Not Applicable	

Comments:

2.0 Work Description

Provide a brief description of scope of work:
Work activities will generally consist of decommissioning monitoring wells, installing new monitoring wells, and excavating test pits within the Capital View Office Park parking lot. A field vehicle and traffic cones will be used to block off the work area during work activities.

3.0 Type and Duration

Work locations on this project will be: Intermediate work (1-8 hours per location)

Non-roadway work will be performed in: Closed parking lot

Special traffic conditions may include (select most prevalent): Construction equipment

4.0 Traffic Control Layout, Number of Devices Required and Phasing

The following STAR requirements in the Field Guide to RWZ Safety applies:

Section 7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

STAR configuration:
An example STAR traffic control configuration for this project is illustrated below. The actual type and number of devices required are specified below. Don't leave vehicle doors open. Don't establish controls within 25 ft of the front or rear of parked large vehicles/rolling equipment without coordinating with the vehicle/equipment operator.

Intermediate Term (1-8 Hours)
Channelizing Cones, Caution Tape and
Type II Barricades

Select the traffic control devices to be used and enter number each required:

Check all that apply:	*Wording or Pictogram*	*Number:*
☐ Warning signs		
☐ Warning signs		
☐ Warning signs		
☐ Stop/Slow paddle		
☐ Red flag		
☐ Drums		
☐ Channelizer cone (42 inch height, 10 lb base)		
☑ Channelizer cone (42 inch height, 30 lb base)		10
☐ Traffic cones (≥ 18 inches tall)		
☑ Barricade ☐ Type I ☑ Type II		2
☐ Flags for cones		
☐ Lights (for night work)		
☐ Plastic fencing (rolls)		
☑ Caution tape (rolls)		4
☐ Other (specify):		

STAR Phasing:

1) Position truck as shield, if practical

2) Deploy traffic control devices

3) Affix flags, caution tape or fencing

4) Unload project equipment

5) Commence work

6) SSO to maintain controls

7) Remove controls in reverse order

5.0 Approvals

Plan Developer:	David Rodriguez
HASP Reviewer	Dave Groff

APPENDIX C

Community Air Monitoring Plan

ARCADIS Design & Consultancy for natural and built assets

nationalgrid

COMMUNITY AIR MONITORING PLAN

Rensselaer Non-Owned Former
Manufactured Gas Plant Site
Rensselaer, New York
Site No. V00488

July 2016

COMMUNITY AIR MONITORING PLAN

Rensselaer Non-Owned Former MGP Site

Prepared for:

National Grid

300 Erie Boulevard West

Syracuse, New York 13202

Prepared by:
Arcadis of New York, Inc.
6723 Towpath Road
P O Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:

B0036730

Date:

July 2016

CONTENTS

ATTACHMENT

1 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been prepared by Arcadis of New York, Inc. (Arcadis) to support the performance of pre-design investigation (PDI) activities to be conducted at the National Grid Non-Owned Rensselaer former manufactured gas plant (MGP) site (the site) located in Rensselaer, New York (Site No. V00488). Details related to the proposed PDI activities are presented in the January 2016 Remedial Design Action Work Plan (RDWP).

This CAMP fulfills the general requirements set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (G-CAMP) (included as Attachment 1). The intent of this CAMP is to provide a measure of protection for downwind communities from potential airborne releases of constituents of concern during subsurface work activities at the site. As such, this CAMP identifies potential air emissions, and describes air monitoring procedures, monitoring schedule, data collection, and reporting requirements for the PDI activities.

Note that this CAMP only covers community air monitoring activities to be conducted during the PDI and a separate CAMP will be prepared as part of the remedial design, to support remedial construction activities.

1.1 Site Location and Description

The former MGP site is located on Washington Street in the City of Rensselaer, Rensselaer County, New York. The former MGP site is comprised by the former MGP area, including remnants of two gas holders, a tar well, and MGP facilities. The former MGP site is currently paved and used as a parking lot for the Capital View Office Park which houses the Albany Regional Office for the New York State (NYS) Office of Children and Family Services (OCFS). Off-site areas surrounding the former MGP site include:

- Huyck Square to the north and Mill Creek/Huyck Pond, which is surrounded by undeveloped land.
- Academy Street to the west.
- Washington Street to the east and the Capital View Office Park.
- Accu Care Home Health Services, Inc. and NYS Route 151 to the south.

For the purpose of this RDWP, the former MGP site and off-site areas are collectively referred to herein as the “project area.” The project area and adjacent properties are located in an area zoned for downtown mixed-use (MU-2) and planned development district land use.

1.2 Site History

The East Albany Gas Light Company (EAGLC) began gas manufacturing operations at the site circa 1876. In general, the former MGP initially consisted of a single gas holder and the former retort house, and used the coal carbonization process which did not use a petroleum feedstock. Between 1900 and 1909, the site changed ownership three times: Kinderhook Light and Power Company took ownership in 1900; Hudson Railway & Power Company in 1902; and Albany & Southern Railroad Company in 1909.

Additionally, the MGP was expanded to include an additional gas holder, coal shed, tar well, and meter, purifier and condenser rooms.

Between 1918 and 1925 the manufactured gas production ceased and the plant became part of the F.C. Huyck & Sons Felt Mill (located on the property east of the MGP). The coal shed was converted into a garage, a carpentry shop was built following the demolition of the large gas holder, and the remaining MGP facilities were used as chemical laboratories. The remaining MGP structures were demolished between 1949 and 1967.

1.3 Summary of PDI Activities

The proposed PDI activities to be conducted at the site generally include the following:

- Decommissioning select existing monitoring wells
- Installing NAPL monitoring wells
- Conducting NAPL monitoring
- Drilling soil borings
- Excavating test pits
- Waste characterization sampling
- Performing in-situ solidification (ISS) bench-scale testing
- Conducting a site survey

Additional details regarding the proposed PDI activities are provided in the RDWP. Note that community air monitoring will only be performed when installing/decommissioning monitoring wells, drilling soil borings, and excavating test pits.

1.4 Air/Odor Emissions and Control Measures

Air emissions control and fugitive dust suppression techniques will be used during the PDI activities, as necessary, to limit the potential for organic vapor and dust emissions from the site. Air monitoring for the specific purpose of protecting the community from PDI activity impacts (and verification thereof) will take place during intrusive activities.

Odor and dust control measures will be available at the site during the investigation activities and will be used when necessary. Polyethylene sheeting will be used to control nuisance odors, dust, and volatile organic compound (VOC) emissions, as needed. Odor and dust control measures will be implemented based on visual or olfactory observations, and the results of airborne particulate and VOC monitoring (described in Section 2). In the event that airborne particulate and VOC monitoring indicates criteria exceedances, all staged and drummed materials will be covered with polyethylene sheeting and/or drum covers, as appropriate.

2 AIR MONITORING PROCEDURES

Real-time air monitoring will be implemented during PDI activities for VOCs, and particulate matter less than 10 microns in diameter (PM_{10}). However, particulate monitoring will not be performed during precipitation events. Upwind and downwind monitoring locations will be determined through visual observation (wind vane, windsock, or similar techniques).

2.1 Monitoring Location Selection and Deployment

VOC and PM_{10} monitoring locations will be determined based on visual observation of wind direction. A single upwind and a single downwind location will be selected daily where both VOC and PM_{10} will be recorded. The upwind location will be established at the start of the workday before PDI activities are initiated. Monitoring activities will continue in a downwind direction throughout the day. If wind direction shifts radically during the workday (i.e., greater than approximately +/- 60 degrees from original upwind direction), new upwind and downwind monitoring locations will be established. Any monitoring location changes will be documented in the field logbook.

2.2 VOC Monitoring

As required by the NYSDOH guidance for community air monitoring, VOCs will be monitored continuously during ground intrusive activities (e.g., test pit excavation) with instrumentation that is equipped with electronic data-logging capabilities. Because real-time monitors for polycyclic aromatic hydrocarbons (PAHs) are not available, the real-time VOC monitors will also serve as surrogate indicators for emissions (if any) of PAHs during the performance of PDI activities. A real-time VOC monitor equipped with either a photoionization detector (PID) or a flame ionization detector will be used to conduct the monitoring for VOCs. A RAE 3000 (or equivalent) will be used to conduct the real-time VOC monitoring. All 15-minute readings shall be recorded via the data logging function of the monitoring equipment. All periodic, instantaneous readings, including readings taken to facilitate activity decisions, will be recorded in the field logbook.

2.3 PM_{10} Monitoring

As required by the NYSDOH guidance, real-time particulate matter will be monitored continuously during intrusive PDI activities using instrumentation equipped with electronic data-logging capabilities. A TSI 8530 DustTrak II (or equivalent) will be used to conduct the real-time PM_{10} monitoring. All 15-minute readings shall be recorded via the data logging function of the monitoring equipment. All periodic, instantaneous readings, including readings taken to facilitate activity decisions, will be recorded in the field logbook.

Fugitive dust migration will be visually assessed during all work activities, and reasonable dust suppression techniques will be used during any PDI activities that may generate fugitive dust (see Section 1.4).

2.4 Action Levels

The action levels provided below are to be used to initiate response actions, if necessary, based on real-time monitoring.

2.4.1 Action Levels for VOCs

As outlined in the NYSDOH G-CAMP, if the ambient air concentration for total VOCs exceeds 5 parts per million (ppm) above background (upwind location) for the 15-minute average, intrusive PDI activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above background, then intrusive PDI activities can resume with continuous monitoring.

If the ambient air concentrations for total VOCs persist at levels in excess of 5 ppm above background but less than 25 ppm above background, intrusive PDI activities will be halted, the source of the elevated VOC concentrations identified, corrective actions to reduce or abate the emissions undertaken, and air monitoring will be continued. Once these actions have been implemented, intrusive PDI activities can resume provided the following two conditions are met:

- The 15-minute average VOC concentrations remain below 5 ppm above background.
- The VOC level 200 feet downwind of the monitoring location 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.

If the ambient air concentrations for total VOCs exceed 25 ppm above background, the intrusive PDI activities must cease, and emissions control measures must be implemented.

2.4.2 Action Levels for PM_{10}

As required by the NYSDOH guidance, if the ambient air concentration for PM_{10} at the monitoring downwind monitoring location is noted at levels in excess of 100 micrograms per cubic meter ($\mu g/m^3$) above the background (upwind location), or if airborne dust is observed leaving the work area, intrusive PDI activities will be temporarily halted. The source of the elevated PM_{10} concentration is to be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will continue. Work may continue following the implementation of dust suppression techniques provided the PM_{10} levels do not exceed 150 $\mu g/m^3$ above background.

If, after implementation of dust suppression techniques, PM_{10} levels are greater than 150 $\mu g/m^3$ above background (upwind), work must be stopped and PDI activities must be re-evaluated. Work may only resume provided that the dust suppression measures and other controls are successful in reducing PM_{10} levels less than 150 $\mu g/m^3$ above background and in preventing visible dust from leaving the work area.

If the ambient air concentration of PM_{10} is 150 µg/m^3 above background, the intrusive PDI activities must cease and emission control measures must be implemented. The PM_{10} concentrations will be recorded in accordance with Section 2.3 above.

2.5 Meteorological Monitoring

Wind direction is the only meteorological information considered relevant for the PDI activities and CAMP. Meteorological monitoring will be conducted periodically at the site using a windsock, wind vane, or other appropriate equipment. Wind direction will be established at the start of each work day and may be re-established at any time during the work day if a significant shift in wind direction is noted. Wind direction will be recorded in the field activity logbook.

2.6 Instrument Calibration

Calibration of the VOC and PM_{10} instrumentation will occur in accordance with each of the equipment manufacturer's calibration and quality assurance requirements. The VOC and PM_{10} monitors will be calibrated at least daily, and calibrations will be recorded in the field activity logbook.

3 MONITORING SCHEDULE, DATA COLLECTION, AND REPORTING

This section identifies the monitoring schedule and data collection and reporting requirements.

3.1 Monitoring Schedule

Real-time VOC and PM_{10} monitoring will be performed continuously throughout the intrusive PDI activities. Wind direction will be determined at the start of each day and at any other appropriate time during PDI activities.

3.2 Data Collection Schedule and Reporting

Air monitoring data will be collected continuously from VOC and PM_{10} monitors during intrusive PDI activities by an electronic data-logging system. The data management software will be set up so that instantaneous observed readings would be recorded by the electronic data acquisition system and averaged over 15-minute time periods. In addition to the above, VOC readings will be collected periodically during non-intrusive PDI activities. All readings will be recorded and archived for review by NYSDOH and NYSDEC personnel, as necessary.

ATTACHMENT 1

NYSDOH G-CAMP

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

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^{o} C (14 to 122^{o} 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 D

National Grid's Quality Assurance Project Plan

GENERIC
QUALITY ASSURANCE PROJECT PLAN

FOR

SITE INVESTIGATIONS

AT NON-OWNED FORMER MGP SITES

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NOVEMBER 2002

Reviewed and Approved by:
(Project Quality Assurance Manager) (Signature) (Date)

Site Specific
Revisions Attached: Supplement No. _____ Date

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GENERIC QUALITY ASSURANCE PROJECT PLAN

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1.0 GENERAL

This Generic Quality Assurance Project Plan (QAPP) has been prepared to specify procedures that will provide data of known, documented quality, and which will be legally defensible, should the need exist. This document specifically supplements the Generic Field Sampling Plan (FSP), also attached as an appendix to the Site-Specific Work Plan. To the extent discrepancies exist between this Generic QAPP and the Site-Specific Work Plan, the Site-Specific Work Plan shall control.

2.0 PROJECT DESCRIPTION

The project sites are Former Non-owned Manufactured Gas Plant (MGP) sites. The purpose of the investigations is to gather sufficient data to enable the New York State Department of Environmental Conservation (NYSDEC) and Niagara Mohawk, a National Grid Company (NM) to characterize chemical substances which are or may be present at the Sites and to enable the NYSDEC and NM to determine whether such substances pose a significant threat to public health or the environment.

The data collected as a result of these investigations will be used to support the Site Characterizations and Remedial Investigation/Feasibility Studies (RI/FS) as described in the Site-Specific Work Plans. The types, numbers, and locations of environmental samples to be collected are also described in the Site-Specific Work Plans. Field procedures for all environmental sampling activities are detailed in the FSP.

3.0 PROJECT ORGANIZATION

The project organization is described in detail in the Site-Specific Work Plan. The project organization describes the relationship between the NM Project Manager, NYSDEC Project Manager, NM's Engineering Consultant, and subcontractors (e.g. laboratories, data validators, drillers, etc.).

For the purpose of quality control, the Engineering Consultant's Project Quality Assurance Manager (PQAM) will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will assure that data validation screening is performed by trained and experienced data validators using the applicable criteria specified in the NYSDEC 2001 Analytical Services Protocol (ASP). For the purposes of this document, all references to ASP indicate the 2001 NYSDEC Analytical Services Protocol. The specific requirements for data validation screening are given in Section 9.3. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements of this QAPP.

4.0 QA/QC OBJECTIVES FOR MEASUREMENT OF DATA

The overall quality assurance (QA) objective for the project is to develop and implement procedures which will provide data of known, documented quality. Field and laboratory quality assurance/quality control (QA/QC) requirements defined in the NYSDEC ASP and other applicable guidelines ensure acceptable levels of data quality will be maintained throughout the sampling and analysis program.

The QA/QC objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. The data reduction, validation, and reporting scheme is presented in Figure 1. The quality assurance samples to be collected (type and frequency of collection) are specified in the Site-SpecificWork Plans.

4.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), and relative range are common. For this project, precision will be evaluated by recording duplicate measurements of the same parameter on similar sample aliquots under the same conditions and calculating the relative percent difference (RPD) between the values. The formula for calculating RPD is presented in Section 13.2.

RPDs can only be calculated when the duplicate samples both contain detectable concentrations of the analyte. If an analyte is considered not detected at the detection limit, then RPD cannot be calculated. Instead, the results of the analysis of the two-spiked laboratory samples will be used to determine precision.

Measurement data for this project will include field data as well as laboratory analytical data. Laboratory precision will be performed according to the requirements described in the associated analytical methods. The field measurement data may include immunoassay polycyclic aromatic hydrocarbon (PAH) and/or polychlorinated biphenyl (PCB) screening, pH, conductivity, temperature, turbidity, organic vapor readings, and water level measurements. The objective for precision of field data collection methods is to take replicate (minimum of two for every 20 samples) measurements for field parameters to determine the reproducibility of the measurements.

Precision of the immunoassay screening will be evaluated by the field analysis of replicate samples as equivalent levels of PAHs/PCBs. As the screening is not quantitative (i.e., the screening determines if the constituents are present above or below standard values and does not provide a numeric result), RPDs cannot be calculated on the field-analyzed samples. Therefore, measurement of equivalent levels of constituent (i.e., detected below the same standard or within the same range of two standards) will be considered as denoted precision of the screening test.

For the pH meter, precision will be tested by multiple readings in the medium of concern.

Consecutive readings should agree within 0.1 pH units after the instrument has been field calibrated with standard buffers before each use. The thermometer will be visually inspected prior to each use to ensure its condition is satisfactory. Consecutive measurements of a given sample should agree to within 1°Celsius. After calibration, the conductivity meter will be tested for precision at ± 1% of full-scale, depending on the meter/scale. The organic vapors will be measured using a Photovac Microtip (or equivalent) photoionization detector (PID). Daily background and upwind readings of drilling and sampling activities will be measured prior to commencing work and at periodic intervals throughout each day's activities. The natural variation/fluctuation in measurements at background or upwind locations will be used for baseline background values, and the variability will be noted. Water level indicator readings will be precise within 0.01 feet for duplicate measurements or additional water level measurements will be collected to determine whether the difference is due to operator or instrument error. Turbidity measurements will be calibrated to a precision of ± 2% nephelometric turbidity units (NTUs).

4.2 Accuracy

Accuracy is a measure of the difference between a measured value and the "true" or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity, which is recovered, or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are close to the detection limits are less accurate because they are affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument or other variables and thus will be more accurate.

The accuracy of laboratory-measured data will be evaluated by determining the percent recovery of both matrix and blank spike samples as described in Section 13.1. For the measurement of organics by gas chromatography (GC) or GC/mass spectroscopy (MS), the recovery of a surrogate spiked into each sample, blank, and standard will also be used to assess accuracy.

Accuracy between the immunoassay screening and the laboratory analytical results will be evaluated by the confirmatory testing of 10 percent (i.e., one in ten) of the environmental samples at the off-site laboratory. The rate of potential false positives and negatives should be less than 15 percent. Screening samples will not be spiked in the field by the addition of known parameter concentrations. However, the confirmatory samples sent to the off-site laboratory will undergo surrogate spiking and recovery evaluation and, to the extent possible, may be chosen as the site-specific matrix spike sample(s) for additional accuracy determination.

The objective for accuracy of the other field measurements is to achieve and maintain factory equipment specifications for the field equipment. Field measurements cannot be assessed for accuracy by spiking the medium with the analytical parameter and measuring the increase in

response; therefore, these instruments can only be assessed for accuracy by the response to a known sample (such as a calibration standard) used to standardize them. The pH meter, conductivity meter, and turbidity meter are calibrated with solutions traceable to the National Institute of Standards and Technology (NIST, formerly the National Bureau of Standards).

All volatile organic detectors (such as the PID) will be calibrated to an appropriate standard daily prior to use.

4.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, or analysis. Decontamination of sampling devices and digging equipment will be performed between samples as outlined in the FSP. Laboratory sample containers will be thoroughly cleaned in accordance with procedures outlined in Section 5.2. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated through the analysis of field duplicate samples, coded to ensure the samples are treated and analyzed as separate samples. The analytical laboratory will make every reasonable effort to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received. Many means of homogenization expose the sample to significant risk of contamination or loss through volatilization, and these should be avoided if possible.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank/duplicate and chain-of-custody procedures are presented in Sections 5.3 and 6.1.

4.4 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid. The QC objective for completeness is generation of valid data for 100 percent of the analysis requested. Any data deficiencies and their impact on project goals will be evaluated during data validation and discussed in the Data Usability Summary Report (DUSR) (see Section 9.3.2).

4.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project;
- Ensuring traceability of all analytical standards and/or source materials to USEPA or NIST;
- Verifying all calibrations with an independently prepared standard from a source other than that used for calibration;
- Using standard reporting units and reporting formats including the reporting of QC data;
- The validation of all analytical results, including the use of data qualifiers in all cases where appropriate; and
- The requirement that all validated flags be used any time an analytical result is used for any purpose whatsoever.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

5.0 SAMPLING PROCEDURES

5.1 Sampling Program

The objective of the sampling program is to provide current data concerning the presence and nature and extent of contamination of groundwater, surface water, soils (surface and subsurface), and/or sediment. Sampling and analysis may include as identified in the Site-SpecificWork Plan:

- groundwater samples
- surface water samples
- sediment samples
- surface and/or subsurface soil samples
- air samples

5.2 Sampling Procedures and Handling

Sample Container Preparation

Sample containers will be properly washed and decontaminated by the factory or laboratory prior to use. All preservatives will be added to containers prior to shipment by the laboratory. The types of containers and preservation techniques are shown in Table 1. Records of the sources of bottles and preservatives will be kept by the analytical laboratory.

Methods of Sampling

As a minimum, sampling procedures will be in accordance with the most recent NYSDEC or USEPA guidelines and/or regulations, as appropriate. Alternate techniques will be utilized when such guidelines and/or regulations are inappropriate or non-existent. Alternate techniques will be implemented only after consultation with NYSDEC, whenever possible.

Referenced sampling procedures are listed below. All procedures will be the latest in effect as of the date of this Generic QAPP.

- USEPA - 600-4-79-020, "Methods for Chemical Analysis of Water and Wastes"
- National Water Well Association - "Manual of Ground-water Sampling Procedures"
- USEPA - 600-4-83-040, "Characterization of Hazardous Waste Sites - a Methods Manual: Volume II. Available Sampling Methods"
- USEPA - OSWER - 9950.1 "RCRA Ground-water Monitoring Technical Enforcement Guidance Document"
- USEPA - 540/S-95/504, “Low-Flow (Minimal Drawdown) Ground Water Sampling Procedures”

- NYSDEC – "Technical and Administrative Guidance Memoranda" (TAGMs)

All sampling methods are explained in detail in the FSP.

5.3 Quality Assurance Samples

Field Quality Control Samples

To assess field sampling and decontamination performance, two types of "blanks" will be collected and submitted to the laboratory for analyses. The blanks will include:

Trip Blank - A trip blank will be prepared by the laboratory, and will consist of 40-ml volatile organic analysis (VOA) vials containing distilled, deionized water which accompanies the other sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for which analysis for Target Compound List (TCL) volatiles or benzene, toluene, ethylbenzene and total xylenes (BTEX) is planned. The trip blank will be analyzed for TCL volatile organic compounds or BTEX to assess any contamination introduced as a result of sampling and transport, , handling and storage.

Equipment Blank - Equipment blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix as specified in the Site-SpecificWork Plan. Equipment blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of deionized, distilled water provided by the laboratory, which has passed through or over the sampling apparatus. It is usually collected as a last step in the decontamination procedure, prior to collecting a sample. The equipment blanks will be analyzed for the same parameters as the matrix being sampled.

In addition, the precision of field sampling procedures will be assessed by collecting coded field duplicates and matrix spike (MS)/matrix spike duplicates (MSD)/matrix duplicates (MD).

The duplicates will consist of:

Field Duplicate - To determine the reproducibility and homogeneity of samples, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are a duplicate sample. This will eliminate any possible bias that could arise. The frequency of collection of these samples is one per 20 field samples as specified in the Site-SpecificWork Plans. The criteria for assessing coded field duplicates are given in Section 6.0.

Matrix Spike/Matrix Spike Duplicate/Matrix Duplicate (MS/MSD/MD) - MS/MSD/MD samples (MSD for organics; MD for inorganics) will be collected at a frequency of one pair per 20 field samples per seven day sample delivery group (SDG). The reproducibility and homogeneity of the samples can be assessed by determining the

RPD for both spike and non-spike compounds as described in Section 13.0. The MS, MSD, and MD samples should be Site-Specific, unless otherwise authorized by the Engineering Consultant's Project Manager and/or PQAM after consultation with NM and NYSDEC personnel whenever possible.

6.0 SAMPLE TRACKING AND CUSTODY

Sample chain-of-custody (COC) will be initiated by the laboratory with selection and preparation of the sample containers. To reduce the chance for error, the number of personnel handling the samples will be minimized.

In-situ or on-site monitoring data will be controlled and entered in permanent logbooks. Personnel involved in the COC and transfer of samples will be trained on the purpose and procedures prior to implementation.

Evidence of sample traceability and integrity will be provided by COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is shown in Figure 2. A sample will be considered to be in a person's custody if the sample is:

- In a person's possession;
- Maintained in view after possession is accepted and documented;
- Locked and tagged with custody seals so that no one can tamper with it after having been in physical custody; or
- In a secured area which is restricted to authorized personnel.

6.1 Field Sample Custody

A COC record will accompany the sample from time of collection to receipt by the analytical laboratory. If samples are split and sent to different laboratories, COC records will be sent with each sample. Figure 3 is a typical example of a chain-of-custody record. The "remarks" column will be used to record specific considerations associated with sample acquisition such as: sample type, container type, sample preservation methods, and analyses to be performed. Two copies of this record will accompany the samples to the laboratory. The laboratory will maintain one file copy, and the completed original will be returned to the Engineering Consultant’s Project Manager.

Individual sample containers, provided by the laboratory, will be used for shipping/couriering samples. The shipping containers are insulated, and ice will be used to maintain samples at approximately four degrees Celsius until samples are returned and in the custody of the laboratory. All sample bottles within each shipping container will be individually labeled and controlled.

Each sample shipping container will be assigned a unique identification number by the laboratory, and will be marked with indelible ink on the outside of the shipping container. This number will be recorded on the COC record. The field sampler will indicate each individual sample designation/location number in the space provided on the appropriate COC form for each sample collected. The shipping container will then be closed, and a seal provided by the laboratory affixed to the latch. This seal must be broken to open the container. Tampering may be indicated if the seal

is broken before receipt at the laboratory. The laboratory will contact the FOL or Engineering Consultant's Project Manager, and the associated samples will not be analyzed if tampering is apparent.

6.2 Laboratory Sample Custody

The FOL will notify the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The laboratory sample program will meet the following criteria:

- The laboratory will designate a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.
- Care will be exercised to annotate any labeling or descriptive errors. In the event of any discrepancy in documentation, the laboratory will immediately contact the Engineering Consultant's Project Manager and/or PQAM as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. That assessment will be recorded as part of the incoming COC procedure.
- The samples will be stored in a secured area at a temperature of approximately four degrees Celsius until analyses are to commence.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis for control.
- A copy of the tracking form will accompany the laboratory report and will become a permanent part of the project records.

6.3 Sample Tracking System

A sample tracking system will be implemented to monitor the status of sampling events and laboratory analysis of samples. Sample numbers, types, analytical parameters, sampling dates, and sample delivery group (SDG) designations for samples, and required due dates for receipt of analytical results will be entered into the system. The Engineering Consultant's Project Manager will use the tracking system to monitor the project sampling schedules and the status of analytical reports, and to implement any penalty clauses for late delivery per standard laboratory subcontracts when necessary.

A description of the sample tracking system follows:

1. For each day that samples are collected, the Field Operations Lead (FOL) or designee will complete a COC form (Figure 3) and a Daily Status and Monitoring Report (Figure 4) listing all appropriate samples.
2. The FOL or designee will retain the client copy of the COC, and forward the laboratory copy of the COC with the sample shipment.
3. The FOL or designee will fax copies of the completed COC form and Daily Status and Monitoring Report to the Engineering Consultant's PM. The Engineering Consultant's PM or a designated employee will confirm sample shipment with the laboratory and resolve any sample transfer issues.
4. The status of analytical results will be tracked by the Engineering Consultant's PM or designee using the information provided on the completed COC form and Daily Status and Monitoring Report. The information shall be summarized in a computerized database, as warranted.

Upon receipt of the analytical results from the laboratory, the Engineering Consultant's PM or designee will review the data package for completeness and contract compliance. The Engineering Consultant's PM will then forward the result package to the data validator for validation. The data validator shall be required to submit a complete set of validated data to the Engineering Consultant's PM within 60 days of receipt of the data package report.

The Engineering Consultant's Project Manager or a designated representative will maintain day-to-day contact with the laboratory concerning specific samples and analyses directly or by assignment.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 Field Instrumentation Calibration

The FOL will be responsible for ensuring that instrumentation are of the proper range, type and accuracy for the test being performed, and that all of the equipment are calibrated at their required frequencies, according to their specific calibration protocols/procedures.

All field measurement instruments must be calibrated according to the manufacturer's instructions prior to the commencement of the day's activities. Exceptions to this requirement shall be permitted only for instruments that have fixed calibrations pre-set by the equipment manufacturer. Calibration information shall be documented on instrument calibration and maintenance log sheets or in a designated field logbook. The calibration information (log sheet or logbook) shall be maintained at the site during the on-site investigation and, once the field work is completed, shall be placed in the Engineering Consultant's project files. Information to be recorded includes the date, the operator, and the calibration standards (concentration, manufacturer, lot number, expiration date, etc.). All project personnel using measuring equipment or instruments in the field shall be trained in the calibration and usage of the equipment, and are personally responsible for ensuring that the equipment has been properly calibrated prior to its use.

In addition, all field instruments must undergo response verification checks at the end of the day's activities and at any other time that the user suspects or detects anomalies in the data being generated. Verification checks may also be performed at the request of NM or NYSDEC representatives. The checks consist of exposing the instrument to a known source of analyte (e.g., the calibration solution), and verifying a response. If an unacceptable instrument response is obtained during the check (i.e., not within specifications), the data shall be labeled suspect, the problem documented in the site logbook, and appropriate corrective action taken.

Any equipment found to be out of calibration shall be re-calibrated. When instrumentation is found to be out of calibration or damaged, an evaluation shall be made to ascertain the validity of previous test results since the last calibration check. If it is necessary to ensure the acceptability of suspect items, the originally required tests shall be repeated (if possible), using properly calibrated equipment, to acquire replacement data for the measurement in question.

Any instrument consistently found to be out of calibration shall be repaired or replaced within 24 hours or field work will be terminated until the malfunctioning equipment is repaired/replaced.

7.2 Laboratory Instrumentation Calibration

Personnel at the laboratory will be responsible for ensuring that analytical instrumentation are of the proper range, type and accuracy for the test being performed, and that all of the equipment are calibrated at their required frequencies, according to specific protocols/procedures.

Off-site laboratory equipment shall be calibrated using certified/nationally recognized standards and according to the applicable methodologies and the laboratory Standard Operating Procedures

(SOPs). In addition, these methods/procedures specify the appropriate operations to follow during calibration or when any instrument is found to be out of calibration.

8.0 ANALYTICAL PROCEDURES

All off-site laboratory samples will be analyzed according to the methods provided in Exhibit D of the NYSDEC ASP. QA/QC procedures given in Exhibit E and I of the ASP will be followed. Regardless of the method used, all analytical and extraction holding times must meet the NYSDEC ASP requirements for that analytical group (i.e., volatile analyses, including BTEX, have a holding time of seven days, if unpreserved). Holding times will be calculated from verified time of sample receipt at the laboratory. For NYSDEC ASP, samples must be received at the laboratory within 48 hours of sample collection. The analytical laboratory chosen for the project will be certified, and must maintain certification, under the New York State Department of Health's Environmental Laboratory Approval Program for analyses of solid and hazardous waste. The breakdown of investigative samples is detailed in the Site-Specific Work Plan. Laboratory analytical methods and quantitation limits are presented in Tables 2 and 3 of this Generic QAPP. The method detection limits (MDLs) for the analytes will be specified by the laboratory selected for the project based on its most recent MDL studies, and subject to approval by the NYSDEC.

Field screening samples will be analyzed according to the NYSDEC ASP and the manufacturer's instructions. Unless site-specific requirements dictate a change in concentration limits (which would be explained within the Site-Specific Work Plan), the standard levels for the PAH and PCB screening will be 1 ppm and 10 ppm. The test system user shall be technically qualified individual who has received training in the immunoassay analysis requirements, procedures and potential risks prior to field screening of samples. Use of the field screening test kits will only occur in a controlled environment, following the storage and handling procedures outlined in the NYSDEC ASP and the manufacturer's instructions. Additional technical information on the field screening testing are presented in Attachments 1 and 2.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the ASP.

The data package provided by the laboratory will contain all items specified in the ASP, as appropriate to the analyses performed. Category B reporting will be used.

9.1 Chain-of-Custody Records

Completed copies of the COC records accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the report of analytical testing.

9.2 Data Handling

One complete copy and one additional copy of the analytical data summary report will be provided by the laboratory. One set of the analytical data will be forwarded directly to the data validator by the laboratory. The Engineering Consultant's Project Manager will immediately arrange for filing of the complete package, after the QA/QC reviewer checks the package to ensure all deliverables have been provided. The second data summary report will be used to generate summary tables. These tables will form the foundation of a working database for assessment of the site contamination condition.

The Engineering Consultant's Project Manager will maintain close contact with the QA/QC reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA/QC review has been completed, the Engineering Consultant's Project Manager may direct the team leaders or others to initiate and finalize the analytical data assessment.

9.3 Data Validation

9.3.1 Full Data Validation

Data validation is a basic step in the control and processing of the project data generated by the laboratory. The data validation process will consist of a systematic review of the analytical results and QC documentation, and will be performed in accordance with the guidelines identified in Section 9.3.1. All off-site laboratory data will undergo full validation, unless otherwise stated in the Site-Specific Work Plan. On the basis of this review, the data validator will make judgments and express concerns and comments on the quality and limitations of specific data, as well as on the validity of the overall data package. The data validator will prepare documentation of his or her review and conclusions in a Data Usability Summary Report (DUSR; see Section 9.3.2).

The data validator will inform the Engineering Consultant's Project Manager of data quality and limitations, and assist the Project Manager in interacting with the laboratory to correct data omissions and deficiencies. The laboratory may be required to rerun or resubmit data depending on the extent of the deficiencies, and their importance in meeting the data quality objectives within the overall context of the project. The validated laboratory data will be reduced into a computerized

tabulation which will be suitable for inclusion in the Site Characterization and RI Reports and will be designed to facilitate comparison and evaluation of the data. The data tabulations will be sorted by classes of constituents and by sample matrix. Each individual table will present the following information:

- Sample matrix, designations, and locations;
- Sample dates;
- Constituents for which positive results were obtained;
- Reported constituent concentrations in the field and/or trip blanks associated with the samples;
- Constituent concentration units;
- Name and location of laboratory which performed the analyses;
- Data qualifiers provided by the laboratory; and
- Data qualifiers and comments provided by the data validator, if any.

9.3.2 Data Usability Summary Report (DUSR)

A Data Usability Summary Report (DUSR) will be prepared after reviewing and evaluating the analytical data. The parameters to be evaluated in reference to compliance with the analytical method protocols includes all sample chain-of-custody forms, holding times, raw data (instrument print out data and chromatograms), calibrations, blanks, spikes, controls, surrogate recoveries, duplicates and sample data. If available, the field sampling notes should also be reviewed and any quality control problems should be evaluated as to their effect on the usability of the sample data.

The DUSR will describe the samples and analysis parameters reviewed. Data deficiencies, analytical method protocol deviations and quality control problems will be described and their effect on the data will be discussed in the DUSR.

Resampling/reanalysis recommendations, if applicable, will be made. Data qualifications are documented for each sample analyte following the NYSDEC ASP guidelines.

This work will be performed by trained and experienced data validators who meet the NYSDEC approval criteria. The Environmental Scientist preparing the DUSR must submit a resume to the NYSDEC Quality Assurance Unit documenting relevant experience in environmental sampling and analysis methods and data review and documentation of a Bachelors Degree in Natural Science or Engineering. The results of the data validation screening (i.e. missed holding times or data rejected due to blank contamination) will be incorporated into the data summary tables used in the final investigative report. The DUSR identifies data gaps caused by non-compliant or rejected data, and will indicate what steps have been or will be taken to fill these gaps.

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

10.1 Quality Assurance Batching

Each set of samples will be analyzed concurrently with calibration standards, method blanks, MS, MSD or MD, and QC check samples (if required by the protocol). The MS/MSD/MD samples will be designated by the field personnel. If no MS/MSD/MD samples have been designated, then the laboratory must contact the Project Quality Assurance Officer (PQAO) or Engineering Consultant's Project Manager for corrective action.

10.2 Organic Standards and Surrogates

All standard and surrogate compounds are checked by the method of mass spectrometry for correct identification and gas chromatography for degree of purity and concentration. When the compounds pass the identity and purity tests, they are certified for use in standard and surrogate solutions. Concentrations of the solutions are checked for accuracy before release for laboratory use. Standard solutions are replaced monthly or earlier based upon data indicating deterioration.

10.3 Laboratory Quality Control Samples

The quality control samples included are detailed below.

Method Blanks/Preparation Blanks: Analyses for organic compounds (method blank) and inorganics (preparation blank) include a blank analysis of the laboratory reagent water. The blank is analyzed with each set of samples or more often as required to verify that contamination has not occurred during the analytical process. The concentration of target compounds in the blanks must be less than or equal to the method detection limits specified in the ASP for the selected method of analysis.

Matrix Spike/Matrix Spike Duplicate Analysis - This analysis is used to determine the effects of matrix interference on analytical results. Spikes of analytes are added to aliquots of sample matrix in the manner specified in the ASP. Selected samples are spiked to determine accuracy as a percentage recovery of the analyte from the sample matrix and precision as RPD between the MS and MSD samples. A matrix duplicate is prepared in the same manner as the matrix spike sample.

Analytical Duplicate Samples - Replicate samples are aliquots of a single sample that are split on arrival at the laboratory, or upon analysis. Significant differences between two replicates, split in a controlled laboratory environment, will result in flagging the affected analytical results.

Surrogate Spike Analyses - Surrogate spike analyses are used to determine the efficiency of recovery of organic analytes in the sample preparations and analyses. Calculated percentage recovery of the spike is used as a measure of the accuracy of the total analytical method.

Laboratory Control Sample/ (Spike Blank) - For each method which requires a laboratory

control sample (LCS) or spike blank, a LCS spike blank will be prepared with each quality control batch and analyzed according to criteria specified in the ASP. These samples support an assessment of the ability of the analytical procedure to generate a correct result without matrix effects or interference affecting the analysis.

11.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

Quality assurance audits may be performed by the Project Quality Assurance Manager (PQAM) or personnel designated by the PQAM. The PQAM and his or her designees function as an independent body and report directly to Engineering Consultant's quality assurance management. The PQAM may plan, schedule, and approve system and performance audits based upon the Engineering Consultant's procedure customized to the project requirements. These audits may be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). At times, the PQAM may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits.

Formal audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by lead auditors after gathering and evaluating all resultant data. Items, activities, and documents determined by lead auditors to be in noncompliance will be identified at exit interviews conducted with the involved management. Noncompliances will be logged, documented, and controlled through audit findings which are attached to and are a part of the integral audit report. These audit finding forms will then be directed to management to satisfactorily resolve the noncompliance in a specified and timely manner. All audit checklists, audit reports, audit findings, and acceptable resolutions must be approved by the PQAM prior to issue. QA verification of acceptable resolutions will be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the PQAM will close out the audit report and findings.

It is the Engineering Consultant's Project Manager's overall responsibility to verify that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Engineering Consultant's Project Manager within 15 days of completion of the audit. Serious deficiencies must be reported to the Engineering Consultant's Project Manager within 24 hours.

Serious deficiencies identified during an audit will be reported to NM and NYSDEC as part of the DUSR or Site investigation and/or RI Reports.

11.1 System Audits

System audits, performed by the PQAM or designated auditors, may encompass evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Engineering Consultant's Project Manager requests the PQAM to perform unscheduled audits, these activities will be instituted.

11.2 Performance Audits

In accordance with the requirements for NYSDOH ELAP CLP certification, the laboratory will participate in all performance evaluation testing.

Also, one field audit may be performed by the PQAM or designated auditor during collection of the field samples to verify that field samplers are following established sampling procedures. Performance of a field audit will be based on the type of investigation activities being performed, the length of the field project, and any available information concerning prior inspections of the project or sampling team. The Site-Specific Work Plan will provide details on the performance of a field audit.

12.0 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

12.1 Preventive Maintenance Procedures

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators. Analytical instruments will be serviced at intervals recommended by the manufacturer. An instrument repair/maintenance log book will be kept for each instrument, and this log will be available on-site during field activities and, at the completion of the investigation, be placed in the project files. Entries include the date of service, type of problem encountered, corrective action taken, and initials and affiliation of the person providing the service.

The instrument use log book will be monitored by the analysts to detect any degradation of instrument performance. Changes in response factors or sensitivity are used as indications of potential problems. These are brought to the attention of the laboratory supervisor and preventive maintenance or service is scheduled to minimize down time. Back-up instrumentation and an inventory of critical spare parts are maintained to minimize delays in completion of analyses.

Use of equipment in need of repair will not be allowed, and field work will be terminated until the malfunction is repaired or the instrument replaced.

12.2 Schedules

Written procedures, where applicable, will identify the schedule for servicing critical items in order to minimize the downtime of the measurement system. It will be the responsibility of the operator to adhere to this maintenance schedule and to arrange any necessary and prompt service as required. Service to the equipment, instruments, tools, gauges, etc. shall be performed by qualified personnel.

12.3 Records

Logs shall be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories and by the data and sample control personnel when and if equipment, instruments, tools, and gauges are used at the sites. The Engineering Consultant’s Project Manager or the PQAM may audit these records to verify complete adherence to these procedures.

12.4 Spare Parts

Where appropriate, a list of critical spare parts will be identified by the operator in consultation with the equipment manufacturer. These spare parts will be stored for availability and use in order to reduce the downtime. In lieu of maintaining an inventory of spare parts, a service contract for rapid instrument repair or backup instruments will be available.

13.0 ASSESSMENT PROCEDURES FOR DATA ACCEPTABILITY

Procedures used to assess data precision and accuracy will be in accordance with the appropriate laboratory method, and as periodically updated.

13.1 Accuracy

The percent recovery is calculated as below:

$$\% = \frac{Ss - So}{S} \times 100$$

So = The background value, i.e.; the value obtained by analyzing the sample

S = Concentration of the spike added to the sample

Ss = Value obtained by analyzing the sample with the spike added

% = Percent Recovery

13.2 Precision

The relative percent difference (RPD) is calculated as below:

$$RPD = \frac{|V1 - V2|}{0.5\,(V1 + V2)} \times 100$$

V1, V2 = The two values obtained by analyzing the duplicate samples

13.3 Completeness

Completeness is the measure of the amount of valid data obtained from a measurement system compared to the total amount expected to be obtained under ideal conditions. A target of 100 percent completeness, calculated for each analysis method, has been established as the overall project objective.

$$PC = \frac{NA}{NI} \times 100$$

where:

PC = Percent completeness
NA = Actual number of valid analytical results obtained
NI = Theoretical number of results obtainable under ideal conditions

14.0 CORRECTIVE ACTION

The following procedures have been established to assure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

When a significant condition adverse to quality is noted on-site, at the laboratory, or at a subcontractor location, the cause of the condition will be determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the FOL, Engineering Consultant's Project Manager, and involved subcontractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action. All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality.

At a minimum, corrective actions may be initiated:

- When predetermined acceptance standards are not attained
- When procedure or data compiled are determined deficient
- When equipment or instrumentation is found faulty
- When samples and test results are questionably traceable
- When quality assurance requirements have been violated
- When designated approvals have been circumvented
- As a result of system and performance audits
- As a result of a management assessment
- As a result of laboratory/inter-field comparison studies
- As required by NM
- As required by NYSDEC ASP, 2001

Procedure Description

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities.

Work may be audited at Engineering Consultant's office, Site, laboratory, and subcontractor locations by the PQAM and/or designated auditor. Items, activities, or documents ascertained to be in noncompliance with quality assurance requirements will be documented and corrective actions mandated through audit finding sheets attached to the audit report. Audit findings are logged,

maintained, and controlled by the PQAM (Section 11.0).

Technicians assigned quality assurance functions will also control noncompliance corrective actions by having the responsibility of issuing and controlling the appropriate Corrective Action Request Form (Figure 5). All project personnel may identify a noncompliance; however, the technician is responsible for documenting, numbering, logging, and verifying the closeout action. It is the Engineering Consultant's Project Manager's responsibility to verify that all recommended corrective actions are produced, accepted, and received in a timely manner.

The Corrective Action Request (CAR) identifies the adverse condition, reference document(s), and recommended corrective action(s) to be administered. The issued CAR is directed to the responsible manager in charge of the item or activity for action. The individual to whom the CAR is addressed returns the requested response promptly to the technician in charge, affixing his signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The technician maintains the log for status control of CARs and responses, confirms the adequacy of the intended corrective action, and verifies its implementation. The technician will issue and distribute CARs to specified personnel, including the originator, responsible project management involved with the condition, the Engineering Consultant's Project Manager, involved subcontractor, and the FOL, at a minimum. CARs are transmitted to the project file for the records.

15.0 QUALITY ASSURANCE REPORTS

Quality assurance reports to management may consist of the reports on audits, reports on correction of deficiencies found in audits, a final QA report on field sampling activities, and the data validation report.

At the end of the project, the PQAM may submit a lessons leaned report to the Engineering Consultant's Project Manager which will discuss the QA activities. That report may include discussions of any conditions adverse or potentially adverse to quality, such as responses to the findings of any field or laboratory audits; any field, laboratory, or sample conditions which necessitated a departure from the methods or procedures specified in this QAPP; field sampling errors; and any missed holding times or problems with laboratory QC acceptance criteria; and the associated corrective actions undertaken. This report shall not preclude immediate notification to project management of such problems when timely notice can reduce the loss or potential loss of quality, time, effort, or expense.

These reports, if prepared, shall be reviewed by the Engineering Consultant's Project Manager for completeness and the appropriateness of any corrective actions, and they shall be retained in the project files.

In the final investigative report, laboratory and field QC data will be presented, including a summary of QA activities and any problems and/or comments associated with the analytical and sampling effort. Any corrective actions taken in the field, results of any audits, and any modifications to laboratory protocols will be discussed.

Attachment 1

NYSDEC ASP Methods 4035 (PAHs) and 4020 (PCBs)

Attachment 2

Field PAH and PCB Soil Test Technical Guides and Test Kit Instructions

TABLE 3
TARGET ANALYTES AND CONTRACT REQUIRED QUANTITATION (CRQ) LIMITS[1]

	Contract Required Quantitation Limit Water Samples (ug/L)	Contract Required Quantitation Limit Soil Samples (ug/kg)
NYSDEC ASP TCL Volatile Organic Compounds (by 2001-1)		
Acetone	10	10
Benzene	10	10
Bromodichloromethane	10	10
Bromoform	10	10
Bromomethane	10	10
2-Butanone	10	10
Carbon disulfide	10	10
Carbon tetrachloride	10	10
Chlorobenzene	10	10
Chloroethane	10	10
Chloroform	10	10
Chloromethane	10	10
Dibromochloromethane	10	10
1,1-Dichloroethane	10	10
1,2-Dichloroethane	10	10
1,1-Dichloroethene	10	10
1,2-Dichloroethene (cis and trans)	10	10
1,2-Dichloropropane	10	10
cis-1,3-Dichloropropene	10	10
trans-1,3-Dichloropropene	10	10
Ethylbenzene	10	10
2-Hexanone	10	10
4-Methyl-2-pentanone	10	10
Methylene chloride	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	10	10
Tetrachloroethene	10	10
Toluene	10	10
1,1,1-Trichloroethane	10	10
1,1,2-Trichloroethane	10	10
Trichloroethene	10	10
Vinyl chloride	10	10
Total Xylenes	10	10

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Semivolatile Organic Compounds (by 2001-2) Base/Neutral Extractables		
Acenaphthene	10	330
Acenaphthylene	10	330
Anthracene	10	330
Benzo(a)anthracene	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(g,h,i)perylene	10	330
Benzo(a)pyrene	10	330
bis(2-Chloroethoxy)methane	10	330
bis(2-Chloroethyl)ether	10	330
bis(2-ethylhexyl)phthalate	10	330
4-Bromophenyl phenyl ether	10	330
Butyl benzyl phthalate	10	330
Carbazole	10	330
4-Chloroaniline	10	330
2-Chloronaphthalene	10	330
4-Chlorophenyl phenyl ether	10	330
Chrysene	10	330
Dibenz(a,h)anthracene	10	330
Dibenzofuran	10	330
Di-n-butylphthalate	10	330
1,2-Dichlorobenzene	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
3,3'-Dichlorobenzidine	10	330
Diethyl phthalate	10	330
Dimethyl phthalate	10	330
2,4-Dinitrotoluene	10	330

NOTES

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2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Semivolatile Organic Compounds (by 2001-2, Cont.)		
2,6-Dinitrotoluene	10	330
Di-n-octylphthalate	10	330
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330
Isophorone	10	330
2-methyl Naphthalene	10	330
Naphthalene	10	330
2-Nitroaniline	25	800
3-Nitroaniline	25	800
4-Nitroaniline	25	800
Nitrobenzene	10	330
N-Nitroso-diphenylamine	10	330
N-Nitroso-dipropylamine	10	330
2,2' Oxybis(1-chloropropane)	10	330
Phenanthrene	10	330
Pyrene	10	330
1,2,4-Trichlorobenzene	10	330

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Semivolatile Organic Compounds (by 2001-2, Cont.) **Acid Extractables (cont.)**		
4-Chloro-3-methylphenol	10	330
2-Chlorophenol	10	330
2,4-Dichlorophenol	10	330
2,4-Dimethylphenol	10	330
4,6-Dinitro-2-methylphenol	25	800
2,4-Dinitrophenol	25	800
2-Methylphenol	10	330
4-Methylphenol	10	330
2-Nitrophenol	10	330
4-Nitrophenol	25	800
Pentachlorophenol	25	800
Phenol	10	330
2,4,5-Trichlorophenol	25	800
2,4,6-Trichlorophenol	10	330
NYSDEC ASP TCL Pesticides and PCBs (by 2001-3)		
Aldrin	0.05	1.7
alpha-BHC	0.05	1.7
beta-BHC	0.05	1.7
delta-BHC	0.05	1.7
gamma-BHC (Lindane)	0.05	1.7
Chlordane (alpha &/or gamma)	0.05	1.7
4,4'-DDD	0.10	3.3
4,4'-DDE	0.10	3.3
4,4'-DDT	0.10	3.3
Dieldrin	0.10	3.3
Endosulfan I	0.05	1.7
Endosulfan II	0.10	3.3
Endosulfan sulfate	0.10	3.3

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Pesticides and PCBs (by 2001-3, Cont.)		
Endrin	0.10	3.3
Endrin Aldehyde	0.10	3.3
Endrin Ketone	0.10	3.3
Heptachlor	0.05	1.7
Heptachlor Epoxide	0.05	1.7
Methoxychlor	0.50	17.0
Toxaphene	5.0	170.0
Aroclor-1016	1.0	33.0
Aroclor-1221	2.0	67.0
Aroclor-1232	1.0	33.0
Aroclor-1242	1.0	33.0
Aroclor-1248	1.0	33.0
Aroclor-1254	1.0	33.0
Aroclor-1260	1.0	33.0
NYSDEC ASP TAL Metals and Cyanide (by CLP-M)		
Aluminum	200	
Antimony	60	
Arsenic	10	
Barium	200	
Beryllium	5	
Cadmium	5	
Calcium	5000	
Chromium	10	
Cobalt	50	
Copper	25	
Iron	100	
Lead	3	
Magnesium	5000	

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd.)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TAL Metals and Cyanide (by CLP-M) (Cont.)		
Manganese	15	
Mercury	0.2	
Nickel	40	
Potassium	5000	
Selenium	5	
Silver	10	
Sodium	5000	
Thallium	10	
Vanadium	50	
Zinc	20	
Cyanide	10	

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

These CRQLs are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The quantitation limits for samples may be considerably higher depending on the sample matrix.

TABLE 1
SAMPLE CONTAINERIZATION

Analysis	Bottle Type	Preservation[1]	Holding Time[2]
Aqueous Samples			
Volatile Organics (BTEX)	40 ml glass vial with Teflon-lined septa	Cool to 4°C	7 days
PCBs/Pesticides	1000 ml amber glass	Cool to 4°C	5 days*
Semivolatile Organics (PAHs)	1000 ml amber glass	Cool to 4°C	5 days*
Metals	1000 ml polyethene	HNO_3 to pH <2	6 months (Mercury 26 days)
Cyanide	1000 ml polyethene	NaOH to pH >12	12 days
Soil & Sediment Samples			
Volatile Organics (BTEX)	Wide-mouth glass w/ teflon-lined septa [3]	Cool to 4°C	7 days
Semivolatile Organics (PAHs)	Wide-mouth glass w/ teflon cap [3]	Cool to 4°C	5 days*
Pesticide/PCBs	Wide-mouth glass w/ teflon cap [3]	Cool to 4°C	5 days*
Metals, Cyanide	Wide mouth glass w/ teflon cap [3]	Cool to 4°C	Metals - 6 months Mercury - 26 days Cyanide - 12 days

NOTES

1. All samples to be preserved in ice at 4°C during collection and transport.
2. Days from verified time of sample receipt (VTSR) by the laboratory.
3. Sized appropriately for the analytical method.
4. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in containerization requirements, the Site-Specific Work Plan (which will include this information) will take precedence.

* Extraction of water samples for pesticides/PCB analysis by separating funnel must be completed within five days of VTSR. Continuous liquid-liquid extraction is the required extraction for water samples for semivolatiles. Continuous liquid-liquid extraction of water samples, or sonication or soxhlet procedures for semivolatile and pesticides/PCB analyses, shall be started within five days. If a re-extraction and reanalysis must be performed, the extraction must start within 10 days and completed within 12 days of VTSR. Extracts of either water or soil/sediment samples must be analyzed within 40 days of VTSR.

TABLE 2
LABORATORY ANALYSIS PROGRAM

Matrix	Parameter [1]	Analytical Method [2]
Water	BTEX	Method 8260B*
	VOC	2001-1
	SVOC	2001-2
	PAHs	Method 8270C*
	PCBs and Pesticides	2001-3
	Metals	CLP-M (various for individual metals)
	Cyanide	CLP-M
Soil & Sediments	BTEX	Method 8260B*
	VOC	2001-1
	SVOC	2001-2
	PAHs	Method 8270C*
	Pesticides and PCBs	2001-3
	Metals	CLP-M (various for individual metals)
	Cyanide	CLP-M
	TCLP	Method 1311; Method Series 7000, 8000
Waste Characteristics		Methods 1010/1020A; 9040B/9041A; Section 7.3

NOTES

1. Abbreviations: BTEX = Benzene, Toluene, Ethylbenzene, Xylene; VOCs = Volatile organic compounds; SVOCs = Semivolatile organic compounds; PAHs = Polycyclic aromatic Hydrocarbons; TCLP = Toxicity Characteristic Leaching Procedure; PCBs = Polychlorinated Biphenyls; CLP = Contract Laboratory Program.
2. NYSDEC Analytical Services Protocol, 2001, Category B deliverables.
   Analyses must meet NYSDEC ASP holding time specified for Methods in Exhibit I Part II.
3. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in analytical requirements, the Site-Specific Work Plan (which will include this information) will take precedence

* BTEX and PAH analyses must meet NYSDEC ASP holding time specified for Methods 2001-1 and 2001-2, respectively.

Figure 1 Data Reduction, Validation and Reporting

Figure 2 Sample Custody

Figure 3 Chain-of-Custody Record

Figure 4 Daily Status & Monitoring Report

Figure 5 Corrective Action Request Form

ATTACHMENT 1

Arcadis Standard Operating Procedure Monolith Leaching Method

Arcadis Standard Operating Procedure
Monolith Leaching Method

Overview

This leaching test is a quasi-dynamic procedure intended for application to solidified samples of soils impacted with organic and/or inorganic constituents of concern (COCs). The solidified samples constitute "monoliths" and are created through the addition of various (often pozzolanic) admixtures. The geotechnical characteristics of monoliths including unconfined compressive strength (ASTM D-1633) and permeability (ASTM D-5084-03) are initially tested. Selected monoliths with acceptable geotechnical characteristics are then leached using this procedure to document reduction in contaminant transport. During the implementation of the method, monoliths are immersed in an aqueous based extraction fluid, which is replaced at 24 hour intervals and analyzed for COCs. A cumulative amount of COCs is then documented over the total immersion time period.

Semivolatile Organic Compound and Metals Extraction

Monolith - cast cylinder (2-inch x 4-inch mold) Surface Area = 202.5 cm^2

Per Method 1312, the leaching vessel will be constructed of unreactive materials and designed for the extraction of organic chemicals and metals. The solidified monolithic sample will be placed in the test vessel. The monolith will be extracted in deionized water. The extraction liquid volume will be 2 Liters **(10 times the monolith's surface area as adopted from ANS 16.1)**. The monolith must be immersed such that >98% of the specimen is in contact with the leachate at all times.

The leaching vessel will sit quiescently in the dark at ambient temperature for 24 hours. After the 24 hour leaching interval, the aqueous contents of the leaching vessel will be poured off, preserved and stored according to USEPA Method 8270 or USEPA Method 6010. This step may be repeated on individual monolith samples with regular analysis of the leachate according to USEPA Method 8270 as determined by site-specific conditions until either: leachate concentrations are below regulatory criteria; or thirty tests have been completed.

Note – this extraction can also provide analytical sample volume for many other USEPA analytical methods for non-volatile analytes. For alternate, nonvolatile analytes, extraction procedures would remain the same and extraction fluid preservation would follow guidelines and hold times in the appropriate USEPA methodologies.

Volatile Organic Compound Extraction

Monolith - cast cylinder (reduced 50cc tube – diameter 2.5cm, height cut to 5.1cm along the lines marked on the cylinders) Surface Area = 50.0 cm^2

Per Method 1312, the leaching vessel will be constructed of unreactive materials and designed for the extraction of organic chemicals. The solidified monolithic sample will be placed in the test vessel. The monolith will be extracted in deionized water. The extraction fluid volume will be 500 ml **(10 times the monolith's surface area as adopted from ANS 16.1)** to create a zero head space condition.

The leaching vessel will sit quiescently in the dark at ambient temperature for 24 hours. After the 24 hour leaching interval, the aqueous contents of the leaching vessel will be poured off, preserved and stored according to USEPA Method 8260. This step may be repeated on individual monolith samples with regular analysis of the leachate according to USEPA Method 8260 as determined by site-specific conditions until either: leachate concentrations are below regulatory criteria; or thirty tests have been completed.

Selection of Extraction Fluid

Extraction fluid is selected according the USEPA Method 1312 SPLP Section 5.4.

References

USEPA Method 1312 - Synthetic Precipitation Leaching Procedure

Standard drafted by the American Nuclear Society Standards Committee [ANSI/ANS] 16.1-1986.