National Grid

Fleet Building Addition Interim Remedial Measure Design

North Albany Former MGP Site
Albany, New York
NYSDEC Site #401040

March 2025

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Certification

I, John C. Brussel, P.E., as a Professional Engineer registered in the State of New York, to the best of my knowledge, and based on my inquiry of the persons involved in preparing this document under my direction, certify that this *Draft Fleet Building Addition Interim Remedial Measure Design* for National Grid – North Albany former manufactured gas plant site in Albany, New York was completed in general accordance with the following:

- Paragraph II of the Order on Consent ("Consent Order") between Niagara Mohawk and the New York State Department of Environmental Conservation (NYSDEC) (Index No. A4-0473-0000, signed by NYSDEC on November 7, 2003).
- Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375-3.8(g).
- Sections 5.1 and 5.2 of the NYSDEC document titled "DER-10 Technical Guidance for Site Investigation and Remediation," (DER-10) issued on May 3, 2010.
- The Record of Decision (ROD) issued by the NYSDEC on March 31, 2016.
- Section 3 of the NYSDEC-approved Remedial Design Work Plan, dated February 2017.
- The Vehicle Maintenance Building Addition Geotechnical/Environmental Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan (Conceptual Plan) contained in an October 17, 2024 letter from Arcadis of New York, Inc. (Arcadis) to the NYSDEC.
- December 12, 2024 e-mail correspondence from Arcadis to the NYSDEC responding to the conditions in NYSDEC's conditional approval of the Conceptual Plan.
- The guidance referenced in Section 1 of this Remedial Design.

John C. Brussel 3/12/25

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Acronyms and Abbreviations

AMSL	above mean sea level
ASTM	ASTM International
BBL	Blasland, Bouck, & Lee, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
C&D	construction and demolition
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
CF	cubic foot
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COC	constituent of concern
CP	Canadian Pacific
CPM	critical path method
CQAP	Construction Quality Assurance Plan
CY	cubic yards
DNAPL	dense non-aqueous phase liquid
ELAP	Environmental Laboratory Approval Program
FMA	Former Manufactured Gas Plant Area
FS	Feasibility Study
GHG	greenhouse gas
GPR	ground penetrating radar
GPS	global positioning system
HASP	Health and Safety Plan
HDPE	high-density polyethylene
HTS	high-temperature superconductive
HWSTA	Hazardous Waste Storage Tank Area
IC	institutional control
IRM	Interim Remedial Measure
ISS	in-situ soil solidification

LNAPL	light non-aqueous phase liquid
MGP	manufactured gas plant
MOC	material of concern
NAAE	Nelson Associates Architectural Engineering
NAD 83	North American Datum of 1983
NAPL	non-aqueous phase liquid
NAVD 88	North American Vertical Datum of 1988
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OSDA	Offsite Downgradient Area
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDF	portable document format
PDI	Pre-Design Investigation
PHA	Process Hazard Assessment
POP	Project Operations Plan
PPE	personal protective equipment
ppm	parts per million
psi	pounds per square inch
QA/QC	Quality Assurance/Quality Control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RDWP	Remedial Design Work Plan
ROD	Record of Decision
SCO	soil cleanup objective
sf	square feet
SMP	Site Management Plan
SVOC	semi-volatile organic compound

SWMU	solid waste management unit
SWPPP	Stormwater Pollution Prevention Plan
TAGM	Technical and Administrative Guidance Memorandum
TCLP	Toxicity Characteristic Leaching Procedure
TOGS	Technical and Operational Guidance Series
TSDF	Treatment, Storage, and Disposal Facility
TSS	tar-saturated soil
TWA	time-weighted average
UCS	unconfined compressive strength
UDig	UDig NY, Inc.
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
YSA	Yard Storage Area
µg/m3	micrograms per cubic meter

1 Introduction

This Fleet Building Addition Interim Remedial Measure Design (IRM Design) has been prepared by Arcadis of New York, Inc. (Arcadis) on behalf of National Grid for the North Albany former manufactured gas plant (MGP) site located in Albany, New York (the site). The site location is shown on Design Drawing G-001. The site layout is shown on Design Drawing G-101, and a close-up view of Fleet Building addition area is provided on G-102. This report describes and presents the IRM design to be implemented to address soil within and adjacent to the proposed Fleet Building addition footprint (prior to construction) that is impacted by:

- The presence of MGP-related materials consisting of coal tar (i.e., dense non-aqueous phase liquid [DNAPL]) and potentially tar-saturated wood chips (purifier waste materials), as well as soil and groundwater containing polycyclic aromatic hydrocarbons (PAHs); benzene, toluene, ethylbenzene, and xylenes (BTEX); and cyanide associated with the former MGP operations conducted in the northern portion of the site.
- Light non-aqueous phase liquid (LNAPL), PAHs, and BTEX in soil and groundwater related to former onsite petroleum storage (underground and aboveground storage tanks) and dispensing.

Soil impacts for the remainder of the site will be addressed by the final remedy, under a separate design and remediation contract, following completion of the IRM and construction of the Fleet Building addition. Impacts to soil and groundwater are generally related to by-products associated with the former MGP.

The NYSDEC-selected site-wide remedy is described in the Record of Decision (ROD) issued by the New York State Department of Environmental Conservation (NYSDEC) on March 31, 2016 (NYSDEC 2016a), the NYSDEC-approved Remedial Design Work Plan (RDWP; Arcadis 2017) and the NYSDEC-approved Pre-Design Investigation Summary Report (PDI Report; Arcadis 2018). The NYSDEC-selected site-wide remedy generally includes the following components:

- Removing approximately 12,600 cubic yards (CY) of surface material and subsurface soil in preparation for in-situ soil solidification (ISS) of underlying soils.
- Stabilizing approximately 36,200 CY of in-situ subsurface soil containing significant visual evidence of non-aqueous phase liquid (NAPL) and/or PAHs at concentrations greater than 1,000 parts per million (ppm).
- Excavating approximately 17,400 CY of highly viscous NAPL, heavily NAPL-impacted soil, and NAPL-coated wood chips located in the purifier waste area east/northeast of Building #2.
- Placing clean imported fill material within the purifier waste excavation area east/northeast of Building #2.
- Constructing (i.e., excavating and installing materials for) passive NAPL barrier walls east of the Genesee Street substation and along the hydraulically downgradient portion of the Former MGP Area (FMA) to: (1) facilitate NAPL collection and recovery; and (2) prevent further migration of NAPL beyond the FMA. If the Genesee Street substation is de-energized or relocated in the future, National Grid would re-evaluate potential alternatives for addressing NAPL and impacted soil in this area.
- Installing new NAPL recovery wells in the FMA and the Hazardous Waste Storage Tank Area (HWSTA) to facilitate collection and passive recovery of LNAPL and DNAPL. Additionally, new “sentinel” NAPL monitoring wells will be installed west of Broadway.
- Installing up to eight new NAPL recovery wells in the Offsite Downgradient Area (OSDA) to facilitate collection and passive recovery of DNAPL.

- Removing approximately 6,600 CY of surface material (i.e., asphalt and gravel subbase at locations not subject to ISS treatment or excavation) to facilitate installation of a new asphalt cap.
- Constructing a new asphalt cap in the FMA to prevent potential future exposures to remaining impacted media.
- Treating (via low-temperature thermal desorption [LTTD]) and disposing of material excavated from the purifier waste area that is characteristically hazardous for benzene (assumed to be approximately 8,700 CY).
- Disposing approximately 21,200 tons of surface material and other debris as a non-hazardous waste at a construction and demolition (C&D) landfill.
- Disposing approximately 20,600 CY of material as a non-hazardous waste at a solid waste landfill. The material will be excavated from: (1) the purifier waste area; (2) the ISS treatment area (surface and shallow subsurface soil to facilitate ISS); and (3) the location where the passive NAPL barrier wall will be installed.
- Conducting quarterly NAPL monitoring in the FMA and OSDA to passively recover LNAPL and DNAPL that may accumulate in new and existing NAPL recovery wells.
- Conducting annual groundwater monitoring in the OSDA to evaluate the dissolved-phase concentrations of constituents of concern (COCs) in OSDA groundwater.
- Conducting annual inspections of the asphalt cap (to identify cracks, deterioration, etc.) and implementing repairs to the cap, as necessary.
- Establishing institutional controls (ICs) for the FMA and OSDA to prohibit use of groundwater and limit the future development and use of these areas. The ICs will include a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, in any currently unoccupied onsite buildings upon occupancy or when site-related chemicals of concern are no longer in use in areas inside the onsite buildings.

The portion of the remedy presented in this IRM Design will be implemented prior to the Fleet Building addition construction and includes completing the activities below within the proposed Fleet Building footprint, starting approximately 8 feet from the existing building and extending approximately 10-feet east, west, and south (to allow for excavation as part of the final remedy to extend to the IRM remedial limits, and not be limited by the new building addition).

- Removing approximately 845 CY of surface material and shallow subsurface soil to a depth of approximately 6 feet below ground surface (bgs) in preparation for ISS of underlying soils and the removal of approximately 15 CY of stone/soil for the installation of a new sanitary sewer pipe from the oil-water separator inside the Fleet Building.
- Solidifying approximately 2,632 CY of in-situ subsurface soil containing visual evidence of NAPL and/or PAHs at concentrations greater than 500 ppm, which is a lower cleanup value than that identified for the overall site remedy. The cleanup value for the IRM was reduced in response to NYSDEC's comments contained in a November 18, 2024 letter providing conditional approval of an October 17, 2024 conceptual work plan for soil remediation in support of the Fleet Building addition. The NYSDEC's comments were addressed in December 12, 2024 e-mail correspondence to the NYSDEC, which was accepted by the NYSDEC on December 13, 2024.
- Placing clean imported fill material within the excavation/ISS area to match surrounding grade.

The work identified above for the IRM Design (and described in more detail later in this report) will be performed by a qualified remedial contractor (the Contractor) to be selected by National Grid based on competitive bidding.

Remaining portions of the site will be addressed during the final remedy to be constructed under a separate design, bidding, and contract, following the IRM completion.

The proposed IRM detailed herein is intended to mitigate potential threats to human health and the environment arising from MGP-related impacts and will help achieve the remedial objectives for the site. The IRM will be observed by National Grid's representative ("the Engineer") for general compliance with this IRM Design, including the attached supporting documents.

This IRM Design is part of the overall bid package, and therefore includes technical bid information for prospective Contractors, including Design Drawings and Specifications. The Contractor will be required to comply with all requirements of this IRM Design, including:

- Design Drawings
- Specifications (Appendix A)
- Community Air Monitoring Plan (CAMP; Appendix B)
- Health and Safety Plan (HASP; Appendix C)
- Construction Quality Assurance Plan (CQAP; Appendix D).

The Contractor will also be required to follow provisions of its own site-specific HASP that: (1) meets the requirements of Title 29 of the Code of Federal Regulations (29 CFR) 1910 and 29 CFR 1926 and covers all personnel who will be employed by the Contractor to perform work at the site, including direct employees and subcontractors; (2) complies, at a minimum, with the requirements of the Arcadis HASP for onsite observation and sampling (Appendix C); and (3) includes recommended health and safety measures for the adjacent community and general public. The HASP shall clearly identify the person responsible and the procedures to be followed in an emergency.

Changes to the proposed IRM may be required due to field conditions encountered. National Grid will inform NYSDEC of any changes. The Contractor shall not implement the changes without prior National Grid approval. NYSDEC approval will also be required before the Contractor can implement changes to the proposed IRM.

This IRM Design has been prepared in general accordance with the following:

- Paragraph II of the Order on Consent ("Consent Order") between Niagara Mohawk and the NYSDEC (Index No. A4-0473-0000, signed by NYSDEC on November 7, 2003).
- Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375-3.8(g).
- The ROD.
- Sections 5.1 and 5.2 of the NYSDEC document titled, "DER-10 Technical Guidance for Site Investigation and Remediation," (DER-10) issued on May 3, 2010.
- Section 3 of the NYSDEC-approved RDWP.
- The NYSDEC-approved Pre-Design Investigation Report.
- The Vehicle Maintenance Building Addition Geotechnical/Environmental Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan (Conceptual Plan) contained in an October 17, 2024 letter from Arcadis to the NYSDEC.
- December 12, 2024 e-mail correspondence from Arcadis to the NYSDEC responding to the conditions in NYSDEC's conditional approval of the Conceptual Plan.

1.1 Plan Organization

This IRM Design has been organized as presented in Table 1.1 below.

Table 1.1 – RD Organization

Section		Purpose
Section 1 –	Introduction	Provides a brief overview of the proposed IRM, site background information, site characterization, remedial objectives, and regulatory requirements.
Section 2 –	Project Responsibilities	Identifies roles and responsibilities for those involved in implementing the IRM.
Section 3 –	Description of Interim Remedial Measure	Presents a detailed description of the proposed IRM work activities, organized by task.
Section 4 –	Description of Site Controls	Presents a description of site controls to be used during remediation to protect the public health, safety, welfare, and environment and to maintain the effectiveness of the IRM.
Section 5 –	Regulatory and Permitting Requirements	Presents the regulatory and permitting requirements associated with implementing the activities described in this IRM Design.
Section 6 –	Green Remediation and Sustainability Efforts	Identifies potential strategies that may be implemented during the IRM to promote sustainable technologies and practices.
Section 7 –	Construction Completion Report	Identifies the anticipated contents of the Construction Completion Report (CCR) to be prepared after the IRM is implemented.
Section 8 –	Schedule	Presents the anticipated schedule for implementing the IRM.
Section 9 –	References	Presents a list of references cited in this IRM Design.

1.2 Background

This section presents relevant background information used to develop the design for the proposed IRM described in this IRM Design. The site location and layout are described below, followed by a description of the existing Fleet Building and the proposed addition, and relevant site historical information.

1.2.1 Site Location and Layout

The former MGP site is located in the northern portion of the National Grid North Albany Service Center in Albany, New York (see Design Drawing G-001). Land use in the surrounding area is primarily commercial/industrial, with residential areas located to the west of the facility. The site is bordered by Interstate I-90 to the north, Bridge Street to the south, a Canadian Pacific Railway (CP Rail) railroad right-of-way to the east, and Broadway to the west. The Hudson River is located approximately 0.5 miles east of the site.

The site consists of the following areas:

- FMA – consists of the paved area immediately north and east of Building #2 where the former MGP operations were located.

- HWSTA – consists of the aboveground storage tank area immediately south of Building #2.
- YSA – consists of the equipment storage area located south of Building #2.
- OSDA – consists of the area east of the National Grid property to approximately 200 feet east of Erie Boulevard.

The site operates as an active utility service center that serves as the primary maintenance, supply, storage, and office support facility for National Grid's operations in Eastern New York State. The North Albany Service Center is located on an approximately 25-acre parcel that consists of several buildings, parking lots, and storage areas. A detailed site plan is presented as Design Drawing G-101. Current buildings and primary site features at the facility include:

- The Versaire Building (Building #1) is a warehouse and crew headquarters building, located in the western portion of the site, facing Broadway.
- Building #2 is the main office building at the site and consists of a three-story structure containing offices, meeting rooms, storage areas, and maintenance shops, located in the central portion of the site.
- Buildings #2-3 and #2-4 currently serve as storage sheds and were constructed as part of a lumber planing business formerly located in the southeastern section of the property.
- The Fleet Building (Building #5) is a vehicle repair garage located in the northeastern part of the site, which also contains various office and storage spaces.
- An electrical equipment and waste storage building (Transformer Building) is located south of Building #2.
- An aboveground storage tank facility, consisting of three waste oil storage tanks and a virgin oil storage tank, is located south of Building #2 in the area immediately outside the Transformer Shop.
- A control building that was used in conjunction with the testing of a high-temperature superconductive (HTS) cable, is located in the northern portion of the site. Since the completion of the cable testing, use of the building has been taken over by National Grid.
- Two sheds in the northeast corner of the property that contain equipment used to support cellular phone communications. The sheds are owned and operated by Verizon Corporation.
- A pole barn/equipment storage pad (enclosed on three sides) is located south of Transformer Building (near the east side of the building).
- A mostly paved/partially gravel-covered storage yard (the Yard Storage Area [YSA]) extends across the southern section of the site. The YSA is used to store miscellaneous items, including various electrical equipment, cable spools, steel framing, and wood poles.
- A guardhouse is located at the main facility entrance near the northwestern corner of Building #2.
- Two aboveground fuel pump islands (one diesel and one gasoline) are located northeast of Building #2.
- A railroad spur owned and operated by CP Rail enters and crosses the southeastern portion of the property. This railroad spur is used to transport chemical products to industrial properties south of the site.
- A natural gas regulator station and an electrical substation (the Genesee Street Substation) are located in the northwestern corner of the property.
- Paved areas at the site include the areas north, east, and west of Building #2 and the western portion of the YSA. Paved areas at the site are used for parking, equipment storage, and site access.

1.2.2 Existing Fleet Building and Proposed Addition

The existing Fleet Building consists of a pre-engineered metal building that is constructed on piles formed of concrete encased in steel. Refer to Electronic Attachment 1 for foundation plan for the existing Fleet Building. The exterior walls of the Fleet Building largely consist of metal panel, with areas of concrete masonry unit construction. The finish roofing system consists of a standing seam metal panel roof. The Fleet Building has 10 garage bays for vehicle maintenance and repairs. Subsurface utilities connecting to the building include water, natural gas, telecommunications, and sanitary sewer piping, as shown on Design Drawing G-104.

The Fleet Building addition is necessary to accommodate larger tracked offroad vehicles and equipment that cannot currently enter the existing building. The number and size of vehicles being serviced at the facility have increased and additional large, tracked vehicles and equipment are anticipated to support the New York State Climate Leadership and Community Protection Act through a May 2022 Order on Implementation.

The proposed addition is a steel framed structure approximately 55 feet long, 43 feet wide, and 32 feet tall. The addition will provide wider and taller entrances, greater overhead clearance, an overhead bridge crane with hoists, and a larger interior workspace needed to perform maintenance and repairs on the larger equipment. The addition will have a 6-inch thick reinforced concrete slab on grade. The building addition walls will be load-bearing walls, supported by a foundation system that includes nine reinforced concrete spread footers below the walls (i.e., four spread footers each below the western and eastern walls including at southwestern and eastern corners, and one spread footer below the middle of the southern wall). Three reinforced concrete grade beams will span east-to-west, spaced approximately 14.5-feet apart, connecting footers below the east and west walls and supporting the concrete floor slab. The bottom of the reinforced concrete spread footers will be approximately 5.5 feet bgs, and the bottom of the reinforced concrete grade beams will be approximately 2.5 feet bgs. A frost wall will extend below the walls (between footers) to a depth of approximately 5.2 feet bgs. The bottom of the deepest foundation feature (the spread footers) will be at an elevation of approximately 15.9 feet relative to the North American Vertical Datum of 1988 (NAVD 88).

Although vapor intrusion is not an issue for the existing Fleet Building based on previous vapor intrusion investigation, a passive sub-slab depressurization system will be installed as a conservative pro-active measure (as part of the contract for the building addition construction). The passive sub-slab depressurization system will include: (1) sub-slab horizontal soil vapor vent piping installed within ventilation trench extending below the building addition floor slab; (2) air-tight (non-perforated) vent riser piping that connects to the sub-slab vent piping to convey subsurface vapors vertically up to discharge points above the roof; (3) wind-driven turbines on the building addition roof to create a vacuum to draw vapors from below the floor slab to the discharge point; and (4) a 15 mil thick vapor barrier installed below the 6-inch thick concrete floor slab of the building addition.

1.2.3 Historical Site Operations

This section presents historical site use, based on a review of the following information:

- The document entitled “Initial Submittal, North Albany (Broadway Ave.) MGP Site,” (Niagara Mohawk Power Corporation, 1994).
- Sanborn Insurance Maps of Albany, New York dated 1892, 1908, 1935, and 1951 (prepared by the Sanborn-Perris Company Limited and the Sanborn Map Company).
- New York State Library Archives Department files relating to the construction, operation, and abandonment of the Erie Canal.

- City of Albany assessment records dated 1927 and 1932.
- Aerial photographs obtained from the City of Albany, the New York State Department of Transportation (NYSDOT), and LightBox Holdings L.P. (formerly known as EDR).
- NYSDOT records relating to the construction of Interstate 787.

Historical aerial photographs and Sanborn fire insurance maps obtained from LightBox Holdings L.P. are included in Electronic Attachment 2.

General information relating to the historical usage of the site and surrounding properties is presented below, followed by a detailed discussion of former MGP operations at the site.

Historical Site Use

Prior to 1872, the property was part of the Steven Van Rensselear estate and was primarily used for farmland and residential purposes. Industrial usage of the property has included the MGP facility, which operated from the 1870s through the 1940s, and electric/gas utility support services, which began in connection with the MGP operation and continue to the present. The southern portion of the property has also been used for ice storage and distribution, lumber planing and milling, and petroleum distribution operations. During the period of industrial usage of the site (e.g., 1870s to present), the property has been bordered to the west by Broadway and to the east by a railroad right-of-way (currently owned by CP Rail). Historical site usage to the east and south of the property includes transportation facilities (railway and streetcar), lumber planing and milling, chemical manufacturing, and rendering**.**

The Erie Canal was formerly located east of the railroad right-of-way (currently owned by CP Rail) at the current location of Erie Boulevard (as shown on Design Drawing G-101). The canal (which predates the railroad) was constructed during the 1820s and varied from approximately 7 to 13 feet in depth. The sides of the canal consisted of stone or brick embankments, which were approximately 2.5 feet thick. Former barge slips located on the east side of the canal provided access to various lumber yards and milling operations in an area referred to as the Albany Lumber District. The portion of the Erie Canal in the vicinity of the site was abandoned during the 1920s and was filled during the late 1920s and early 1930s. Several utilities (i.e., water supply, sanitary sewer, and storm sewer lines) were constructed within the former canal bed before the backfilled canal was paved.

A branch of the Hudson River known as the Little River (approximately 1,000 feet east of the property) was previously located immediately east of the Lumber District. The Little River was separated from the main channel of the Hudson River by Patroon's Island. The Little River was filled during construction of Interstate 787 in the mid-1960s (the Interstate was constructed over the former location of the Little River, and Patroon's Island was incorporated into a recreation area that extends along the west bank of the Hudson River).

Historical MGP Operations

As indicated above, the former MGP operated at the site from the 1870s through the 1940s. The former MGP initially used the coal-carbonization process, switched to the water-gas process during the 1890s, and subsequently switched to the carbureted water-gas process prior to 1908. MGP structures were demolished after the facility ceased operations, with the final MGP-related buildings removed during the early 1990s. Based on conditions encountered in test pits and soil borings completed in the general vicinity of the former MGP structures (i.e., tar pits, tar tanks, oil tanks, gas holders, etc.), potential foundations (i.e., concrete slabs) were identified near the following structures (refer to Electronic Attachment 3 for figures showing the soil borings referenced below and for the soil boring logs):

- The former relief gas holder located in the northwest corner of the site near the current Genesee Street Substation (soil borings SB-18, SB-110, and SB-148).
- The 2,000,000 cubic foot (CF) gas holder located in the western portion of the site (soil boring SB-13, SB-14, SB-139 and test pit TP-4).
- The former oil tanks located immediately north of Building #2 (soil boring SB-144).
- The former 3,000,000 CF gas holder located between Building #2 and the Fleet Building (soil borings SB-12, SB-145, SB-147, GT-16, WC-8, VMB-1, and VMB-2).

Hazardous Waste Disposal Facility Operations

National Grid began operation of a regional hazardous waste storage facility (the North Albany Treatment, Storage, and Disposal Facility [TSDF]) on the property during the 1980s. The NYSDEC issued a final 6 NYCRR Part 373 Hazardous Waste Management Permit for the North Albany TSDF on January 6, 1995. As part of the Hazardous Waste Management Permit, National Grid was required to implement a Resource Conservation and Recovery Act (RCRA) Corrective Action program to address releases of hazardous waste and/or hazardous constituents from solid waste management units (SWMUs) at the facility.

As defined in Permit Module III of the Hazardous Waste Management Permit for the North Albany TSDF, releases of hazardous wastes and/or hazardous constituents identified at the site were categorized into the following three groups of SWMUs:

- *Category I* – Areas that were impacted by only MGP-related wastes and residual materials. The FMA was the only Category I SWMU identified at the site.
- *Category II* – Areas where MGP-related wastes and residuals were co-mingled with other facility-related environmental concerns. Category II SWMUs consisted of several underground and above ground storage tanks that were formerly located in the FMA and the site storm sewer system.
- *Category III* – Areas where only facility-related environmental concerns were identified that were not related to the former MGP operations at the site. Category III SWMUs included several former hazardous waste storage areas associated with the TSDF, the YSA, and an isolated area of LNAPL identified at monitoring well MW-10.

An overview of the investigations conducted to evaluate conditions at the site is presented in Subsection 1.3 below. Select SWMUs identified at the site have already been addressed by remedial measures, as described in Subsection 1.4.

1.3 Site Characterization/Nature and Extent of Impacts

The site was the subject of multiple environmental investigations and other studies between 2004 and 2017. These investigations are identified below:

- Preliminary Site Assessment/IRM Study conducted during 1994 by Foster Wheeler consisted of collecting surface soil samples; collecting subsurface soil samples from 37 soil borings and 8 test pits; installing, developing, slug testing, and sampling 14 groundwater monitoring wells; and collecting debris samples from two storm sewer catch basins/manholes in the FMA.
- MGP/RCRA Investigation conducted in 1996 and 1997 by Blasland, Bouck, & Lee, Inc. (BBL; now Arcadis) consisted of collecting and analyzing surface soil samples from 20 locations in the YSA and the area south of

the TSDF; collecting and analyzing subsurface soil samples from 50 soil borings and 14 test pits; installing, developing, conducting hydraulic conductivity testing, and collecting and analyzing groundwater samples from 16 onsite and offsite groundwater monitoring wells; and completing a detailed reconnaissance of subsurface drainage structures at the site (including collecting and analyzing debris samples from 10 subsurface structures).

- Groundwater Investigation and NAPL Monitoring Activities conducted from July 1998 through December 2000 by BBL to address data gaps suggested by the results of the MGP/RCRA Investigation.
- Pre-Design Soil Investigation conducted from October and December 2000 by BBL consisted of completing 15 soil borings and collecting subsurface soil samples to further evaluate the extent of MGP-related impacts in the FMA north of Building #2.
- HTS Cable Installation Subsurface Soil Sampling conducted in October 2004 by Niagara Mohawk (a National Grid company) to evaluate subsurface conditions along the path of a HTS underground cable that was subsequently installed in the northern portion of the North Albany Service Center property.
- Soil Vapor Intrusion Investigation conducted from November 2008 through March 2009 by Arcadis at the site to determine the potential for volatile organics in soil beneath Building #2 and the Fleet Building to migrate to indoor air.
- PDI conducted in August and September 2017 by Arcadis to support of preparing the Remedial Design for the selected remedy including conducting subsurface structure/utility mapping, subsurface soil sampling, bench-scale ISS treatability study, structural inspection, groundwater investigation, and site survey.
- Various investigations to support excavations for facility upgrades, including soil investigations in August 2019 to support drainage improvements around the Versaire Building, in September 2020 to support the relocation of the guardhouse, in March 2022 to support the re-skinning of Building #2-4 and installation of new gas service, and in December 2024 to support the installation of a new gas main south/southeast of the site (in the right-of-way on the north side of Bridge Street and on National Grid property east of Mill Street). Each investigation included drilling and sampling multiple soil borings to assess conditions within anticipated removal areas.
- Vehicle Maintenance Building Addition Geotechnical/Environmental Investigation conducted in May 2024 to support the proposed addition onto the southeastern corner of the Fleet Building, including drilling three soil borings and collecting soil samples for laboratory analysis.
- Periodic groundwater and NAPL monitoring conducted from 1997 through 2014 by Arcadis to evaluate potential changes in the distribution of dissolved constituents in groundwater in the vicinity of the site.

During these investigations, numerous soil borings were drilled, test pits were excavated, monitoring wells and piezometers were installed, and hundreds of samples of environmental media were collected and analyzed. The comprehensive results of these investigations (except those conducted specific to facility upgrades) are presented in the February 2017 Feasibility Study (FS) Report, the March 2018 PDI Summary Report, and October 17, 2024 Geotechnical/Environmental Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan letter. Electronic copies of these reports and the individual reports specific to facility upgrades are included in portable document format (PDF) in Electronic Attachment 4.

An ecological evaluation was not performed to identify threatened/endangered species and habitats or rare ecological communities, as the limits of the proposed remedial activities are entirely composed of asphalt and gravel covered driveways and parking areas.

A summary of previous remedial activities conducted at the site is provided below.

1.4 Summary of Previous Remedial Activities

Previous remedial activities at the site are summarized below. Refer to the FS Report for further details.

- *Storm Sewer Cleaning IRM* – Storm sewer cleaning IRM activities were conducted in December 1999 and consisted of removing and collecting accumulated debris from drainage structures and piping associated with the storm sewer system at the site (primarily in the YSA south of Building #2). Following the IRM, the storm sewer system is not considered to be a preferential pathway for migration of constituents of concern. The storm sewer IRM activities were documented in the *Interim Remedial Measure Summary Report – Storm Sewer Cleaning Activities* (BBL 2000b).
- *TSDF Closure Activities* – The North Albany hazardous waste TSDF was closed in 2000 in accordance with an NYSDEC-approved *Closure Work Plan* (BBL 2000a). TSDF closure activities addressed specific non-MGP impacted SWMUs. Based on the results of the TSDF closure activities, the NYSDEC granted final closure of the North Albany Service Center TSDF and agreed that remaining environmental issues at the site would be addressed under the existing MGP Consent Order between National Grid and the NYSDEC (i.e., there are no post-closure corrective action requirements for the North Albany Service Center Category III SWMUs). The TSDF closure activities were documented in the *TSDF Closure Certification Report* (BBL 2000c).
- *Chemical Oxidation Treatability Studies* – Bench-scale and pilot-scale treatability studies were conducted during 2002/2003 and 2005/2006 to assess the effectiveness of using chemical oxidation for treating site-related impacts including BTEX, PAHs, and coal tar residuals. The result of the studies concluded that in-situ chemical oxidation may not be an effective technology for source removal/reduction, but that the technology may be applicable to target dissolved-phase impacts in the OSDA following FMA source material (i.e., NAPL and heavily impacted soil) remediation. The bench-scale findings are summarized in the *Chemical Oxidation Bench-Scale Treatability Study Summary Report* (BBL 2003), and the pilot-scale findings are summarized in the *Pilot-Scale Treatability Testing Summary Report* (Arcadis 2007a).
- *YSA IRM* – Approximately 6,000 CY of impacted soil, gravel and debris were removed in 2007 to address environmental concerns associated with spills and releases in the yard storage area. Disturbed areas were restored and covered with asphalt pavement. The YSA IRM is described in the *Yard Storage Area Interim Remedial Measure Summary Report* (Arcadis 2007b).

A brief discussion of the site topography and drainage is provided below, followed by a discussion of geology, hydrogeology, groundwater usage, and nature and extent of MGP-related impacts at the site.

1.4.1 Site Topography and Drainage

Surface topography in the vicinity of the North Albany Service Center slopes gently towards the south and east. Site topography is generally of low relief, with ground surface elevations ranging from approximately 16 feet above mean sea level (AMSL) along the eastern side of the site to approximately 32 feet AMSL near the northwestern corner of the FMA. Stormwater is conveyed offsite via a series of catch basins, manholes, and piping. The drainage features near the Fleet Building are shown on Design Drawing G-104. Stormwater flow from the onsite storm water sewer system is conveyed to a single manhole (manhole MH-3) that discharges to offsite storm sewers. Stormwater discharged from manhole MH-3 is ultimately conveyed to the Hudson River. The onsite

storm sewer system was cleaned during the December 1999 IRM. Major portions of the site storm sewer system were replaced during 2012 to improve drainage conditions at the site.

1.4.2 Geology

The general geologic stratigraphy underlying the site is characterized as follows (with increasing depth from grade):

- General fill (ranging in thickness from 0 to 18 feet), consisting primarily of sand with ash, brick, cinders, coal, slag, and wood.
- Glaciofluvial deposits (ranging in thickness from 4 to 31 feet), consisting predominantly of sand and silt, with occasional layers of clay or peat. This unit includes a semi-confining/discontinuous silt and clay layer.
- Weathered bedrock (encountered at depths between 7 and 34 feet bgs).
- Bedrock (bedrock surface encountered 12 to 38 feet bgs).

Bedrock beneath the site is Black Snake Hill Shale. The upper portion of the bedrock unit consists of a weathered zone that extends up to seven feet in thickness. The weathered bedrock is underlain by more competent gray to black shale.

Subsurface stratigraphy in the vicinity of the Fleet Building addition is depicted on two geologic cross-sections. The geologic cross-section locations are shown on Design Drawing C-101 and the geologic cross-sections are presented on Design Drawings C-201 and C-202. The semi-confining silt and clay layer that is part of the glaciofluvial stratigraphic unit described above is further depicted on an isopach map (Figure 1-11 of the FS Report), which indicates the thickness of the silt and clay materials and a top of silt and clay map (Figure 1-12 of the FS Report), which contours the top of the semi-confining unit.

Based on a review of the silt and clay isopach and top of surface maps, there are several areas where the silt and clay unit is missing or thin (less than 2 feet thick), including near the Fleet Building addition area. The following observations were noted:

- The silt and clay unit was not encountered in a small area centered near monitoring well MW-104 southwest of the Fleet Building. Additionally, the silt and clay unit is thin immediately west of the Fleet Building and within the Fleet Building addition footprint. These areas also align with a depression in the surface of the silt and clay. This depression and the thinning of the clay unit in this area is reflected on cross-section C-C' (Figure 1-8 of the FS Report) near soil borings SB-202 and SB-205 and monitoring well MW-103.
- The silt and clay unit was not encountered in soil borings completed along the northern property boundary and extending south from the northern property boundary to the approximate northern edge of the Fleet Building.
- The silt and clay unit was not encountered in soil borings completed along the western property boundary. In the northwestern corner of the property (near the Genesee Street Substation and the 250,000 CF relief holder), the silt and clay unit appeared to be thicker (up to approximately 8 feet). However, the clay was missing in the immediate location of the substation and the holder, indicating that the silt and clay unit may have been physically removed during the installation of these features. Where present in this area, the silt and clay surface slopes downward from the northwest toward the southeast.

A ground penetrating radar (GPR) geophysical survey was conducted in February 1997 in the area east of the facility (i.e., from the eastern facility perimeter fence to the rail yard between Interstate I-787 and Erie Boulevard)

to help characterize the relative bedrock elevations and subsurface features in the area downgradient of the facility. Additionally, more than 70 soil borings were completed to the top of the bedrock surface as part of the site characterization efforts. Based on the top of the bedrock elevation, as determined by the soil borings and the GPR survey results, the interpreted bedrock surface generally slopes to the east/southeast in the area east of the facility. A top of weathered bedrock surface topographic map is shown on Figure 1-13 of the FS Report. The interpreted top of the weathered bedrock near the Fleet Building addition is shown on Design Drawings C-201 and C-202. The logs for the three geotechnical/environmental soil borings completed in support of the Fleet Building addition (borings VMB-1, VMB-2, and VMB-3) are presented in Electronic Attachment 3. As indicated by the logs and cross sections, the top of weathered bedrock beneath the Fleet Building addition is anticipated to be approximately 22 to 25 feet bgs.

Approximately 42 feet of bedrock coring was conducted at monitoring wells three monitoring well locations (MW-16R, MW-21R and MW-22R, with approximately 14 feet of boring at each location). Based on coring logs for these locations (refer to Electronic Attachment 3), bedrock is described as dark gray shale, soft, folded, slightly calcareous and slightly weathered. Fractures were observed during coring and were typically described as 50-degree fractures along bedding planes with occasional high-angle 80-degree fractures. The rock quality designation ranged from 0 (due to core barrel blockage) to 94 percent, with rock quality improving with depth.

1.4.3 Hydrogeology

Across most of the site, the water table is located in the shallow overburden/fill. Along the eastern portion and downgradient of the site, the water table drops in elevation into the semi-confining (glaciofluvial silt and clay) layer. Water-level data indicate that the water table beneath the Fleet Building addition area generally occurs at depth at or below an elevation of approximately 15 feet NAVD 88 (i.e., 5 to 6 feet below ground surface), with one exception (December 2010) when groundwater was identified at approximately 17 feet NAVD 88 (approximately 3 to 4 feet bgs). Where the silt and clay unit is present, two separate hydrostratigraphic units (a shallow overburden unit and a deep overburden unit) are present. A water table elevation map reflecting groundwater elevations measured in December 2007 is shown on Figure 1-13 of the FS Report. Groundwater in the shallow overburden unit flows generally to the east/southeast. Based on water level elevations measured at bedrock monitoring wells MW-16R, MW-21R and MW-22R (these wells are east of the site in the OSDA), groundwater in the shallow bedrock generally flows to the southeast.

The horizontal hydraulic gradient in the shallow overburden varies across the site. Steeper hydraulic gradients are encountered at upgradient locations (close to monitoring well MW-20D, which is near the Genesee Street and Broadway intersection), south of Building #2, and along the eastern property boundary. Relatively shallow groundwater (approximately 3 to 5 feet bgs) was encountered at monitoring wells MW-6S (southeast of Building #2), MW-7 (east of the former 3,000,000 cf gas holder), MW-13 (east of the Fleet Building), and MW-15S (east of Building #2-4). These wells were located near the eastern property boundary where the silt and clay layer is more continuous. Based on the observed head difference between well pairs in shallow and deep overburden units (such as monitoring wells MW-7/MW-14 and MW-6S/MW-6A), it appears that groundwater in the shallow overburden unit at these locations is perched on top of the silt/clay layer. Based on site geology, groundwater at shallow overburden monitoring wells MW-13 and MW-15S may also be perched.

Slug testing was conducted to calculate hydraulic conductivities of the hydrostratigraphic units across the site. The geometric mean hydraulic conductivity for each hydrostratigraphic unit is presented in the Table 1.2 below.

Table 1.2 – Hydraulic Conductivity

Hydrostratigraphic Unit	Geometric Mean Hydraulic Conductivity
Shallow Overburden	$8.0x10^{-3}$ centimeters per second (cm/sec) (22.7 feet/day)
Deep Overburden	$2.8x10^{-2}$ cm/sec (79.4 feet/day)
Bedrock	$4.4x10^{-5}$ cm/sec (0.12 feet/day)

Several of the deep overburden wells were partially screened within the weathered bedrock. As indicated above, the results of the hydraulic conductivity testing indicate that the deep overburden is the most transmissive unit for groundwater flow at the site (likely due to the weathered bedrock component).

Downward vertical hydraulic gradients were observed between shallow overburden and deep overburden at onsite groundwater monitoring wells MW-6 (southeast of Building #2), MW-26 (northeast of the former 2,000,000 cf gas holder), MW-27 (north of the Fleet Building), MW-28 (northeast of Building #2), and piezometer PZ-01. The gradients were generally greater than 0.2 feet/foot, likely due to the perched groundwater conditions in areas of the site where these wells are located. East of the FMA, smaller downward vertical hydraulic gradients were observed between shallow overburden and deep overburden (<0.1 feet/foot at monitoring wells MW-17 and MW-22). Slightly upward vertical hydraulic gradients were observed between competent shale bedrock and deep overburden at monitoring wells MW-16, MW-21 and MW-22.

1.4.4 Groundwater Usage

The City of Albany derives its potable water supply from Alcove Reservoir (primary source) and Basic Creek Reservoir (secondary source) in the Towns of Coeymans and Westerlo, New York, respectively. There are no current or likely future users of site-related groundwater and there are no known drinking water supply wells within a one-half mile radius of the North Albany Service Center. Residents and commercial establishments in the vicinity of the North Albany Service Center obtain municipal drinking water from the City of Albany.

1.4.5 Nature and Extent of Impacts

The nature and extent of impacts associated with the site were assessed by multiple investigations. The nature and extent of impacts in soil, bedrock, and groundwater at the site are presented below.

1.4.5.1 Subsurface Soil

The nature and extent of MGP-related impacts to subsurface soil at the site were characterized by the previous investigations. The following criteria were used to delineate the nature and extent of impacts in subsurface soil:

- Visual characterization of soil samples to identify MGP- and/or petroleum-related impacts based on the presence of odors, staining, sheens, and NAPL.
- Comparison of total BTEX and total PAH concentrations in soil to the soil screening levels of 10 and 500 ppm (respectively) as presented in the NYSDEC Division of Hazardous Waste Remediation document entitled "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels" HWR 94-4046 (TAGM 4046). The NYSDEC's Environmental Remediation Program (6

NYCRR Part 375) issued in December 2006 and supplement document titled “CP-51/Soil Cleanup Guidance,” issued October 21, 2010 replaced TAGM 4046. The objectives of the programs are consistent, but 6 NYCRR Part 375 also considers land use in establishing soil cleanup objectives (SCOs) (NYSDEC 2006).

Soil sampling locations where visual indications of MGP- and non-MGP-related environmental concerns were encountered are shown on Figure 1-15 of the FS Report. Soil analytical results for total BTEX and total PAHs are shown on Figure 1-16 of the FS Report. Samples containing total BTEX and total PAHs at concentrations greater than 10 and 500 ppm, respectively, are highlighted on the figure. A summary of subsurface soil data is described below.

Onsite

Visual indications of NAPL in subsurface soil were encountered throughout portions of the FMA. The heaviest MGP- and non-MGP-related impacts (based on thickness of NAPL saturation) are present in the northwestern corner of the site (in the vicinity of the former 250,000 CF relief gas holder and the active Genesee Street Substation) and along the eastern property boundary (in the purifier waste area and in the vicinity of the former 3,000,000 CF gas holder). The majority of the visual indications of NAPL/tar-saturated soil (TSS) are in the saturated zone (i.e., below the groundwater table). At several soil boring locations, visual indications of NAPL/TSS were present immediately above a discontinuous silt and clay unit that divides the shallow and deep overburden hydrostratigraphic units. However, at several locations NAPL/TSS was also observed below the silt and clay unit. The potential confining properties of the silt and clay (where present) combined with the fact that the silt and clay unit is missing in some areas may influence the distribution of NAPL and TSS at the site.

Although subsurface investigation activities have not been implemented to evaluate the presence of subsurface environmental concerns beneath Building #2, the location of NAPL-impacted soils, groundwater flow direction, and the top of bedrock slope, suggest that NAPL and other MGP- and/or non-MGP-related COCs and materials of concern (MOCs) may be present beneath the eastern portion of the building. An oil sheen and droplets of separate-phase material were observed on groundwater that infiltrated an excavation (performed as part of the TSDF closure activities) immediately south of Building #2 and slightly northwest of the HWSTA. Additionally, black oil-like material was observed in soil samples collected at soil boring SB-17 from 3.5 to 12.2 feet bgs in the Northern Portion of the HWSTA.

Within the proposed footprint of the Fleet Building addition, NAPL (primarily in the form of blebs) was encountered in soil recovered from the three pre-design investigation geotechnical/environmental soil borings, as follows:

- *VMB-1 (Southwest Corner of Proposed Addition):* NAPL characterized as dark brown high viscosity NAPL blebs or dark brown NAPL with a taffy-like consistency was identified in the 14 to 16 foot depth interval of boring VMB-1. This was directly below the silt and clay layer, which was encountered from approximately 10 to 14 feet bgs.
- *VMB-2 (Southeast Corner of Proposed Addition):* NAPL characterized as dark brown NAPL with a taffy-like consistency was identified from 7 feet bgs to the top of the underlying silt and clay layer at approximately 12 feet bgs at boring VMB-2. No NAPL was encountered below the silt and clay layer.
- *VMB-3 (Northern Portion of Proposed Addition):* No NAPL was encountered in boring VMB-3, other than small NAPL blebs from 22 feet bgs to the bottom of the boring, which coincided with apparent top of shale bedrock at 25.5 feet bgs.

Offsite Downgradient Area

Soil borings SB-123 and SB-124A (northeast and east of the Fleet Building) were the only locations where visual indications of MGP- and/or non-MGP-related environmental concerns were encountered within OSDA overburden soils. NAPL/TSS was encountered in weathered bedrock at soil borings SB-129 and SB-131, located downgradient (topographically and hydraulically) from soil boring SB-124A.

A total of 21 subsurface soil samples from 13 locations in the OSDA were submitted for analysis of BTEX and PAHs. The analytical results indicated that total PAHs and BTEX SCOs were not exceeded, except for total BTEX at SB-124 from 4 to 6 feet bgs (at a concentration of 23.8 ppm). Soil impacts in the OSDA were generally identified immediately east of the Fleet Building and greatly decreased with distance from the FMA, often to non-detectable concentrations.

1.4.5.2 Bedrock

As indicated above, NAPL was observed in samples collected at several locations in the saturated overburden below the silt and clay unit (where present) and within weathered bedrock in the FMA. MGP-related material (coal tar) was also encountered in weathered bedrock at soil borings SB-129 and SB-131 located in the OSDA. Weathered bedrock analytical results for BTEX and PAHs identified exceedances at SB-129, but not SB-131, indicating a reduction in NAPL impacts with distance from the FMA.

Arcadis installed three bedrock monitoring wells (MW-16R, MW-21R and MW-22R) to investigate the potential presence of site related COCs and MOCs in bedrock in the OSDA. No visual observations or elevated photo-ionization detector readings indicating the potential presence of MGP- or non-MGP-related materials were noted during rock coring at MW-16R, MW-21R, and MW-22R. Additionally, NAPL was not encountered during subsequent gauging events at these wells.

1.4.5.3 Groundwater

As indicated in Section 1.3, periodic groundwater monitoring has been conducted at the site from 1997 through 2014. Groundwater samples were collected from select monitoring wells and submitted for laboratory analysis. Analytical results were compared to the NYSDEC document entitled “Division of Water Technical and Operation Guidance Series Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations” (TOGS 1.1.1), reissued June 1998 and addended April 2000 and June 2004 (NYSDEC 2004). Groundwater monitoring results are described in detail in the annual Groundwater Monitoring and NAPL Monitoring/Recovery reports prepared by National Grid and submitted to the NYSDEC.

Analytical results for groundwater samples collected onsite indicate that dissolved-phase constituents are present in groundwater at concentrations exceeding NYSDEC groundwater quality standards and guidance values presented in TOGS 1.1.1 (including samples collected from monitoring wells MW-2 [northwestern portion of the site], MW-4 [immediately north of Building #2], and well clusters MW-26 [northeast of the former 2,000,000 cy holder], MW-27 [north of the Fleet Building] and MW-28 [northeast of Building #2]). Monitoring wells in the FMA that were sampled as part of the periodic monitoring program consist of MW-26S, MW-26D, MW-27S, MW-27D, MW-28S, and MW-28D. The analytical results for the periodic groundwater monitoring indicate that concentrations of COCs in onsite groundwater generally appear to be relatively stable.

Groundwater analytical data indicates that impacted groundwater within the OSDA is generally located along the eastern boundary of the FMA and concentrations decrease with distance from the FMA to the east, often to non-

detectable concentrations. Dissolved-phase COCs were observed at concentrations exceeding NYSDEC groundwater quality standards and guidance values in groundwater samples collected from MW-16D, MW-16R, MW-17S, MW-17D, MW-18S and MW-23S. The offsite/downgradient extent of dissolved phase COCs in groundwater has been defined by groundwater samples collected from the most hydraulically downgradient wells in each hydrostratigraphic unit that do not contain COCs at detectable concentrations; however, many of the downgradient wells have been destroyed and were not sampled for several years.

1.4.5.4 NAPL

Measurable quantities of accumulated DNAPL have been observed in onsite monitoring wells MW-5 (near the southwest corner of the Fleet Building), MW-6S (southeast of Building #2), MW-7 (east of the former 3,000,000 cf gas holder), MW-13 (east of the Fleet Building) and MW-14 (paired with MW-7). However, attempts to recover DNAPL (i.e., via bottom-loading bailers and a peristaltic pump) within the onsite monitoring wells were generally unsuccessful due to the viscosity and density of the DNAPL at these locations. Over the course of the NAPL monitoring program, a minimal quantity of DNAPL was recovered. No indications of DNAPL have been observed in any monitoring wells located in the OSDA, and NAPL and/or NAPL-impacted soil have not been encountered to the north or west from the former relief holder area in the northwestern corner of the site.

LNAPL has been encountered in the following areas at the site:

- *FMA* – Measurable quantities of LNAPL were observed in monitoring wells MW-4 (immediately north of Building #2), MW-8 (northeastern corner of the site), MW-13 (east of the Fleet Building), and MW-14 (east of the former 3,000,000 cf holder). The LNAPL thicknesses was greater than one foot at monitoring well locations MW-4 and MW-8.
- *OSDA* – LNAPL accumulation was not observed in any OSDA monitoring wells during the quarterly NAPL monitoring program. Measurable amounts of LNAPL were not encountered in monitoring wells located in the OSDA.
- *HWSTA* – LNAPL was observed during the completion of soil boring SB-17 in the area immediately south of the former TSDF (south of Building #2), but analytical results collected at this location were less than SCOs. In addition, during the TSDF closure activities, LNAPL was observed on the surface of groundwater encountered following the removal of concrete flooring and subsurface fill materials beneath a truck dock inside Building #2.

Mobile LNAPL was previously encountered at monitoring well MW-10 located northeast of Building #2-4. However, measurable quantities of NAPL were not identified in the well after September 2005 (i.e., 12 consecutive monitoring events without encountering a measurable thickness of NAPL). Where observed, LNAPL was recovered to the extent possible using a disposable bottom-loading bailer and/or peristaltic pump. Over the course of the NAPL monitoring program, a total of approximately 0.13 gallons of LNAPL was recovered.

1.4.5.5 Subsurface Utilities

Subsurface utilities in and around the site are extensive. However, no subsurface utilities have been identified in the vicinity of the proposed IRM soil remediation for the Fleet Building addition, as shown on Design Drawing G-104. The following work has been performed to assess the nature and extent of utilities in and around the site:

- Available historical and updated as-built utility drawings were reviewed (copies of the drawings are provided in Electronic Attachment 5).

- A geophysical survey was conducted using electromagnetic and GPR techniques to identify and mark the location of subsurface utilities and structures (mostly concrete) at depths up to 12 feet below grade at and in the immediate vicinity of the proposed remedial limits. Geophysical survey findings are shown on the figures included in Electronic Attachment 5.
- Land surveying was performed to document the locations and elevations of the utilities as identified by the activities described above. Refer to the 2017 survey by CT Male Associates, as presented in Electronic Attachment 5.

Subsurface utilities in the vicinity of the remedial limits in the set of Design Drawing G-104.

1.5 Remedial Action Objectives

Remedial action objectives (RAOs) established for the site are defined in the ROD. RAOs are specific goals established to protect human health and the environment. The RAOs identified in the ROD are presented in Table 1.3 below.

Table 1.3 – Remedial Action Objectives

RAO#	Description
Soil	
RAOs for Public Health Protection	
1.	Prevent ingestion/direct contact with contaminated soil.
2.	Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.
RAOs for Environmental Protection	
3.	Prevent migration of contaminants that would result in groundwater or surface water contamination.
Groundwater	
RAOs for Public Health Protection	
1.	Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
2.	Prevent contact with, or inhalation of volatiles, from contaminated groundwater.
RAOs for Environmental Protection	
3.	Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
4.	Remove the source of ground or surface water contamination.
Soil Vapor	
RAOs for Public Health	
1.	Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into building at a site.

The proposed IRM soil remediation and proposed vapor intrusion mitigation measures for the Fleet Building addition will achieve the RAOs identified above within and extending past the proposed building addition footprint. These RAOs will be achieved in other areas of the site as the future phased site-wide remediation is implemented.

1.6 Regulatory Requirements

Regulations and guidance identified as being potentially applicable to the proposed IRM are presented in Table 1.4 below.

Table 1.4 – Applicable Regulations/Guidance

Regulation	Topic
29 CFR Parts 1904, 1910, and 1926	Occupational Safety and Health Administration (OSHA) Standards
40 CFR Parts 260-267	RCRA Hazardous Waste Management Regulations
40 CFR Part 268	RCRA Land Disposal Restrictions
40 CFR Part 270	RCRA Hazardous Waste Permit Program
40 CFR Part 273	Standards for Universal Waste Management
49 CFR 105, 107, 171-178	Hazardous Material Safety Administration – Transportation Regulations
6 NYCRR Parts 200, 257, 300	Air Resources
6 NYCRR Part 360	New York State Solid Waste Management Regulations
6 NYCRR Part 364	Waste Transportation Regulations
6 NYCRR Part 370	New York Hazardous Waste Management System – General
6 NYCRR Part 371	Identification and Listing of Hazardous Wastes
6 NYCRR Part 372	Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Disposal Facilities
6 NYCRR Part 373	New York Regulations for Hazardous Waste Management Facilities
6 NYCRR Part 375	Environmental Remediation Programs
6 NYCRR Part 376	Land Disposal Restriction
6 NYCRR Part 608	Protection of Waters
6 NYCRR Parts 700-706	NYSDEC Ambient Water Quality Standards and Guidance Values
Clean Water Act Section 402	Discharge to Waters of the United States
DER-4/NYSDEC TAGM 4061	Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediments from former MGPs
DER-10	Technical Guidance for Site Investigation and Remediation
DER-31	Green Remediation
New York State Standards and Specifications for Erosion and Sedimentation Control	Erosion and Sedimentation Control

Note:
The list of applicable regulations provided above is not all-inclusive. The Contractor shall comply with all applicable federal, state, and local regulations when performing the proposed IRM.

2 Project Responsibilities

National Grid, NYSDEC, New York State Department of Health (NYSDOH), and the Engineer/Construction Manager will jointly implement the IRM described in this document. National Grid has the ultimate responsibility for implementing the IRM, including the site-specific CAMP. NYSDEC and NYSDOH personnel are anticipated to be onsite periodically to observe work activities. The IRM is being performed prior to the Fleet Building addition, designed by National Grid's Fleet Building Addition Engineer (Nelson Associates Architectural Engineering [NAAE]). The Contractor will be responsible for all onsite construction operations during the project, except for certain operations indicated herein. The Engineer will observe construction activities for general compliance with this IRM Design, including the attached supporting documents. The Construction Manager will primarily be responsible for leading construction meetings with assistance from the Contractor, tracking Contractor production (e.g., quantities and costs), and reviewing Contractor invoices and change orders for National Grid.

Safety is a priority for this project and the responsibility of all parties involved. National Grid will host a Process Hazard Assessment (PHA) meeting before Contractor mobilization that will involve a systematic, multi-disciplined team review of the remedial project activities, associated hazards, and safeguards to be used. The meeting discussions will be led by National Grid's Safety Department and attended by representatives from a range of disciplines within National Grid as well as the Contractor, Engineer, and Fleet Building Addition Engineer and/or Fleet Building Addition Construction Manager. The meeting will involve a task-by-task review of the anticipated remedial project activities, including Contractor means and methods for completing the work safely.

Key personnel for National Grid, NYSDEC, NYSDOH, and Arcadis are identified below in Table 2-1.

Table 2-1 – Key Personnel

Name/Affiliation	Address	Phone/Fax/E-mail
National Grid		
Remediation		
Gerald Cummins Project Manager	300 Erie Boulevard West Syracuse, NY 13202	T: 315.428.6073 Gerald Cummins@nationalgrid.com
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NYSDEC		
Greta Kowalski, PG Project Manager	625 Broadway Albany, NY 12233-7017	T: 518.402.2029 Greta.Kowalski@dec.ny.gov

Name/Affiliation	Address	Phone/Fax/E-mail
NYSDOH		
Anthony Perretta Project Manager	Empire State Plaza, Corning Tower, Room 1787 Albany, NY 12237	T: 518.402.7860 Anthony.Perretta@health.ny.gov
Engineer (Arcadis)		
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Fleet Building Addition Construction Manager (JLL)		
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Construction Manager		
To Be Determined		

2.1 National Grid

National Grid will be responsible for the following tasks:

- Coordinating with the Contractor, Engineer, and Fleet Building Addition Engineer (as necessary) to implement the required work activities in conformance with this IRM Design.
- Issuing a Contract to the selected Contractor.
- Issuing Contract addenda (if any) and modifications (if any) based on input from the Engineer.
- Hosting the PHA meeting.
- Acting as the “Generator” for materials resulting from the IRM that will be transported for offsite treatment and/or disposal.
- Executing waste profiles prepared by the Contractor and reviewed by the Engineer.
- Coordinating with NYSDEC regarding environmental-related work activities.
- Communicating with the Engineer and/or Fleet Building Addition Engineer regarding the IRM.

2.2 Contractor

In general, the Contractor’s responsibilities include, but are not limited to, the following:

- Preparing for and attending the PHA meeting.
- Verifying all existing site conditions, including understanding the existing site data summarized in the PDI Summary Report. Failure by the Contractor to understand and verify all existing site conditions shall not result in additional charges to National Grid.

- Thoroughly reviewing this IRM Design, including Design Drawings, Specifications (Appendix A), and supporting plans included as Appendices B, C, and D. Nothing presented in any of the above documents or drawings should relieve the Contractor's obligation to satisfy the components specified in the other documents/drawings. In addition, if there are discrepancies in the information contained in the above-listed documents/drawings, the Contractor shall identify such discrepancies in writing for National Grid and Engineer review.
- Preparing, submitting, and revising (as necessary based on the Engineer's comments and at no additional cost to National Grid) all plans, permits, and information required by this IRM Design.
- Contracting with a third-party engineering firm to conduct pre- and post-remediation structural surveys.
- Contracting an independent third-party air monitoring technician to conduct air monitoring in accordance with the site-specific CAMP (Appendix B) and the Contractor's HASP.
- Maintaining access to the Fleet Building and fuel island for National Grid personnel at all times. Garage bays 5, 6, and 7 (see Design Drawing G-105) are within the remediation/support area and will be inaccessible during remediation. The remaining garage bays (on both the north and south side of the Fleet Building) and the west side of the fuel island must remain accessible to National Grid at all times.
- Providing all supervision, labor, equipment, and materials necessary to implement the activities described in this IRM Design. All of the Contractor's onsite personnel who conduct work activities at the site shall comply with applicable requirements established by OSHA, including (but not necessarily limited to) the OSHA 40-hour training and the corresponding 8-hour refresher course updates specified in 29 CFR 1910.120. The Contractor shall provide to National Grid and the Engineer evidence of 40-hour training and corresponding 8-hour refresher course updates for onsite personnel (i.e., certificates of training completion) before initiating the IRM at the site.
- Reviewing National Grid's Contractor Safety Requirements, latest edition, and providing signatures to document that Contractor personnel have read and understand the requirements.
- Providing certifications/licenses for equipment operators that verify that training requirements have been met.
- Implementing the activities described in this IRM Design safely and in accordance with applicable federal, state, and local laws, rules, and regulations.
- Attending project meetings, including a pre-construction meeting, daily site safety/coordination meetings, weekly project construction/coordination meeting, substantial completion (pre-final) inspection meeting, corrective measures inspection meetings (if needed), and close-out meeting.
- Conducting daily safety/coordination meetings.
- Performing land survey activities to mark proposed and document final excavation/ISS limits and elevations.
- Providing facilities (e.g., office space, phone, and fax access) for NYSDEC's and Engineer's onsite personnel for the duration of the IRM.
- Collecting performance soil/grout samples from the ISS monolith (as described in this IRM Design) for geotechnical analysis by a qualified laboratory approved by National Grid and retained by the Contractor.
- Notifying the Engineer and National Grid immediately upon discovery of a conflict between the IRM Design/Contract Documents and actual site conditions.
- Handling, staging, and containerizing all waste materials generated by the activities described in this IRM Design.

- Coordinating with and subcontracting a waste hauler(s) for offsite transportation of materials generated during completion of the activities described in this IRM Design.
- Coordinating with and subcontracting a disposal facility(ies) and arranging for disposal of all waste materials generated during the IRM at the site that require offsite disposal (e.g., impacted subsurface soil from the proposed excavation/ISS). Note that the disposal facility(ies) must be from National Grid's Environmentally Approved Disposal Facilities list (Attachment 1).
- Coordinating with and subcontracting a treatment facility(ies) and arranging for treatment of all waste materials generated during the IRM at the site that require onsite/offsite treatment and subsequent discharge (e.g., wastewater) or offsite treatment and subsequent disposal (e.g., potentially soil heavily impacted with NAPL, if encountered). Note that these facilities must be from National Grid's Environmentally Approved Disposal Facilities list (Attachment 1).
- Preparing waste profiles for offsite treatment/disposal of wastes to be generated as part of the IRM, for signature by National Grid. The Contractor will be responsible for revising the profiles, as needed, based on review by National Grid/Engineer.
- Providing bills of lading/manifests for the offsite shipment of waste materials from the site. These shipping documents shall be provided to the Engineer to sign on behalf of National Grid (under agreement with National Grid).
- Covering soil/waste material stockpiles using a low-permeability liner (10-mil polyethylene sheeting or equivalent) at all times, except when actively managing soil in the staging area(s), to minimize potential migration/siltation of material/debris to areas beyond the staging area(s). In addition, the Contractor shall cover roll-off waste containers (if used) with a water-tight tarp at the end of each workday, during precipitation events, and after filling the containers. The roll-off waste containers (if used) shall be lined with poly sheeting.
- Coordinating with National Grid and the Engineer, as necessary, to complete required work activities.
- Informing the Engineer and National Grid of any changes in the scope of the IRM and obtaining written authorization from National Grid before implementing these changes.

2.3 Engineer

The Engineer will provide the following services during implementation of the IRM:

- Preparing for and attending the PHA meeting.
- Reviewing Contractor submittals and providing comments, if any, to the Contractor and National Grid.
- Observing and monitoring implementation of the IRM.
- Maintaining records of the work efforts associated with implementation of the IRM, including daily field reports and photographs of the work in progress. The Engineer will take digital photographs to document observations, problems, deficiencies, and work progress. Photographs will be electronically filed by the Engineer in chronological order in a dedicated SharePoint project folder.
- Documenting that the IRM is conducted in general conformance with this IRM Design and notifying National Grid of any deviations.
- Issuing clarification notices, field orders, work change directives, or proposal requests to the Contractor, as needed, as outlined in Specification Section 01 26 00 (Contract Modification Procedures).

- Reviewing waste profiles prepared by the Contractor on behalf of National Grid for offsite treatment/disposal of wastes to be generated as part of the IRM.
- Reviewing and signing (as an authorized agent for National Grid) waste manifests/bills of lading for shipments of waste materials generated by the IRM.
- Maintaining an onsite project log containing waste manifests/bills of lading for wastes generated by the IRM.
- Attending project meetings (including a pre-construction meeting, daily site safety/coordination meetings, weekly project construction/coordination meetings, substantial completion (pre-final) inspection meeting, corrective measures inspection meeting [if needed], and project close-out meeting).
- Preparing a CCR to document completion of the IRM. A Final Engineering Report for the site will be prepared after the site-wide soil remedial construction is completed.

2.4 Fleet Building Addition Engineer

The Fleet Building Addition Engineer will provide the following services during implementation of the IRM:

- Preparing for and attending the PHA meeting.
- Reviewing Contractor submittals and providing comments, if any, to the Contractor and National Grid.
- Attending project meetings (including a pre-construction meeting, daily site safety/coordination meetings, weekly project construction/coordination meetings, substantial completion (pre-final) inspection meeting, corrective measures inspection meeting, and project close-out meeting), as needed.

2.5 Fleet Building Addition Construction Manager

The Fleet Building Addition Construction Manager will provide the following services during implementation of the IRM:

- Preparing for and attending the PHA meeting.
- Attending project meetings (including a pre-construction meeting, daily site safety/coordination meetings, weekly project construction/coordination meetings, substantial completion (pre-final) inspection meeting, corrective measures inspection meeting, and project close-out meeting).

2.6 Construction Manager

The Construction Manager will be National Grid's onsite field representative during implementation of the IRM. The Engineer may serve the role of National Grid's Remediation Construction Manager. Responsibilities of the Construction Manager include, but are not limited to, the following:

- Preparing for and attending the PHA meeting.
- Maintaining records of labor, materials, and equipment used for the IRM and unusual circumstances, if any are encountered.
- Monitoring the Contractor's survey control for evaluating payment quantities, as applicable.
- Reviewing Contractor invoices/requests for payment.

- Attending project meetings (including a pre-construction meeting, daily site safety/coordination meetings, weekly project construction/coordination meetings, substantial completion (pre-final) inspection meeting, corrective measures inspection meeting [if needed], and project close-out meeting) and preparing agendas and meeting minutes.
- Reviewing Contractor daily health and safety field reports.

2.7 Submittals

Within 2 weeks following project award, the Contractor shall prepare and deliver electronic copies of the submittals listed below to National Grid and the Engineer. The Contractor shall provide hard copies of selected submittals, as requested by National Grid/Engineer. The Contractor submittals shall include the following:

- A Project Operations Plan (POP) that presents information provided with the Contractor's bid (updated as appropriate), including:
    1. The Contractor's organizational chart of key personnel
    2. Detailed project management information, including roles of the project team
    3. A narrative discussion of the proposed approach for completing the IRM that addresses work activities sequencing; coordination with local authorities regarding contingency planning and increased vehicle (truck) traffic; entry and access to the work areas during construction and periods of inactivity; site security measures; site preparation activities; protection of utilities and existing features (e.g., buildings, fueling island, roadways); excavation, ISS, erosion control, community air monitoring, dust and nuisance odor control, equipment decontamination, site restoration, and permitting; proposed equipment to be used for the IRM; and proposed methods of managing materials and wastes (including an identification of the proposed transporter[s] and treatment/disposal facility[ies] for each waste stream).
    4. Identification of proposed geotechnical and analytical laboratories, laboratory qualifications, test procedures to be used, and turnaround times for reporting results to the Contractor and National Grid/Engineer.
    5. Figures showing the Contractor's proposed decontamination facilities, field office/construction trailers, equipment storage, remedy implementation approach, and truck travel routes to and from the site.
- A Critical Path Method (CPM) schedule, in Gantt chart format, and identification of the work-week length and daily work hours. The Contractor shall maintain and update the schedule, as needed, but bi-weekly at a minimum, throughout the construction of the IRM.
- Cut-sheets, records, and record drawings for certain materials and equipment to be provided in connection with implementing the IRM.
- A site-specific HASP that: (1) meets the requirements of 29 CFR 1910 and 29 CFR 1926 and covers all personnel who will be employed by the Contractor to perform work at the site, including direct employees and subcontractors; (2) complies, at a minimum, with the requirements of the Arcadis HASP for onsite observation and sampling (Appendix C); and (3) includes recommended health and safety measures for the adjacent community and general public. The HASP shall clearly identify the person responsible and the procedures to be followed in an emergency.
- A Contingency Plan that presents measures to prevent unintended releases (spills) at the site and support areas, and measures to properly respond to spills and spill-related emergencies, fire, explosion, or other emergency, should they occur.

Further requirements for the Contractor submittals identified above are presented in the Design Drawings and Specifications. Additional Contractor submittals are required to implement the remedial construction project. A comprehensive listing of Contractor submittals is provided in the submittal register included in Specification Section 01 33 00. The Contractor shall provide these additional submittals to National Grid and the Engineer at least 3 weeks before the corresponding product delivery/work activity initiation, to the extent practicable, to allow ample time for Engineer review or acceptance. The Engineer will provide certain submittals upon request to NYSDEC at least 2 weeks before product delivery/work activity initiation, to the extent practicable.

The Engineer will provide copies of key Contractor submittals (POP, CPM schedule, site-specific HASP, and Contingency Plan) to NYSDEC for review approximately 3 to 4 weeks following project award, which may be 1 or 2 weeks before mobilization.

3 Description of Interim Remedial Measure

This section presents a task-by-task summary of the IRM to be conducted by the Contractor (except as identified otherwise herein), as follows:

- Work Task 1 – Project Meetings and Inspections
- Work Task 2 – Pre-Construction Activities
- Work Task 3 – Mobilization/Site Preparation
- Work Task 4 – Erosion and Sedimentation Control
- Work Task 5 – Site Security, Control, and Access
- Work Task 6 – Subsurface Utility Identification and Handling
- Work Task 7 – Traffic Control
- Work Task 8 – Excavation Operations
- Work Task 9 – Excavation Dewatering and Water Management
- Work Task 10 – In-Situ Soil Solidification
- Work Task 11 – Material Handling and Disposal
- Work Task 12 – Decontamination
- Work Task 13 – Backfilling
- Work Task 14 – Restoration/Demobilization

Specifications for the IRM are identified in Specification 00 01 10 (Table of Contents) included in Appendix A. Support documents for the IRM (CAMP, HASP, and CQAP) are provided in Appendices B, C, and D.

Details of the remedial activity tasks are presented in Sections 3.1 through 3.14. Details of the site controls required for this project, including community air monitoring and dust control measures and geotechnical monitoring, are presented in Section 4.

3.1 Work Task 1 – Project Meetings and Inspections

Meetings to be held in connection with the project and attended by the Contractor are described below. Additional details for the meetings are presented in Specification Sections 01 31 19.13 (Project Meetings) and 01 31 19.23 (Progress Meetings).

3.1.1 Pre-Construction Meeting

Following Contract award, and before Contractor mobilization, a pre-construction meeting will be held in an office/meeting space at the site (coordinated by National Grid) to introduce the project team members representing the NYSDEC, NYSDOH, National Grid, Contractor, Engineer, and the Fleet Building Engineer. The Engineer will schedule the pre-construction meeting shortly after award of the Contract (no later than 10 business days after notice to proceed) and a minimum of 2 weeks' notice will be provided to project team members. The meeting will be conducted to review Contract requirements, establish a schedule of operations, and resolve issues (if any) raised by the attending parties.

The Engineer will prepare and distribute a summary of the pre-construction meeting to the meeting attendees. Failure by the Contractor to inform the Engineer within 5 business days of receiving the summary of any discrepancies or inaccuracies contained therein indicates that the Contractor concurs with the Engineer's summary of items/issues discussed and agreed upon during the meeting.

3.1.2 Daily and Weekly Project Coordination Meetings

The Contractor and Engineer shall attend daily project coordination meetings to discuss day-to-day operations, schedule, health and safety items, outstanding issues, and the general status of the IRM. The Engineer will include a written summary of each daily project coordination meeting in the project field notebook.

The Contractor (including the Project Manager and Project Supervisor), the Contractor's suppliers/subcontractors (as needed, in person or by telephone), and the Engineer shall attend weekly meetings. The NYSDEC, NYSDOH, National Grid, and Engineer will also attend the weekly meetings, in person or by telephone, as needed. Weekly meetings will be held to discuss issues including, but not limited to, project status, scope of upcoming work, project implementation issues, and schedule. Site inspections/reviews by National Grid and/or the Engineer will be performed in connection with selected weekly project coordination meetings. The Engineer will prepare a summary of items/issues discussed and agreed upon during the weekly meeting and incorporate this summary into the weekly progress report for that week, which will be distributed to the weekly meeting attendees. Failure by the Contractor to inform the Engineer within 5 business days of receiving the weekly progress report of any discrepancies or inaccuracies contained therein indicates that the Contractor concurs with the Engineer's summary.

Daily and weekly meetings will be held in the Engineer's field office trailer (to be provided by the Contractor), to be located in the parking area southwest of the Fleet Building.

3.1.3 Substantial Completion (Pre-Final) Inspection Meeting

The Contractor (including the Project Manager and Project Supervisor) shall attend a substantial completion (pre-final) inspection held at the site at least 14 calendar days before completion of construction. The meeting will also be attended by the NYSDEC, NYSDOH, National Grid, Engineer, and the Fleet Building Addition Engineer to review the completed construction for general consistency with the IRM Design; 2003 Consent Order; ROD; and applicable federal and state laws, rules, and regulations. The Engineer will prepare a written summary of the substantial completion (pre-final) inspection and distribute it to the meeting attendees.

3.1.4 Corrective Measures Inspection Meeting

The Contractor shall attend a corrective measures inspection held at the site (if needed, based on comments provided by the NYSDEC associated with the substantial completion [pre-final] inspection) within 14 calendar days following completion of the corrective measures. The meeting will be attended by NYSDEC, National Grid, the Contractor (including the Project Manager and Project Supervisor), Engineer, and the Fleet Building Addition Engineer to assess the completed corrective measures. The meeting may also be attended by NYSDOH, as needed. The Engineer will prepare a written summary of the corrective measures inspection and distribute it to the meeting attendees.

3.1.5 Close-out Meeting

The project Close-Out Meeting will be attended by NYSDEC, National Grid, the Contractor, Engineer, and the Fleet Building Addition Engineer, at construction completion. The meeting will consist of a final walk-through inspection of the site and will focus on any remaining construction items identified in the substantial completion (pre-final) inspection and corrective measures inspection meeting. The Contractor's demobilization should be completed, except for equipment and materials required to complete outstanding construction items at the time of inspection. The NYSDEC will confirm that all outstanding items have been resolved. The meeting may also be attended by the NYSDOH, as needed. The Engineer will prepare a written summary of the meeting and distribute it to the meeting attendees.

3.2 Work Task 2 – Pre-Construction Activities

Work activities to be performed by the selected Contractor in preparation for implementing the IRM include, but are not limited to, the following:

- Providing the Engineer with an insurance certificate identifying National Grid as primary insured (certificate holder) and the Engineer as additional insureds. Policy limits required for the IRM are identified in National Grid's standard terms and conditions for environmental remediation work. The Contractor shall not begin work before Engineer and National Grid approval of the insurance certificates. The insurance policy shall be primary and non-contributory.
- Determining horizontal limits of the proposed excavation/ISS area using global positioning system (GPS) or conventional survey equipment and techniques. Locations of existing survey control point and benchmarks used by National Grid for previous site survey work are shown on Design Drawing G-101 (coordinates for these points are also presented on the drawing). Survey coordinates for the corners of the excavation/ISS are presented on Design Drawing C-101. The survey coordinates presented in the drawings are relative to the New York State Plane Coordinate System, North American Datum of 1983 (NAD 83). Requirements for survey control are presented in Specification Section 01 71 23 (Field Engineering). The Contractor shall use flagged wooden stakes, flagged metal pins, and/or spray paint, as appropriate, to mark the proposed excavation/ISS limits.
- Performing pre-remediation structural surveys of the Fleet Building and fuel island to document pre-remediation conditions and serve as the baseline for a post-remediation survey. The pre-remediation survey (and post-remediation survey) shall be conducted by a third-party Professional Engineer licensed in New York State and shall include, but not be limited to, visual inspection and photographic documentation of the existing conditions of the above-identified buildings and fuel island. The inspections shall document the condition of the concrete floor slabs/pads, interior walls, doors and windows (jambs, casings, and glass), and other signs of potential distress of structural components, as indicated in Specification Section 02 21 19 (Structural Surveys). The Professional Engineer that conducts the inspections shall prepare and submit a pre-remediation structural survey report to National Grid and the Engineer before Contractor mobilization. The report shall include written text, photographs, and any relevant measurements or descriptions to document the pre-remediation conditions of the Fleet Building and fuel island.
- Contacting UDig NY, Inc. (UDig) to initiate a subsurface utility clearance request, a minimum of 3 business days before the start of the IRM, to identify and mark the locations of underground utilities (e.g., electricity, natural gas, water, storm and sanitary sewer, telecommunications) and associated structures at and near the work areas. The Contractor will be responsible for: (1) confirming the locations of all existing and abandoned

subsurface utilities using a private utility locator (via geophysical and/or other methods); (2) using spray paint and flagging (as appropriate) to mark the utility locations not already marked by UDig; and (3) protecting all utilities throughout the remedial construction work.

- Coordinating with National Grid in connection with scheduling of the temporary closure of Garage bays 5, 6, and 7, and limited access to the fuel island. The Contractor shall contact National Grid within 10 business days following the pre-construction meeting to discuss the proposed timing and duration regarding the closure of the garages and limited access to the fuel island. As previously indicated, garage bays not within the construction limits (on both the north and south side of the Fleet Building) and west side of the fuel island must remain accessible to National Grid at all times.
- Installing temporary fence (minimum 6-foot-high chain-link fence on concrete jersey barrier or pedestals as shown on Design Drawing G-201) around the perimeter of the proposed work area for safety reasons and to limit unauthorized access into the area. The proposed fence locations are shown on Design Drawing G-105. Temporary fence may be installed around the work area perimeter in a phased approach to secure the "active" work area and minimize disturbance/provide access to the garage bays and fuel island. A green-colored heavy-duty privacy screen/mesh tarp or hedge slats shall be installed on the fence to limit view of the construction area by the onsite staff and serve as a windscreen. The Contractor will be responsible for installing additional jersey barriers/fencing (as needed) to keep the work area completely enclosed and secured at all times, and additional gates (as needed) for construction vehicle or worker access.
- Wrapping the front of the existing Fleet Building, from Garage Bay 5 to the eastern edge of the building, with plastic tarps or polyethylene sheeting (10-mil minimum) to protect the building from potential grout splatter during the planned ISS mixing. The tarps/sheeting shall be secured to resist tears from wind forces. Additional splash protection measures (e.g., plastic tarps, polyethylene sheeting, plywood) shall also be installed on the temporary fence to protect the personnel entry door between Garage Bays 4 and 5, as shown on Design Drawing G-105.
- Providing, installing, and maintaining project signs (hotline signs, danger/construction area signs, security signs) along the perimeter of the work area. Requirements for project signage are documented in Specification Section 01 58 13 (Temporary Project Signage).
- Installing temporary barriers and/or other visual markers (e.g., sawhorses, wooden stakes and flagging, orange traffic cones, orange construction fencing, plywood) to identify and protect existing structures in the work area (e.g. bollard, utility poles), as shown on Design Drawing G-105.
- Coordinating with National Grid, the Engineer, and/or City Water Department to obtain access to a potable water source (e.g., onsite spigot located at the Fleet Building, 2.5-inch diameter fire hose hookup inside Fleet Building Bay 8 [northeast corner of building], or fire hydrant located along Broadway), as necessary, to prepare the ISS mixture. The Contractor will be responsible for providing alternative potable water supply (e.g., for drinking water), as necessary, for use during the IRM, at no additional cost to National Grid.
- Contacting National Grid's Electrical Department for a service request to provide electricity to the field office trailers from an existing nearby utility/light pole. The Contractor shall provide a qualified electrician to make electrical service connections from the disconnect box(es) (to be provided by National Grid) to the office trailers. The Contractor will be responsible for paying charges by National Grid for all services related to any pole installation and disconnect boxes. The Contractor shall assume that it will be responsible for providing its own electrical service (via generator) to the grout mixing/batch plant.
- Performing pre-excavation waste characterization soil sampling, immediately following utility clearance and temporary lined material staging area construction, to support direct-loading of excavated material. The

samples shall be submitted to an NYSDOH-certified laboratory for analysis of the constituents required by the proposed disposal facility for waste profiling (e.g., polychlorinated biphenyls [PCBs], Toxicity Characteristic Leaching Procedure [TCLP] volatile organic compounds [VOCs], TCLP semi-volatile organic compounds [SVOCs], TCLP metals, ignitability, reactivity).

The Contractor will be responsible for all activities and associated costs related to identifying, marking, and/or verifying site conditions and the location(s) of all overhead and underground utilities, equipment, and structures as necessary to implement the IRM in accordance with applicable codes, requirements, and best practices. If the Contractor damages existing utilities, equipment, or structures, the Contractor shall notify National Grid and the appropriate utility company/municipality and shall fully repair all damages at no additional cost to National Grid or the Engineer. Repairs (if necessary) shall be completed in accordance with all requirements of the utility company/municipality and to the satisfaction of the Engineer and National Grid.

3.3 Work Task 3 – Mobilization/Site Preparation

The Contractor shall initiate mobilization following the pre-construction meeting and within 15 business days after notification from National Grid to proceed. The Contractor shall not begin mobilization to the site until notification to proceed is provided by National Grid and necessary Contractor submittals have been reviewed by the Engineer as described in Specification Section 01 33 00 (Submittal Procedures). Mobilization shall not begin until after National Grid provides approval of the Contractor's insurance certificate. Mobilization and site preparation work to be performed by the Contractor include the following:

- Mobilizing all labor, equipment, materials, and supplies needed to implement the IRM. Equipment mobilized to the site shall be subject to a visual inspection by the Engineer. Equipment that arrives at the site in an unsatisfactory condition (e.g., with adhered soil/debris, noticeable fluid leaks, mechanical problems), in the opinion of the Engineer, shall be removed from the site and support areas and replaced by the Contractor at no additional cost to National Grid.
- Providing, mobilizing, and maintaining two office trailers to be installed in the parking area southwest of the Fleet Building, as shown on Design Drawing G-105 and as described in Specification Section 01 52 13 (Field Offices and Sheds). This includes one field office trailer for use by the Contractor and a separate field office trailer for use by National Grid, the Engineer, and NYSDEC (each a minimum of 430 square feet [sf] and with partitions to provide three separate office spaces, one which will serve as a common area). The office trailers shall be blocked and leveled, provided with anchoring systems to prevent overturning due to wind forces, and equipped as described in Specification Section 01 52 13 (Field Offices and Sheds).
- Providing, maintaining, and servicing onsite sanitary facilities (e.g., port-a-johns) and potable water supply for use by onsite personnel engaged in the IRM. Separate facilities shall be provided for Contractor and National Grid/Engineer/NYSDEC personnel. Requirements for the sanitation and water supply services are presented in Specification Section 01 52 19 (Sanitary Facilities). The Contractor will be responsible for providing all necessary sanitary supplies to maintain these facilities.
- Installing erosion and sediment control measures as described in Section 3.4 and in accordance with Design Drawing G-105.
- Mobilizing a closed top, steel, minimum 18,000 gallon portable storage tank(s) with pop-up secondary containment for temporary storage of wastewater to be generated by the IRM.

- Constructing temporary remediation support areas including, but not limited to: (1) waste material staging areas (also referred to as containment areas), as needed; (2) grout mixing/batch plant area; (3) onsite storage areas (for clean materials); and (4) equipment, material, and personnel decontamination areas, as shown on Design Drawing G-203. Potential locations for these areas are shown on Design Drawings G-101 and G-105. The Contractor will be responsible for maintaining the remediation support areas as necessary during implementation of the IRM. Additional information related to construction of the temporary material staging area (if needed), grout mixing/batch plant area, and equipment/personnel decontamination areas is provided in Sections 3.3.1 through 3.3.4 below.

The Contractor shall provide dust control measures and other environmental controls for any ground-intrusive work performed in connection with mobilization and site preparation, as described in Section 4.1.

3.3.1 Temporary Material Staging Area

The top approximately 6 feet of soil to be excavated from the remedial limits may be temporarily staged within the excavation footprint and/or direct-loaded for offsite disposal. Direct-loading will minimize material staging and multiple handling. Subsurface debris (e.g., concrete/brick foundations and sidewalk) encountered when removing soil from the remedial limits may also be temporarily staged within the excavation footprint before offsite transportation and disposal.

The Contractor may elect to construct a temporary lined staging area(s) southeast of the proposed Fleet Building addition (see Design Drawing G-105) or in the northwestern portion of the site (see Design Drawing G-101) for temporary storage of soil/debris requiring offsite disposal that cannot be temporarily staged within the excavation footprint. Note, no soil shall be reused as backfill. The actual location(s) proposed by the Contractor shall be identified in the Contractor's POP, which shall be submitted to and reviewed by the Engineer.

The proposed material staging area(s) (if any) shall be constructed to meet the following minimum requirements:

- The existing asphalt pavement surface at the staging area location shall be cleared/swept of material that may otherwise puncture the liner. If a staging area is constructed in an unpaved area, the existing ground surface shall be graded and compacted, as needed.
- The staging area(s) shall be lined with a high density polyethylene (HDPE) liner of sufficient strength and thickness (no less than 40 mil) to prevent puncture during use. A single sheet of HDPE liner material (sized to fit the staging area) is preferred so that welding of seams is not needed. Overlapping of liner material will not be an acceptable substitute for welding seams. Non-woven geotextile fabric (10 ounces per square yard) shall be placed below and above the HDPE liner. The placement of soil into the staging area shall not involve any equipment or procedures that may jeopardize the integrity of the underlying impermeable liner. Requirements for the HDPE liner and geotextile are presented in Specification Sections 31 05 19.16 (Geomembranes for Earthwork) and 31 05 19.13 (Geotextiles for Earthwork).
- The staging area shall be sloped and equipped with a sump to collect liquids that have drained from the soil. A submersible pump shall be placed in the sump to transfer liquids to an appropriate container. Liquids that accumulate within the sump shall be managed by the Contractor as described in Section 3.9.2.
- A minimum of 9 inches of sacrificial drainage sand (as identified in Specification Section 31 23 23) shall be installed over the liner to: (1) anchor the liner; (2) act as a physical and visual buffer between the liner and material placed within the area; and (3) permit liquids within the staging areas to flow to the sump. A geotextile (10 ounces per square yard) shall be placed on the final sand surface as a separation layer.

- A minimum of 12 inches of sacrificial gravel (Type 2 crushed gravel identified in Specification Section 31 23 23) shall be installed over the geotextile and sand as a driving course.
- A minimum 18-inch-high water-tight perimeter berm shall be constructed around the staging area to contain water that drains from the staged soil and to mitigate the potential for surface water runoff (from outside the bermed area) to contact the staged soil. The berm may be constructed by extending the 40-mil HDPE liner over bermed sand sidewalls or sidewalls constructed using concrete “jersey barriers” or “blocks” (non-ramped sides of staging area). Sand shall be placed over/around the top of the concrete “jersey barriers” or “blocks” as needed to provide a smooth surface that shall not puncture the liner.
- The staging area shall be continuously covered with a properly anchored plastic cover (of a thickness no less than 10 mil), except while soil is actively being managed (placed or removed). The cover shall be provided to minimize potential siltation/migration of soil/debris beyond the staging areas. The cover shall be maintained and secured over the waste material (to resist wind forces) during staging activities, except when the waste material is being actively managed. Soil, waste materials, and debris may not be used as anchor materials. In addition, emission and vapor controls shall be employed, as necessary, when soil is being actively managed.
- The staging area shall be properly maintained, inspected daily, and any noted deficiencies shall be promptly corrected by the Contractor.
- Upon removal of all materials, the Contractor shall remove and treat/dispose of any temporary staging areas (including liner materials). The staging area materials shall be handled as described in Section 3.11.

3.3.2 Grout Mixing / Batch Plant Area

The Contractor shall construct and maintain the grout mixing/batch plant area necessary to implement ISS. The approximate footprint of the area available for grout mixing/batch plant equipment is shown on Design Drawing G-105. Details of equipment types, sizes, and layout for the grout mixing/batch plant along with proposed locations must be provided in the Contractor’s POP and ISS Implementation Plan required in Specification Section 02 55 00 (In-Situ Soil Solidification), which shall be submitted to the Engineer for review. The mixing/batch plant area shall be placed on a stabilized surface and shall be capable of providing grout for ISS to the entire remedial limits. The Contractor will be required to construct a containment area for the grout mixing/batch plant equipment to contain potential spills of admixtures and/or grout. If the Contractor elects to use an impoundment for the containment area, it shall be constructed in the same manner as a lined material staging area.

The Contractor shall provide its own electrical power source (generator) as necessary for the grout plant. Water for the grout plant is available via a 2.5-inch diameter fire hose/main inside Garage Bay 8, on the west side of the bay. The Contractor shall coordinate water use with National Grid and keep Garage Bay 8 accessible to National Grid’s fleet vehicles (e.g., put any Contractor water supply line extending in front of the garage underground, covered by secured steel road plate, or use other means acceptable to National Grid). The Contractor shall provide an appropriately sized storage tank (e.g., 8,000 gallon or larger), piping, and pumps to manage water needed daily for its ISS operations.

3.3.3 Equipment Decontamination Area

The Contractor shall construct and maintain decontamination area(s) for trucks, equipment, and personnel during implementation of the IRM, including the washing of truck tires before leaving work areas. A potential location for the decontamination area is identified on Design Drawing G-105. Actual locations proposed by the Contractor must be shown in the Contractor’s POP, which shall be submitted to the Engineer for review. The

decontamination area(s) shall be constructed in the same manner as a lined material staging area, except: (1) a 4-inch-thick sacrificial sand cushioning layer shall be required on the proposed subgrade (for decontamination areas not on pavement) to further protect the integrity of the low-permeability liner; (2) the Type 2 crushed gravel thickness will be 9 inches instead of 12 inches; and (3) wood planks/crane mats shall be placed on top of the granular fill (above the geotextile and sand) to provide a stable base and limit potential damage to the decontamination area liner. The Contractor shall install splash guards (e.g., polyethylene sheeting or plastic tarps attached to wood posts) around the perimeter of the equipment decontamination area, as needed, to contain decontamination sprays. The Contractor shall provide and maintain a high-pressure washer to decontaminate vehicles and equipment. The wastewater shall be managed as described in Section 3.9.2.

3.3.4 Personnel Decontamination Area

The Contractor shall construct and maintain a personnel decontamination area (to be located inside the Contamination Reduction Zone, as described in Section 3.5) that contains, at a minimum, the following:

- 6-mil HDPE sheeting placed on the ground.
- A boot wash tub with a solution of detergent and water and a long-handled brush.
- An additional boot wash tub containing rinse water, a long-handled brush, and a final rinse with a hand pump sprayer.
- A chair(s) so personnel can be seated when cleaning their work boots.
- A 55-gallon drum lined with a 6-mil-thick bag for personal protective equipment (PPE) disposal.
- A hand wash tub with a solution of detergent and water.
- An additional hand wash tub containing rinse water and a final rinse with a hand pump sprayer.
- Paper hand towels.

3.4 Work Task 4 – Erosion and Sedimentation Control

Erosion and sedimentation control measures shall be installed before excavation, ISS, and/or other activities that may result in soil disturbance. The control measures are required to reduce runoff flow velocity (where necessary), minimize run-on into the work area, and reduce the potential for sediment movement into or from the excavation/disturbed areas and material staging areas. The Contractor shall construct and maintain the control measures in accordance with New York State Standards and Specifications for Erosion and Sediment Control (NYSDEC 2016b). This remedial project is not required to obtain coverage under National Pollutant Discharge Elimination System or NYSDEC's General Permit for Stormwater Discharges from Construction Activities (GP-0-25-001) based on the small size of the ground surface (approximately 0.09 acre) that will be disturbed and a Stormwater Pollution Prevention Plan (SWPPP) is not required. A SWPPP is also not required by the City because the project will not disturb more than 1 acre, in accordance with City of Albany Code, Chapter 475 Section 9(B.). At a minimum, erosion and sediment control for this project will involve the following (also refer to Design Drawings G-105):

- Installing silt fencing or compost filter socks around the entire work area (including hydraulically upgradient portions). Silt fencing may be used where current ground cover is gravel and compost filter socks shall be used on asphalt pavement or gravel.
- Installing lined berms around the material staging and decontamination areas (as described in Section 3.3.3).

- Maintaining a cover (e.g., tarps) over excavated materials placed in the material staging area(s) at all times, except when materials are being actively placed, stabilized, or removed.
- Constructing a decontamination/tire wash area(s) to remove soil and other debris from tires of vehicles/ equipment before exiting the work area in lieu of a stabilized construction entrance.

Erosion and sediment controls shall be inspected, at a minimum, once every 7 calendar days during work activities and following storm events. During a temporary work suspension (although not anticipated for this project), the inspection frequency can be changed to monthly during the suspension and then revert back to weekly once work resumes. During the suspension, disturbed areas shall be temporarily stabilized via seeding and mulching. Accumulated sediment collected by the control measures shall be removed throughout the project, and the control measures shall be repaired or replaced as necessary to maintain performance as intended. The removed material shall be direct loaded for offsite disposal with excavated soil or transferred to the lined material staging area(s) for offsite disposal. Erosion and sediment control measures shall be removed when the final ground surface has been restored, as accepted by the Engineer. Weekly erosion and sediment control measure inspections shall be performed until the sediment control measures have been removed. The erosion and sediment control measures described above shall be implemented and maintained during work activities. The Contractor shall certify in its POP that it will follow the erosion and sedimentation control plan as outlined in this IRM Design or it shall submit a separate erosion and sediment control plan meeting minimum project requirements and clearly identifying any proposed changes to the erosion and sedimentation control plan outlined herein.

3.5 Work Task 5 – Site Security, Control, and Access

Access to the construction areas shall be restricted by the perimeter fencing (as shown on Design Drawing G-105). The Contractor shall take additional measures to further limit construction area access and augment security during the IRM as described below. Security around excavation, ISS, staging, handling, decontamination, and storage areas shall be maintained during both work and non-work hours. The level of security will be dependent on the activities being performed and locations of activities. Security measures to be implemented include: (1) perimeter fencing installed on concrete jersey barriers or pedestals; (2) interior temporary fencing (e.g., orange construction fencing) and/or barriers; (3) warning tape and signs; (4) maintenance of sign-in/sign-out sheets; and (5) implementation of safe work practices. Descriptions of security measures are provided below, and the exact methods used by the Contractor shall be specified in the Contractor's POP.

- *Perimeter Fencing on Jersey Barriers or Pedestals* – At a minimum, the work and support areas shall be enclosed with a perimeter security fence(s) to restrict access for unauthorized personnel. Jersey barriers with security fencing shall also be installed along portions of the work area perimeter adjacent to onsite vehicle traffic, as shown on Design Drawing G-105. Temporary fencing shall also be installed and relocated, as needed, during remedial construction. Access gates will provide ingress and egress to and from construction areas. As previously indicated, the perimeter fence will consist of a minimum 6-foot-high chain-link fence (portions installed atop concrete jersey barrier) with a green-colored heavy-duty privacy screen/mesh tarp or hedge slats.
- *Temporary Fencing* – The perimeter fence shall be supplemented by temporary construction fencing (e.g., 4-foot orange HDPE) and/or caution tape as needed to delineate and secure areas of the ongoing IRM, including the Exclusion Zone and Contamination Reduction Zone, which may change as remedial

construction progresses. The areas identified below shall be considered for installation of temporary fencing, and such areas shall be clearly labeled with signage posted on the fence/caution tape:

  - Areas where soil removal, solidification, stockpiling, or loading for offsite transport occurs (Exclusion Zone)
  - Areas used for personal or equipment decontamination activities (Contaminant Reduction Zone)
  - Areas designated for health and safety or support purposes (Support Zone)

- *Posting of Warning Tape and Signs* – Warning tape may be installed at certain locations, such as open excavations, ISS, decontamination, and stockpile areas to restrict access during IRM.
- *Sign-In/Sign-Out Sheet* – A sign-in/sign-out sheet shall be maintained for construction activities at the field construction trailer occupied by the Contractor during remediation activities. All construction workers, other site personnel, and visitors shall be required to sign in upon entering the site and sign out upon leaving.
- *Project Area Traffic Control* – At no time will traffic be permitted to enter the construction area without Engineer approval and sufficient time to coordinate with National Grid, as needed. Traffic accessing the Fleet Building (garage bays outside the construction limits) and fuel island will access the areas from the west. The new traffic pattern shall be enforced with signs to be installed by the Contractor. Flag persons shall also coordinate construction traffic leaving the work area, into National Grid Fleet/employee vehicle traffic areas. A traffic control plan for onsite traffic is presented in Section 3.7 below.
- *Truck Scheduling* – Queueing of trucks on City streets and in the site vicinity will not be permitted. The Contractor shall sequence trucking to limit offsite queuing (to authorized commercial or industrial locations). All trucks loaded with site materials shall exit the site using only the approved truck route identified in Section 3.11.3. This is the most appropriate route and takes into account: (1) limiting transport through residential areas; (2) use of City-mapped truck routes; (3) prohibiting queuing of trucks on City roadways before entering the site; (4) limiting total distance to major highways; and (5) overall safety in transport. Trucks are prohibited from stopping and idling in the neighborhood outside the site.
- *Implementation of Safe Work Practices* – Implementation of safe work practices will provide for additional security during remediation. Safe work practices that will contribute to overall site security include the following measures to be implemented by the Contractor:
  - Maintain temporary construction fencing and signage around all open excavation/ISS and other potentially dangerous areas.
  - Park heavy equipment in a designated area each night and remove keys.
  - Maintain an organized work area and properly store tools and equipment.
  - Conduct a daily security review and health and safety meetings.
  - Maintain covers on staging areas and associated sumps when not in use during working hours and at all times outside working hours.

The Contractor will be responsible for maintaining site security, controls, and access in connection with each work task. The work and support areas are within the secured North Albany Service Center site and shall be coordinated with National Grid to maintain uninterrupted safe access 24 hours per day, 7 days per week for routine National Grid maintenance or emergency repairs at the Fleet Building, fuel island, and other building/structures (e.g., Building #2, telecommunications tower, trailers). It is anticipated that National Grid will provide the contractor daily access to the site via the main entrance driveway along Broadway and/or Mill Street and egress via the exit at Mill Street. Use of the remaining vehicle exits (e.g., near the Genesee Street Substation

or southwest of Building #2) will not be allowed. The Contractor's onsite construction manager shall have a valid National Grid security clearance/badge to facilitate providing access to Contractor Staff.

The Contractor shall maintain a width of at least two active driving lanes between the southern construction limits and Building #2 for unimpeded access 24 hours per day, 7 days per week for onsite staff, Building #2 garage access, and emergency personnel.

The Contractor shall implement measures to prevent offsite tracking of clean or impacted materials beyond the construction limits or onto City streets. The Contractor shall provide a street sweeper to clean the driveways/ parking areas around the remediation area daily when work is ongoing where construction vehicles are entering and exiting the remediation area. Sweeping will be performed to remove dust that might otherwise accumulate from construction vehicle tires when exiting onto the public roadway from the site.

3.6 Work Task 6 – Subsurface Utility Identification and Handling

No subsurface utilities have been identified within the remedial limits. Therefore, no removal, replacement, and/or relocation of subsurface utilities is anticipated. However, several (critical) utilities have been identified near the work area, including fiber optic telecommunications lines to the east and south, natural gas to the north (north of the Fleet Building), and water and communications service to the west. Overhead electric lines (120/240 volt service) extend along utility poles located on the eastern property boundary/fence line. Refer to Design Drawings G-104 for the approximate utility locations and sizes.

The Contractor shall excavate a trench east of the Fleet Building to remove the existing sanitary sewer piping (see Design Drawing G-105) that will be replaced by others. Details regarding the removal, replacement, and protection of subsurface utilities are provided in Specification Sections 01 71 33 (Protection of Work and Property) and 02 60 05 (Removal and Disposal of Contaminated Materials). Trenches, whether excavated to expose subsurface utilities (to confirm locations, orientation, and depths before excavation/ISS [as needed]), shall be backfilled to grade as identified in Specification Section 31 00 00 (Earthwork) or as indicated by the utility owner and/or the Engineer.

All utilities, unless stated otherwise by National Grid or the Engineer, shall remain functional during the progression of this project.

If the Contractor damages existing utilities, equipment, or structures, the Contractor shall notify National Grid and the appropriate utility company/municipality and shall fully repair all damages at no additional cost to National Grid. Repairs (if necessary) shall be completed in accordance with all requirements of the utility company/ municipality and to the satisfaction of the Engineer and National Grid.

3.7 Work Task 7 – Traffic Control

The Contractor shall provide and install traffic control measures to safely detour motor vehicle and pedestrian traffic around the driveways, parking areas, Fleet Building, and fuel island affected by remedial construction, as described below. The section of driveway and parking lot south of the Fleet Building and east of the fuel island shall be closed to vehicle and pedestrian traffic during remedial construction (i.e., closed to traffic/people accessing Fleet Building garage bays 5, 6, and 7 and the east side of the fuel island within the construction limits). Fleet Building garage bays 1 through 4 (south side) and 8 through 10 (north side) and the west side of the fuel

island shall remain accessible to National Grid at all times. Pumps for the east side of the fuel island shall be closed (by National Grid) during remedial construction (e.g., with plastic covers/bags placed over the fuel nozzles). Vehicles shall be directed to the pumps on the west side of the fuel island.

The Contractor shall provide and maintain appropriate warning and guidance devices during the temporary driveway/parking lot closures for pedestrian and vehicular travel, as identified in Specification Section 01 55 26 (Maintenance and Protection of Traffic). Additionally, signage shall include reflective and/or illuminated devices to provide appropriate warning during low-light conditions. At a minimum, the Contractor shall install two reflective white aluminum road signs labelled “No Thru Traffic”, one each mounted on separate 6-foot long (minimum) orange and white, Type III reflective safety barricades (each with flashing lights), at the following locations (shown on Design Drawing G-105): (1) between the diesel and gasoline tanks; and (2) north of the diesel tank. The signs and barricades will provide a visual warning of the fenced construction area ahead and associated lane/route restriction.

The Contractor will be responsible for preparing a Traffic Control Plan in accordance with the Specification Section 01 55 26 (Maintenance and Protection of Traffic) for review by the Engineer before implementing traffic control. As outlined in Specification Section 01 55 26 (Maintenance and Protection of Traffic), the Contractor shall provide advance notice to the fire department, police department, and other emergency services, as applicable, for proposed construction operations, any modifications to existing traffic patterns, and access to onsite structures (e.g., sprinkler hookups, valves, shut-offs, fuel island pumps). The Contractor shall also coordinate closely with National Grid and the Engineer in connection with scheduling of the proposed garage bay closures and limited access to the fuel island. All traffic control work by the Contractor shall be performed in accordance with this IRM Design and the Contractor’s Traffic Control Plan.

The Contractor will also be required to provide one or more flag persons to direct construction vehicle traffic into and out of the work areas (and onto the public roadways, as needed) during remedial construction.

3.8 Work Task 8 – Excavation Operations

The following materials will be excavated as part of the IRM:

- *Asphalt Pavement* – The existing asphalt pavement in the driveway/parking lot within the proposed excavation/ISS footprint and between that footprint and the existing Fleet Building (see Design Drawing C-101) shall be saw-cut beyond the excavation limits. Following saw-cutting, the Contractor shall remove the pavement and transport it offsite for recycling. Based on logs for soil borings previously drilled through the parking lot, the pavement is approximately 3 inches thick overlying a stone, sand, or concrete base. The area of pavement to be removed encompasses approximately 3,450 sf, which equates to a total volume of approximately 36 CY.
- *Gravel Surface Cover* – Gravel surface cover shall be removed to a depth of 0.5 feet bgs within the limits of the excavation/ISS area shown on Design Drawing C-101. The gravel surface cover excavation area occupies 590 sf, resulting in a total volume of approximately 11 CY. The gravel shall be transported offsite for disposal at a landfill on National Grid’s Environmentally Approved Waste Disposal Facilities list (see Attachment 1).
- *Concrete Slab (Former MGP Holder)* – An existing approximately 1- to 1.25-foot-thick concrete slab was observed at two soil borings (VMB-1 and VMB-2) in the southern portion of the remedial limits beneath the asphalt driveway/parking area. This slab is assumed to be the base of the former 3,000,000 cf gas holder

shown on available mapping and historical aerial photographs. The slab shall be demolished and removed in connection with subsurface soil excavation in the area, from approximately 0.25 to 2.25 feet bgs, as necessary to complete subsequent excavation (pre-cut to approximately 6 feet bgs) for ISS. Based on the available information, this former holder may extend over approximately 2,616 sf of the proposed excavation area. Assuming an average concrete thickness of 1.25 feet, the total estimated volume of concrete to be generated by the slab removal is 130 CY. The concrete slab shall be broken up and transported for offsite disposal at a C&D debris landfill or non-hazardous waste landfill acceptable to National Grid. It is assumed that the former MGP holder was constructed on piles (e.g., timber, steel, concrete encased in steel) to support the structure. The Contractor shall prepare a Lifting and Rigging Plan identifying details for removing the piles, in accordance with Section 02 41 19 (Selective Demolition). Piles (if any) will be transported offsite for recycling (steel) or disposal (timber or concrete). Pile removal shall be conducted in accordance with the Lifting and Rigging Plan reviewed by the Engineer. If an obstruction is encountered along the perimeter of the ISS treatment area, the Contractor shall remove the obstruction, or ISS around the obstruction to create a continuous barrier.

- *Subsurface Soil/Debris* – Subsurface soil/debris within the ISS limits shall be removed to the lines and grades shown on Design Drawing C-101 (which corresponds to a final depth of approximately 6 feet below the original ground surface) to provide a working platform for subsequent ISS mixing and to account for the increase in soil volume (bulking) from the solidification process. The pre-ISS excavation depth may be shallower, subject to Engineer approval, if groundwater is encountered at a depth of less than 6 feet bgs. The pre-ISS subsurface soil excavation area occupies approximately 3,570 sf. The total volume of soil to be removed from this area (excluding the asphalt, gravel, and concrete referenced above) is approximately 668 CY. Cross-section locations are shown on Design Drawing C-101, and cross sections showing excavation limits in relation to subsurface geology and subsurface utility locations are provided on Design Drawings C-201 and C-202. Concrete debris (remnant foundations) below a depth of 6 feet bgs in the ISS area that cannot be downsized and is too large to be incorporated into the ISS monolith shall be removed to facilitate ISS mixing. Outside the ISS limits, subsurface soil and debris between the existing Fleet Building and the ISS area shall be removed to a depth of approximately 0.5 feet, except along the eastern and western edges where an approximately 3-foot wide trench will be excavated to a depth of approximately 6 feet. The excavation in this area is in preparation for construction of the new building slab and foundation for the building wall to be installed in this area by others. In addition, subsurface soil and debris below the sanitary sewer pipe from the Fleet Building will be removed to a depth of approximately 12 inches below the existing pipe invert in preparation for installation of a new replacement pipe by others.
- *Bulked Soil/Grout Mixture* – As indicated above, the ISS mixing process will result in an increased volume of soil from mixing grout into the soil. A 20% average bulking factor is assumed for the solidified soil. The total volume of soil to be treated via ISS is approximately 2,632 CY. Therefore, the estimated volume of surplus material resulting from bulking is 527 CY. The bulked soil/grout mixture shall be removed to elevation 14.75 to 15.6 feet NAVD 88 and graded to the south (as shown on Design Drawing C-103). Removal of this material and subsequent backfill placement will: (1) result in the top of the ISS monolith being below the frost line following site restoration; and (2) allow subsequent Fleet Building addition construction by others within clean imported material (the deepest part of the proposed building foundation will extend to an elevation of approximately 15.9 feet NAVD 88, which is approximately 3.5 inches above the top of the graded ISS monolith surface). The excavated bulked soil/grout mixture shall be direct-loaded (to the extent possible) and transported for offsite disposal as a non-hazardous waste at a landfill on National Grid's Environmentally Approved Waste Disposal Facilities List.

Prior to full-scale excavation, the Contractor shall excavate within the remedial limits to evaluate the extent of the former holder (if any). Once the extent of the former MGP holder has been identified, the concrete foundation shall be demolished and removed. The Contractor shall not excavate beyond the limits shown on the Design Drawings without Engineer approval.

3.8.1 Excavation Summary and Volumes

The excavation areas, corresponding materials to be removed, estimated volumes, and proposed disposition of the materials are summarized in Table 3-2:

Table 3-2 – Preliminary Excavation Volumes and Dispositions

Material	Preliminary Estimated Volume (CY)	Disposition
Asphalt Pavement	36	Offsite recycling
Gravel Surface Cover	11	Offsite disposal as non-hazardous waste
Concrete Slab	130	Offsite disposal as C&D debris/non-hazardous waste
Subsurface Soil	668	Offsite disposal as non-hazardous waste
Subsurface Concrete Debris	To Be Determined	Offsite disposal as C&D debris/non-hazardous waste
Bulked Soil/Grout Mixture (from ISS area)	527	Offsite disposal as non-hazardous waste

The excavation volumes shall be based on the in-situ volumes determined based on pre- and post-excavation survey as performed by the Contractor's Professional Land Surveyor licensed in the State of New York. Further information regarding handling the soil identified above (e.g., loading, offsite transportation/disposal, and onsite transfer) is provided in Section 3.11.

3.8.2 Excavation Methods/Sequence

It is anticipated that the Contractor will conduct the excavation operations using conventional construction equipment, such as excavators and/or backhoes (final selection of equipment shall be determined by the Contractor).

Any sloping/benching of excavation(s) sidewalls shall be performed in accordance with the OSHA requirements for excavations as outlined in 29 CFR part 1926 Subpart P. If the Contractor elects to use temporary bracing and/or steel sheetpile wall system for any excavation, a detailed design shall be prepared by the Contractor in accordance with applicable OSHA regulations. The design for the excavation sidewall support system selected by the Contractor shall be provided to the Engineer for review and comment, and any Engineer comments shall be adequately addressed by the Contractor prior to construction.

The Contractor shall minimize the amount of excavation area open at one time to limit the amount of stormwater that would otherwise collect in excavated areas and need to be managed. Until the excavations are backfilled, daily inspections shall be completed by trained Contractor personnel to evaluate situations that could result in possible cave-ins or failure of protective systems (e.g., sidewall sloping, sheetpile, trench boxes). Based on the inspection results, corrective actions shall be implemented by the Contractor as needed.

Equipment used to excavate and handle soil shall not be moved from the Exclusion Zone(s) without first being decontaminated, as described in Section 3.12.

3.9 Work Task 9 – Excavation Dewatering and Water Management

The Contractor shall dewater the excavations and manage water generated from the excavation dewatering and from other IRM activities (e.g., equipment decontamination) as needed. Excavation dewatering and water management shall be performed as described in the subtasks below.

3.9.1 Excavation Dewatering

The excavation below the proposed building addition footprint extends to a depth of approximately 6 feet bgs (corresponding to elevations generally between 14 and 15 feet NAVD 88), and the water table within the excavation limits (based on historical well gauging data) generally ranges from approximately 10 feet to 15 feet NAVD 88 (approximately 5 to 11 feet bgs), with one exception (December 2010) when groundwater was identified at approximately 17 feet NAVD (approximately 3 to 4 feet bgs). The proposed excavation is anticipated to be 1 to 5 feet above the water table. Water that enters the excavation is anticipated to primarily be from precipitation and runoff/overland sheet flow from adjacent areas. The water may not readily infiltrate the exposed soils due to soil type (gravel/sand/clay before ISS mixing; solidified low-permeability monolith following ISS). The Contractor shall dewater the excavation, as needed, by pumping from a low point (sump) created within the excavation. If water is to be pumped directly from the excavation, the Contractor shall take actions to reduce the amount of solids that mix with the water. These may include the following:

- Lining the sump with a non-woven geotextile and placing washed stone (NYSDOT #1 stone as specified in Specification Section 31 23 23 [Fill Materials]) in the bottom of the sump
- Inserting the end of the suction hose used for pumping into a cylindrical object (e.g., corrugated metal pipe or 55-gallon drum) that is perforated, wrapped in a non-woven geotextile, and placed in the low point of the excavation.

Surface water diversion methods shall be used to minimize the amount of runoff that enters the excavation. Surface water diversion methods may include, but are not limited to, channeling surface water flow around the excavation area by constructing berms, digging a temporary ditch outside the excavation area (e.g., within the pavement removal area), and/or installing piping to create a preferential flow path.

3.9.2 Water Management

The Contractor shall provide, mobilize, and maintain a storage tank(s) (a closed top, steel, minimum 18,000 gallon portable storage tank(s) with pop-up secondary containment) for holding water generated during the IRM. The storage tank(s) shall be placed at a location that shall not interfere with remedial operations (e.g., east of the fuel island). The Contractor will be responsible for pumping the wastewater from the excavation areas and decontamination pad into the storage tank(s).

The Contractor shall take steps to minimize the amount of water generated by the IRM. Water generated during the IRM may include, but not be limited to, the following:

- Precipitation and surface water runoff that enters the excavation.
- Precipitation that accumulates in the existing material staging area.
- Water generated by decontamination.

The Contractor shall transport the wastewater to an industrial wastewater treatment facility included in National Grid's Environmentally Approved Disposal Facilities list for offsite treatment, pending the results of characterization sampling (performed by the Contractor) and profile approval by National Grid and the treatment facility. The Contractor shall collect one or more samples to characterize the water for offsite treatment. The sample(s) shall be analyzed in accordance with the constituent list, reporting limits, and analytical methods required by the industrial wastewater treatment facility. The constituent list is anticipated to include VOCs (including BTEX compounds), SVOCs (including PAHs), and inorganic constituents (including cyanide), at a minimum. If the water is determined to be hazardous, then the Contractor shall coordinate with the National Grid-selected transportation and disposal contractor for disposal. The work is anticipated to be implemented in Spring. Therefore, the Contractor will not need to provide a means to deal with freezing conditions.

3.10 Work Task 10 – In-Situ Soil Solidification

ISS operations to be completed as part of the IRM include solidifying approximately 2,632 in-situ CY of subsurface material using admixtures (e.g., blast furnace slag, Portland cement, and water), to fixate/immobilize subsurface impacted materials. ISS shall be performed in an approximately 3,570 sf area, as shown on Design Drawing C-102. The ISS activities shall be completed from the bottom of the pre-ISS excavation (as shown on C-101) to approximately 2 feet into weathered bedrock (to the extent possible, as shown on C-102).

As described in Section 3.8.2, the Contractor shall conduct pre-ISS excavation to provide volume for material bulking during ISS activities. The proposed horizontal and vertical limits of excavation and cross section locations are shown on Design Drawing C-101. Cross sections showing ISS limits in relation to subsurface geology are provided on Design Drawings C-201 and C-202. The excess bulked materials will consist of a mixture of soil, groundwater, and grout. The bulked material volume is estimated to be 15% to 25% of the soil volume treated. The bulked material shall be contained within the ISS areas, to the extent practicable, to minimize handling activities. The Contractor shall perform ISS mixing inside the designated areas and to target elevations shown on Design Drawing C-102. The Contractor shall not solidify soil beyond the limits and depths shown on the Design Drawings without Engineer approval. The Contractor shall include its procedures for verifying ISS depths in its POP. The procedures shall meet the minimum requirements presented in the CQAP (Appendix D).

The Contractor shall complete an ISS test cell to confirm the solidified material meets the unconfined compressive strength (UCS) performance criteria identified below (via daily field pocket penetrometer and geotechnical laboratory analysis after at least 3 days of matrix curing), prior to completing full-scale ISS mixing activities. Full-scale ISS shall not be conducted until it has been demonstrated that the performance criteria have been achieved and approval to proceed has been provided by National Grid and/or the Engineer.

Proposed ISS mixing methods, the ISS mix design, and quality assurance/quality control (QA/QC) associated with ISS are detailed below.

3.10.1 ISS Installation Methods

ISS shall be accomplished by excavator bucket mixing methods. Bucket mixing involves a traditional or modified excavator bucket to manually mix fluid grout into soil. Bucket modifications may include openings cut into the underside of the steel bucket to facilitate the mixing. The treatment area shall be divided into grid cells, and pre-determined amounts of grout (based on the weight of soil in the cell) shall be delivered to the cells via hose/pipe. The soil shall be mechanically mixed with the excavator bucket (via repeated raising, lowering, and sweeping of the bucket through the cell in sequential depth increments of approximately 5 feet) until the grout is evenly distributed throughout the soil. A solidified mass (monolith) is formed as the soil-grout mixture cures. The strength starts to increase a few hours after mixing and rapidly increases during the first week.

Uniform mixing becomes more challenging with increasing depth. At the Engineer's request, the Contractor shall excavate material from various depths during the mixing process for visual assessment by the Engineer. The material shall be observed to confirm that clumps or unmixed soils are not present. The Contractor shall adjust the mixing regimen, as needed, based on the observations.

Bucket mixing is proposed because of extensive subsurface concrete and brick debris anticipated to be encountered in the treatment area and the potential for encountering piles that formerly supported the 3,000,000 cf gas holder (including timber piles that may break off during attempts to remove them during pre-excavation in preparation for ISS). The Contractor shall remove the remaining subsurface portions of the piles and provide a staging area of sufficient size to manage the removed piles and debris.

The Contractor shall remove concrete slab/foundation remains, if any are encountered below the pre-ISS excavation depth and cannot be blended into the soil (e.g., multiple large concrete blocks that cannot be downsized). The demolition and downsizing of the slab/foundation remains may be accomplished using the excavator with bucket or ram-hoe attachment. Downsized brick debris from the demolition shall be blended in with the surrounding soil during ISS mixing.

As indicated in Section 3.3.2, the grout mixing/batch plant may be located north of the Fleet Building (refer to Design Drawing G-105 for a potential location for the plant). The Contractor shall pump the grout from the grout mixing/batch plant through appropriate hose (sized accordingly for ISS production rates) to the ISS treatment cells in the remedial limits.

Part of the ISS area is close to the Fleet Building. As previously indicated, the Contractor shall protect the Fleet Building from grout splatter during ISS mixing. The Contractor shall perform geotechnical monitoring of the Fleet Building and fuel island as described in Section 4.3. The Contractor is responsible for repairing any damage to the structures to the satisfaction of and at no additional cost to National Grid.

3.10.2 ISS Mix Design

Bench-scale ISS treatability testing was conducted as part of the PDI to identify optimal mix designs for full-scale implementation. Based on the treatability study results, the proposed ISS mix to be used for this IRM is 3% Portland cement and 7% ground granulated blast furnace slag cement. If the Contractor proposes to use a mix design(s) other than that provided in the Specifications, the Contactor shall conduct a bench-scale treatability study (using site soil and potable water) to document the proposed mix design's hydraulic conductivity and UCS. Bench-scale testing for Contractor-proposed mix designs shall be conducted at no additional cost to National Grid. Any changes to the approved ISS mix shall require NYSDEC, National Grid, and Engineer approval prior to implementation. Additionally, if the Contractor conducts ISS using a mix design other than that provided in the

Specifications and does not meet the performance criteria provided in the Specifications, the site soils shall be re-solidified, removed, or otherwise addressed by the Contractor at the Contractor's expense with Engineer approval.

3.10.3 ISS Quality Assurance/Quality Control

The Contractor shall visually inspect each batch of mixed grout during ISS mixing activities, before its use in an ISS area (cell), to verify that the grout materials have been homogenously mixed. The Contractor shall also document the volume of soil being treated in each ISS cell, including the volume of treated soil as a result of overlap for each ISS cell by a percentage of the total weight of treated soil. Additionally, the Contractor shall perform consistency testing in the field, including slump test (ASTM International [ASTM] C143) and grout density, pH, temperature and viscosity (API-RP-13B), on daily basis or per batch and include the results in the Contractor's daily submittal.

The Contractor shall collect samples of representative wet ISS material for performance verification sampling in accordance with Specification Section 02 55 00 (In-Situ Soil Solidification) and the CQAP (Appendix D). The ISS performance criteria are as follows:

- UCS of the treated soil matrix must be greater than or equal to 50 pounds per square inch (psi), with no more than 20 percent of the performance samples less than 50 psi, and no samples less than 30 psi.
- The average hydraulic conductivity (permeability) of the treated soil matrix must be less than or equal to $1.0x10^{-6}$ cm/sec, with no more than 20 percent of the performance samples greater than $1.0x10^{-6}$ cm/sec, and no samples greater than $1x10^{-5}$ cm/sec.

The Contactor shall collect ISS performance verification samples using an in-situ wet sampler at a frequency of one sample for every 500 CY of treated material or at least one sample per day if less than 500 cy are mixed. Additional ISS performance verification samples may be collected if a significant visual difference in solidified material is observed. Samples shall be collected from varying depths as identified by the Engineer, representing the bottoms, middles, and tops of the ISS mixing cells. Sufficient material will be collected to fill cylinders provided by the Contractor. Prior to filling the cylinders, the sample material will be passed through a 3/8-inch opening sieve and visually inspected by the Engineer to confirm the mix appears uniform and free of untreated soil clumps. For each sample, six cylinders will be filled to provide extra volume (molds) for UCS and hydraulic conductivity testing to verify results, if needed. The Contractor shall submit samples to a qualified QA/QC laboratory for analysis as described below.

- UCS shall be determined by ASTM D1633. UCS testing shall be performed after 7 days of curing. Additional samples may be tested after a longer cure time (i.e., 28 days) if 7-day samples do not meet or exceed the minimum performance criteria of 50 psi, as determined by the Engineer.
- Hydraulic conductivity (permeability) shall be determined by ASTM D5084. Hydraulic conductivity testing shall be performed after 28 days of curing. The Contractor shall submit additional samples for hydraulic conductivity based upon ISS performance, as observed by the Engineer.

If visual assessment of the QA/QC samples indicates that mixing is not uniform, or if the QA/QC samples do not meet performance criteria, the affected portion of the ISS monolith shall be re-solidified, removed, or otherwise addressed by the Contractor at the Contractor's expense, subject to Engineer and NYSDEC approval. The Engineer will notify NYSDEC of a QA/QC sample failing performing criteria (if any), and NYSDEC approval will be

required for any plans to re-solidify, remove, or otherwise address the material affected by the failing sample. Areas that require re-solidification shall require QA/QC sampling.

Post-ISS QA/QC coring shall be performed to verify the thoroughness of ISS mixing and contact with the underlying bedrock unit in accordance with the NYSDEC's draft guidance document for post-ISS QA/QC coring (Attachment 2). The proposed treatment area occupies approximately 3,570 sf. The NYSDEC's guidance requires one boring per 5,000 sf of ISS treatment area, with at least two boreholes. Accordingly, soil borings shall be drilled at three locations in the ISS treatment area, as follows:

- A boring shall be completed in the ISS test cell, after at least 3 days of matrix curing.
- A boring shall be drilled in the area where previous soil borings identified the greatest thickness of DNAPL (near soil boring VMB-1).
- A boring shall be drilled where individual treatment cells overlap or where difficulties in the ISS process (if any) were encountered.

Per NYSDEC guidance, the first boring shall be drilled when the ISS treatment area is no more than 25% complete (which will be after the ISS test cell is completed). Drilling of the other borings shall be performed (under a second driller mobilization) within a few days of mixing at the respective location, before ISS monolith curing and full-strength development. Core samples and drilling tooling shall be visually inspected as outlined in the NYSDEC's guidance. If less than 60% of the core material is recovered from any of the coring runs, then: (1) a down-hole video camera inspection will be performed to assess the integrity of the ISS mix; or (2) a new core hole will be drilled adjacent to the previous location. National Grid will notify the NYSDEC of performance concerns (if any) based on observations (e.g., continuous layer or seam of NAPL noted within the core, NAPL coating visible on drilling tools, or visible NAPL noted in the drill wash tub) and will propose potential follow-up/corrective actions, as appropriate.

The Contractor will be responsible for tracking the ISS progression, including verifying and documenting: (1) survey horizontal and vertical control; (2) ISS horizontal limits and elevations using conventional survey, GPS survey, and/or telemetry; (3) ISS QA/QC sampling locations and elevations based on survey/telemetry; (4) number of grout batches prepared daily; (5) total daily volumes of grout prepared; (6) start and stop times for ISS mixing in each cell; (7) approximate grout flow rates to the mixing cells; (8) estimated grout usage (volume) per ISS mixing cell; and (9) approximate spoils volume per location.

Telemetry and/or GPS equipment accuracy shall be verified a minimum of twice daily (e.g., before and after completion of daily construction activities) using a previously surveyed fixed benchmark/monument.

The Contractor shall develop and maintain (and provide to the Engineer) ISS progression and as-built information to verify that ISS has been completed as indicated on the Design Drawings. The Contractor shall prepare a figure identifying the final surveyed limits of the overall ISS area, limits of individual mixing cells, locations and elevations of obstructions, QA/QC sampling locations, and elevations following completion of ISS mixing and QA/QC sampling activities. The Contractor shall provide the figure to the Engineer to include in the CCR to be prepared by the Engineer.

3.11 Work Task 11 – Material Handling and Disposal

Materials shall be recycled (where appropriate) or disposed offsite in a manner that minimizes the potential for inadvertent releases to the environment, unsafe conditions for site personnel, and delays or complications in project implementation.

3.11.1 Material Description

Pre-excavation in-situ soil waste characterization sampling will be performed by the Contractor as part of the initial pre-construction activities (as described in Section 3.2 above) to support the direct-loading of impacted excavated materials destined for offsite disposal and pre-approval of soil for disposal at appropriate offsite facilities. The Contractor shall recycle, reuse, or dispose of materials generated as part of the IRM, as described below:

- *Materials for Recycling/Reuse:*
  - Asphalt pavement removed from the excavation/ISS area shall be broken up, appropriately downsized, and transported for offsite recycling.
  - Metal debris removed from the excavation/ISS area (abandoned steel/iron conduit or pipes, if any) shall be stockpiled separately and transported for offsite reclamation of the metal.
  - Sand below the material staging area or decontamination area may be reused onsite as fill (without sampling), provided there are no punctures in the liners that were above and subject to NYSDEC approval.
- *Materials for Offsite Disposal at a Non-Hazardous Waste Landfill:*
  - Gravel surface cover, subbase material, bulked ISS material removed from ISS areas, accumulated silt collected by erosion and sedimentation control measures, and used PPE shall be transported to a landfill for disposal as a non-hazardous waste.
  - Subsurface soil from pre-ISS excavation limits shall be transported to a landfill for disposal. As identified above, the Contractor shall collect soil samples and submit the sample(s) to an NYSDOH-certified laboratory for analysis to pre-characterize the material for direct-loading.
- *Materials for Offsite Disposal at a C&D Debris Landfill:*
  - Concrete and brick debris removed from the excavation/ISS area (material that cannot be downsized and incorporated in the ISS monolith) shall be transported for offsite disposal at a C&D debris landfill or non-hazardous waste landfill.

Estimated volumes of the materials identified above are provided in Table 3-2. The Contractor's proposed waste disposal facilities shall be from National Grid's Environmentally Approved Waste Disposal Facilities list (see Attachment 1).

3.11.2 Loading

The Contractor shall direct-load excavated materials to the extent possible to minimize staging and to double-handling of the materials. Excavated material that requires dewatering to remove free liquids or further characterization shall be stockpiled in the lined material staging area (to be constructed southeast of the proposed

Fleet Building addition or in the northwestern portion of the site) or within the actual excavation pit prior to offsite transportation and disposal.

All dump trailers, dump truck boxes, and roll-off waste containers (collectively referred to as “waste transport containers”) used to transport impacted materials for offsite treatment/disposal shall be lined with polyethylene sheeting (covering the inside of the entire container) before waste loading. The waste transport containers shall also be covered with a tarp upon loading and before departing the site. In addition, all transport waste containers shall have a watertight tailgate secured via turnbuckles. The Contractor shall visually inspect the waste transportation trucks (e.g., box sidewall, box tailgate, tires) and decontaminate each truck as needed before leaving the site to prevent offsite tracking of clean or impacted materials onto City streets.

The waste loading area shall be in the Contamination Reduction Zone adjacent to the Exclusion Zone. The Contractor shall place 10-mil (minimum thickness) polyethylene sheeting on the ground surface in the waste loading area to protect the area from incidental spillage during loading. The Contractor shall use conventional equipment (e.g., excavator, loader) to load materials into the waste transport containers. The Contractor shall exercise care during loading to prevent spillage of impacted materials onto the outsides of the waste transport containers. The Contractor’s personnel (not the truck driver) shall reposition tarp bars over the loads, and the Contractor or the driver shall cover the waste transport containers with a solid tarp (constructed of vinyl or reinforced polyethylene) following loading and before departing the site. The tarps shall extend over the entire load and shall be secured to resist wind forces at highway speeds. The drivers shall not be permitted to walk over the waste material. The use of mesh covers is prohibited.

3.11.3 Transportation/Disposal

The Contractor shall arrange offsite transportation of materials and wastes generated by the remedial project. The Contractor will be responsible for placarding of waste containers/trucks, and for transportation to the designated facility by a licensed hauler in accordance with applicable local, state, and federal regulations. Each waste transporter shall have a valid waste transporter permit (6 NYCRR Part 364). Wastes shall be transported under a non-hazardous waste manifest or bill of lading, as appropriate. If hazardous waste is encountered and removed during the IRM (although not anticipated), the waste shall be transported under a hazardous waste manifest or a conditionally exempt MGP remediation manifest for proper offsite treatment/disposal.

The Contractor will be responsible for preparing waste profiles for review by the Engineer and signature by National Grid. The Contractor will also be responsible for preparing manifests/bills of lading and providing them to the Engineer to sign on behalf of National Grid (under agreement with National Grid). The manifests/bills of lading shall list National Grid as the waste generator, and copies of completed manifests/bills of lading, which shall be maintained in the project office trailer, shall be provided to the Engineer.

Truck routes for arrival at and departure from the site (for travel via Interstate I-90) shall be as follows:

- *Arrival:* From Interstate I-90E, take Exit 6 for Henry Johnson Boulevard 0.7 miles. Turn right onto Northern Boulevard for 0.2 miles and then turn right onto Van Renssalaer Boulevard for approximately 0.3 miles. Turn left onto North 1st Street for approximately 0.3 miles and then turn right onto Broadway for approximately 0.1 miles. The site will be on your right (1125 Broadway).
- *Departure:* From the site, proceed west along Mill Street approximately 0.1 mile then north along Broadway for approximately 0.2 mile and turn left onto North 1st Street for approximately 0.3 miles. Then turn right onto

Van Renssalaer Boulevard for approximately 0.3 mile and turn left onto Northern Boulevard for approximately 0.2 miles and then turn left on I-90W.

The Contractor shall show the proposed commercial or industrial locations to be used for queuing trucks in a Traffic Control Plan submittal to be prepared as outlined in Specification Section 01 55 26 (Maintenance and Protection of Traffic) Section 1.02(A.)(1.). Potential facilities for offsite disposal of wastes generated by the IRM are presented in Attachment 1.

3.12 Work Task 12 – Decontamination

The Contractor will be responsible for conducting decontamination activities, as necessary, for all personnel and equipment that come in contact with impacted materials at the site. The Contractor shall decontaminate equipment and personnel in the respective decontamination areas to be constructed as described in Section 3.3. Equipment and materials that come in contact with impacted soil (e.g., excavation equipment, trucks, hand tools) shall be decontaminated before handling clean materials and before demobilization from the site. In addition, equipment shall be decontaminated if used to handle material exhibiting a toxicity characteristic before further handling of non-hazardous soil.

The Contractor shall select the means and methods (as part of the POP) for equipment decontamination. Specific equipment cleaning procedures shall be required, including the following (at a minimum):

- Soil handling equipment (e.g., excavators, loaders) that comes into contact with impacted soil will be cleaned in the equipment decontamination area before entering non-work areas, handling “clean” materials (e.g., backfill), or leaving the site. Equipment shall be cleaned using a high-pressure water spray and/or steam cleaning to remove bulk waste material that could potentially contain COCs. Equipment shall be rinsed and visually inspected following cleaning. If the visual inspection indicates that waste materials remain, the equipment shall be re-cleaned and re-inspected.
- Each waste transport vehicle shall pass through an equipment decontamination/tire wash area before departing the work area. Accumulations of soil on the vehicle tires or other exterior surfaces shall be removed using a high-pressure water and/or steam spray in the equipment decontamination area. In addition, manual cleaning methods, such as brushing and/or wiping, shall be used as needed. The vehicles shall be visually inspected before leaving the site, and additional cleaning shall be performed as needed until no accumulated material is observed.
- Liquid materials, such as decontamination water (and other residual material collected during equipment decontamination) shall be containerized in NYSDOT-approved 55-gallon drums or other appropriate containers and transported to an industrial wastewater treatment facility for treatment in accordance with Section 3.9.2. Interim holding tanks can be proposed by the Contractor, but shall be decontaminated after final use to the satisfaction of the Engineer.
- Solids and other waste materials generated by equipment decontamination shall also be containerized for offsite disposal. The residual solid wastes may be included with the offsite shipments of impacted soil.
- The Contractor and the Engineer shall visually inspect equipment and materials (including excavation equipment, loaders, trucks, tanks, pumps, hand tools, and other items) following final equipment cleaning. If the visual inspection indicates that waste materials remain, the Contractor shall re-clean the equipment, and an additional inspection shall be performed by the Contractor and the Engineer. The Contractor shall decontaminate equipment until no visible soil, debris, or stains are present on the equipment surfaces (to the

satisfaction of the Engineer). Unless otherwise directed by the Engineer, any equipment to be taken offsite by the Contractor shall be subject to a visual review by the Engineer and cleaning (or additional cleaning, as necessary, at no additional cost to National Grid) at the decontamination area.

3.13 Work Task 13 – Backfilling

Backfilling procedures and backfill sources are presented in the following subtasks.

3.13.1 Backfilling Procedures

The Contractor may be permitted to begin backfilling a portion of an excavation where the target ISS depth has been reached and ISS performance verification sampling has confirmed that additional ISS is not required, while continuing to excavate/solidify impacted soil from another section of the excavation/ISS area. The Contractor shall provide bills of lading to the Engineer documenting that each load of fill delivered to the site is from the approved source (see Section 3.13.2).

Before placing backfill, the Contractor shall remove standing water (precipitation or surface water runoff) and groundwater, if any, that accumulates within the excavation/ISS areas. The standing water shall be transferred to a portable storage tank(s) for characterization and subsequent management as described in Section 3.9.2. The Contractor shall install a permeable non-woven geotextile or orange construction fencing (demarcation layer) on the top of ISS surface, the two foundation trench excavations within 8 feet of the existing building, and the bottom of the utility trench for new sanitary sewer piping from the Fleet Building, providing a clear visual marker between the ISS monolith/trench bottoms and the clean imported fill material placed atop. The geotextile will be placed with appropriate edge and end seam overlaps over the entire sub-grade surface.

The Contractor shall place, grade, and compact fill materials in lifts no more than 12 inches thick. The imported clean backfill shall meet commercial/industrial use SCOs and consist of general fill (varying thickness) below 6 inches of compacted stone (#1 & 2 blend) within the remedial limits.

Requirements for the demarcation layer and installation are presented in Specification Section 31 05 19.13 (Geotextiles for Earthwork). If the Contractor uses orange construction fencing, it shall be installed using techniques similar to those employed in the installation of the geotextile material and to the satisfaction of the Engineer. The Contractor shall also survey the locations and elevations of the demarcation layer.

The Contractor shall arrange for compaction testing of the fill materials by an independent testing laboratory. The Contractor shall perform in-place density tests at a frequency of one test per lift of backfill placed or one passing test per 2,500 sf of subgrade or 100 CY of soil fill whichever results in the greatest frequency to document that compaction requirements are being achieved. A minimum of one test per lift shall be completed in the remedial limits. All backfill shall be compacted to a minimum of 95% of maximum dry unit weight as determined by Modified Proctor testing following ASTM D1557. The testing laboratory shall test soils in accordance with ASTM D6938 (nuclear gauge method) with proctors for each soil type.

3.13.2 Backfill Sources

At least 3 weeks before bringing imported backfill to the site, the Contractor shall provide the Engineer with the following information for each fill source: (1) the name and location of the fill source; (2) identification of any state or local approvals as a fill source; (3) a brief history of the property that is the source of the fill; and (4) description

of the areas where the fill material is proposed for use (e.g., material staging area, excavation/trench backfill, surface restoration, etc.). At least 2 weeks before bringing imported backfill to the site, the Contractor shall provide the Engineer with the NYSDEC's Request to Import/Reuse Fill or Soil form (latest version from NYSDEC's website: Request To Import or Reuse Soil) for each type of backfill material needed for the project (general fill, sand, Type 2 crushed gravel, and Type 1 & 2 blend crushed stone), with the following provided as attachments to the form:

- Sieve analysis reports and moisture/density test results for the proposed imported fill materials as described in Specification Section 31 23 23 (Fill Materials).
- Laboratory analytical results for samples collected by the Contractor to assess concentrations of chemical constituents in the backfill, unless the fill meets the NYSDEC's sampling exemption. Gravel, rock, or stone consisting of virgin material from a permitted mine or quarry, will be exempt from pre-characterization sampling requirements provided it contains less than 10% (by weight) material that would pass through a size 100 sieve. For backfill that does not meet the NYSDEC's sampling exemption, the Contractor shall collect samples for each backfill type and source in general accordance with the protocols outlined in Section 5.4(e)10 of DER-10 and Appendix G of the NYSDEC document titled "Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs" (NYSDEC 2023), with the modification that the number of discrete samples collected for analysis of VOCs will be the same as the number of composite samples collected for analysis of SVOCs, pesticides, PCBs, biphenyls, inorganic constituents, and PFAS. The number of samples will be a function of the volume of each type/source of fill to be used (one sample for less than 300 CY, two samples for 300 CY to 1,000 CY, and three samples for 1,000 to 2,000 CY). The Contractor shall submit the samples to an NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory at the Contractor's expense. The analyte list shall be consistent with that included in Appendix 5 of DER-10 and in the above-referenced NYSDEC PFAS document.

Backfill brought onsite by the Contractor from an offsite source must meet the SCOs set forth in Appendix 5 of DER-10 for commercial/industrial use. The Contractor shall identify (and test at the Contractor's expense) alternate sources of backfill if unacceptable sample results are obtained for the Contractor's proposed fill.

Backfilling with imported material meeting the commercial/industrial use SCOs will create a clean zone allowing future ground intrusive work above the demarcation layer (e.g., Fleet Building foundation construction, sanitary sewer installation/repair) to be performed by a general contractor without OSHA Hazardous Waste Operations and Emergency Response training. Community air monitoring will not be required for such future work in that clean zone. In addition, soil excavated from within the clean zone may be reused as fill onsite without further sampling (unless it is within 2 feet of surrounding soils that were not excavated as part of the IRM), and equipment used for excavation within the clean backfill will not require decontamination.

Backfilling shall be completed and confirmed by the Contractor's surveyor using the grade control survey points. The Contractor will be responsible for obtaining documentation from the backfill source for the weight of each backfill load (weight tickets) for invoice payment purposes. The Contractor shall provide the Engineer with weight tickets for each load of imported backfill upon delivery to the site.

3.14 Work Task 14 – Restoration/Demobilization

At the conclusion of the IRM, the Contractor shall conduct restoration/demobilization activities, including (but not limited to) the following:

- Placing and compacting 6-inches of crushed stone (#1 & 2 blend) to match surrounding grade, in accordance with Section 31 23 23 (Fill Materials) and as shown on Design Drawing C-104.
- Dismantle the work, grout mixing/batch plant, staging, and equipment and personnel decontamination areas.
- Remove specified erosion and sediment control measures when the IRM is completed.
- Transport residual wastes (e.g., disposable equipment, PPE, sampling equipment, cleaning residuals, and sacrificial soil and liners from the staging, grout mixing/batch plant, and equipment decontamination areas) remaining at the completion of the IRM for offsite disposal in accordance with applicable rules and regulations. The Contractor shall perform characterization sampling of the residual wastes (as needed) at no additional expense to National Grid. The Contractor shall submit characterization samples to a NYSDOH ELAP-certified laboratory for analysis.
- Decontaminate equipment and materials (including excavation/ISS equipment, trucks, hand tools, and other items) that came in contact with impacted soil before demobilization from the site, as outlined in Section 3.12.
- Remove all Contractor equipment, materials, and personnel from the site.
- Perform a post-remediation structural survey by the same third-party engineering firm that conducted the pre-remediation structural survey. The post-remediation structural survey shall be consistent with the scope of the pre-remediation structural survey and include, but not be limited to, visual inspection and photographic documentation of the Fleet Building and fuel island, in accordance with Specification Section 02 21 19 (Structural Surveys). A post-remediation structural survey report shall be submitted to National Grid and the Engineer within 2 weeks following the inspection. Note that any damage to existing structures (caused by negligent activities by the Contractor) shall be repaired by the Contractor at no additional cost to National Grid.
- Prepare and provide required final field records to the Engineer. The Contractor shall maintain and provide field records to the Engineer during the remedial project at milestones to be determined in the field and agreed upon by the Engineer.

The remedial equipment and materials shall be demobilized following completion of the IRM.

4 Description of Site Controls

The Contractor shall employ appropriate measures during the IRM implementation to limit the generation of noise, vapors/odors, and dust to within acceptable levels. Air monitoring and dust, vapor, and/or odor control shall be performed for any construction work tasks outlined in Section 3 that have the potential to generate dust, vapor, or odors. The magnitude and extent of vapor/odor and dust control measures required shall be based on the results of air monitoring performed by the Contractor's third-party air monitoring technician. The main objectives of the air monitoring and response actions are to protect the health and safety of onsite workers and the surrounding community and to address potential nuisance odors. Details of the air monitoring program are presented in the site-specific CAMP (Appendix B), HASP (Appendix C), and site-specific HASP to be prepared by the Contractor. Minimum Contractor requirements for noise, vapors/odors, and dust suppression are presented below, followed by an overview of the proposed air monitoring and geotechnical monitoring programs.

4.1 Noise, Dust, Vapor, and Odor Suppression

The Contractor shall employ adequate measures during the IRM implementation to maintain noise levels produced by construction equipment to safe and tolerable limits, as set forth by OSHA and any applicable New York State and local code ordinances (including City of Albany Code, Part 2, General Legislation, Chapter 255, Article V). All construction equipment posing a potential noise nuisance shall be outfitted with noise-muffling devices by the Contractor at no additional cost to National Grid.

The Contractor shall employ adequate measures during the IRM implementation to minimize fugitive dust, in conformance with the Contractor's HASP (for the work zone) and the perimeter action levels for particulates with a nominal diameter less than 10 microns specified in the CAMP (Appendix B), or if site personnel observe visible dust related to site work that is acknowledged by National Grid/Engineer. Contractor methods used to control dust during IRM may include, but shall not be limited to, the following:

- Apply a water spray to suppress dust originating from soil excavation or soil handling.
- Minimize the number and size of excavation/ISS areas open at one time.
- Cover the soil and materials in the staging area(s) using polyethylene sheeting (minimum 10-mil thickness) to prevent wind-blown particulate transport and deposition.
- Use a street sweeper (with water spray) to clean the driveways/parking areas around the remediation area, if any dust is tracked into these areas as vehicles leave the decontamination/tire wash area.
- Limit travel speed (i.e., to 5 miles per hour) and apply water to gravel haul roads, if used.

If deemed necessary by the Engineer, the Contractor shall also implement vapor/odor control measures during the IRM. Conditions that may require vapor/odor control measures include: (1) site personnel detect a significant odor that is acknowledged by the Engineer; (2) the public or onsite National Grid staff complains of an odor; (3) perimeter VOC action levels as specified in the CAMP (Appendix B) are exceeded; or (4) work area VOC action levels as specified in the Contractor's HASP are exceeded. Contractor methods used to control odors/vapors during the IRM may include, but shall not be limited to, applying a BioSolve® solution (or equivalent; see product information attached to the CAMP) and/or long-term vapor-suppressant foam.

The Contractor shall have a supply of BioSolve® solution (or approved equivalent) and long-term vapor-suppressant foam available for immediate use during the IRM. Nuisance odors may be generated during ISS from

mixing of NAPL-impacted soil. BioSolve® solution and vapor-suppressant foam, which use encapsulation and chemical masking, shall be applied to suppress vapors/odors (if encountered) originating from soil containing NAPL. The Contractor shall apply the BioSolve® solution or vapor-suppressant foam with a pressure washer, and a Contractor worker shall be available for dedicated application of BioSolve® solution (as needed).

4.2 Air Monitoring

Details of the air monitoring to be performed by the Contractor's independent third-party air monitoring technician during the IRM, including the monitoring equipment and procedures to be used, proposed action levels, and reporting requirements, are presented in the CAMP. Work area air monitoring to be performed by the Contractor shall be detailed in the Contractor's HASP. Minimum requirements for the Contractor's site-specific HASP are presented in Specification Sections 01 11 00 (Summary of Work) and 01 35 29 (Contractor's HASP). Work area air monitoring to be performed by the Contractor and the perimeter/community air monitoring to be performed by the Contractor's independent third-party air monitoring technician are summarized briefly below.

Work Area/Breathing Zone Air Monitoring

The Contractor shall implement a work area/breathing zone air monitoring program using direct-reading instruments that measure total organic vapor and particulate concentrations. The Contractor shall perform the monitoring during all intrusive and/or potential dust-generating activities (e.g., erosion and sediment control measures installation, excavation, ISS, backfilling, grading, and material handling). Results of the monitoring shall be used to identify engineering controls. Further monitoring shall be performed after implementation of engineering controls, and the monitoring results may be used to identify the level of PPE required, if needed. The results shall also document potential full-shift exposures for Contractor personnel and potential acute exposure conditions.

Perimeter/Community Air Monitoring

The perimeter/community air monitoring program shall be implemented by an independent third party retained by the Contractor ("air monitoring technician") in accordance with the CAMP (Appendix B). The program shall use direct-reading instruments (mounted on tripods or other structure) to measure total organic vapor and particulate levels at four designated air monitoring sample stations. The air monitoring sample station locations shall be determined daily (at the start of each workday and midway through the workday) based on wind direction, as follows:

- Station "UP" shall be positioned to monitor conditions upwind of site activities.
- Stations "DN1" and "DN2" shall be positioned to monitor conditions downwind of site activities.
- Station "FLT" shall be positioned to monitor conditions adjacent to the Fleet Building (between Garage Bays 6 and 7), throughout the IRM, regardless of wind direction.

Recognizing that there will be wind gusts from time to time that differ from the prevailing wind direction, Stations "UP", "DN1", and "DN2", shall be positioned to account for variability in wind direction. Monitoring data from the downwind stations shall be used to make field adjustments (if needed) to be protective of offsite receptors. A spare set of air monitoring equipment shall also be provided in case of equipment failure at the above-identified monitoring stations.

The perimeter/community air monitoring shall be performed during all intrusive and/or potential dust-generating activities and shall provide an early warning system so that engineering controls can be placed to prevent community exposure to emissions from project activities. The air monitoring technician shall routinely check the air monitoring sample stations to confirm that the equipment is functioning properly and to record manual hourly air monitoring readings. The air monitoring technician shall also document activities being performed while air monitoring is ongoing.

The direct-reading instruments at the air monitoring sample stations shall continuously monitor air quality and compute 15-minute running average concentrations (calculated for continuous 15-minute increments – e.g., 08:00 to 08:15, 08:15 to 08:30) during site activities. Data loggers shall record the instrument readings at pre-set intervals (e.g., 1-minute intervals and running 15-minute time-weighted averages [TWAs]). Visible and audible alarms shall sound if an action level is exceeded. In addition, wireless telemetry shall relay an alarm condition (i.e., for an alert or action level exceedance) to the cell phone of the designated representatives for the Contractor and the Engineer.

The air monitoring technician shall submit a weekly CAMP report (via e-mail) to the NYSDEC, NYSDOH, and National Grid. The weekly CAMP report shall include, but not be limited to, the following:

- A brief memorandum summarizing the air monitoring work activities and results for the monitoring period, including an in-text table that presents a “dashboard” view of the organic vapor and particulate concentrations measured at each station during the period. The memorandum shall be supported by two attachments: (1) Attachment 1 showing air monitoring station daily locations; and (2) Attachment 2 presenting graphs of the 15-minute TWA VOC and particulate concentrations recorded at each of the four sampling stations (one graph for each station showing the weekly results relative to action levels).
- A compressed data file that contains the raw data files from the individual monitors and meteorological data from the weather station (available upon request).
- A discussion of any exceedance of a perimeter air monitoring action level for total organic vapors or particulates for a 15-minute TWA, including the cause of the exceedance, and corrective measures implemented (or to be implemented) as a result of the exceedance.

In the event of an air monitoring action level exceedance for either total organic vapors or particulates, the air monitoring technician shall notify the Engineer (in person) once the exceedance is observed (in real time). The Engineer will notify National Grid and NYSDEC (via telephone). Within 24 hours of the exceedance, the Engineer will send a follow-up e-mail to NYSDEC, NYSDOH, National Grid, and the Contractor that summarizes the data, the cause of the exceedance, and corrective measures implemented (or to be implemented) in response to the exceedance.

A portion of the remediation will be performed within 20 feet of an existing structure (Fleet Building). Accordingly, special requirements include a dedicated air monitoring station adjacent to the Fleet Building (centered between Garage Bays 6 and 7, which is midway between the eastern and western ISS limits). Monitoring air within the Fleet Building is not proposed, due to the use of potentially VOC containing products, oil, and/or gasoline/diesel during maintenance and repair of vehicles.

If VOC concentrations at the air monitoring station adjacent to the Fleet Building (or at the downwind monitoring station adjacent to Building 2 when the wind direction is from the north) are greater than 1 ppm above background (15-minute average), then work will cease, and corrective actions will be taken to limit VOC vapors. Work will resume provided that VOC concentrations at these monitoring stations are less than 1 ppm above background. Similarly, if particulate concentrations at these monitoring stations are greater than 100 micrograms per cubic

meter (µg/m^3) above background (15-minute average), then work will cease, and corrective actions will be taken to limit dust. Work will resume provided that particulate concentrations at the monitoring stations closest to the buildings are less than 150 µg/m^3 above background. The action levels for monitoring stations adjacent to the buildings are lower than those for other downwind air monitoring stations. Refer to the CAMP and Specification Section 01 35 49 (Community Air Monitoring Plan) for each of the alert and action levels to be used for the IRM and for actions to be taken if these levels are exceeded.

Chemical-specific air monitoring shall also be conducted by the air monitoring technician if perimeter action levels for VOCs are regularly exceeded. If perimeter action levels are regularly exceeded, an additional evaluation of work activities and site conditions shall be conducted to identify why these exceedances are being observed and actions to be taken to address this exposure pathway. Such chemical-specific air monitoring may involve use of colorimetric detector tubes (e.g., Draeger tubes) or collection of air samples via Summa® canisters and analysis for VOCs by a NYSDOH ELAP-certified laboratory using United States Environmental Protection Agency (USEPA) Compendium Method TO-15 or equivalent. Results for the chemical-specific air samples shall be reported to NYSDEC, NYSDOH, and National Grid along with the weekly air monitoring data submittal presented above.

4.3 Geotechnical Monitoring

The Contractor will be responsible for conducting geotechnical monitoring before, during, and after completing the IRM as indicated below and in accordance with Specification Section 31 09 13 (Geotechnical Instrumentation and Monitoring). The Contractor shall install survey elevation monitoring points and vibration monitors before starting excavation/ISS activities, as follows (refer to Design Drawing C-102 for geotechnical monitoring locations):

- Survey elevation monitoring points (settlement monitoring points) shall be installed at four locations: (1) three locations along the south side of the Fleet Building; and (2) one at the northeast corner of the fuel island.
- Vibration monitors shall be installed at two locations on the Fleet Building adjacent to the construction limits and one location (to be selected by National Grid in the field) on the ground surface over the 12-inch diameter, 99 psi natural gas main located north of the Fleet Building (i.e., the gas main closest to the building).

The survey elevation monitoring points and vibration monitors shall be installed and monitored in accordance with Specification Section 31 09 13 (Geotechnical Instrumentation and Monitoring). The Contractor shall conduct additional geotechnical monitoring (i.e., visual inspections) around the perimeter of the ISS area during mixing and curing at a minimum of once per day, as outlined in the Specifications and CQAP.

The Contractor shall perform corrective actions as needed in response to readings and measurements taken as described in the Specification Section 31 09 13 (Geotechnical Instrumentation and Monitoring).

5 Regulatory and Permitting Requirements

The Contractor will be responsible for obtaining any pertinent and applicable local, state, or federal permits associated with the implementing the IRM outlined in this IRM Design. These permits may include, but are not necessarily limited to, those related to waste transportation, zoning regulations, and building permits. All appropriate permits must be maintained, and a copy must be at the site throughout the duration of the project. No street opening or right-of-entry permits are anticipated to be needed for the IRM, as all work is well within National Grid's property.

6 Green Remediation and Sustainability Efforts

This section has been prepared based on the NYSDEC's *DER-31 Green Remediation* (NYSDEC 2011). The objective of this section is to identify potential strategies that may be implemented by the Contractor to promote sustainable technologies and practices during implementation of the IRM. Potential strategies that may be implemented to promote environmental stewardship are presented in Table 6.1 below. The Contractor shall identify additional sustainable approaches (if any) proposed to be implemented at the site.

Table 6.1 – Green Remediation Strategy and Benefits

Potential Green Remediation Strategy	Potential Environmental Benefit
Use of Renewable Energy – National Grid provides electric service at the site and offers a choice of power generators, including "GreenUp" providers that generate power via renewable sources.	Renewable power sources produce far less greenhouse gas (GHG) emissions than electricity generated from fossil fuel-burning power stations.
Clean Diesel Fuels and Technology – To the extent practicable, diesel-powered heavy equipment used onsite will meet USEPA exhaust emission standards, and use of the newer (Tier 3 and 4) Standards for non-road diesel engines will be strongly encouraged.	The use of clean diesel technology will reduce the amount of particulate matter and nitrogen oxide produced during heavy equipment operation compared to conventional diesel-burning engines.
Heavy Equipment Idle Time Reduction – Engine warm-up of heavy equipment will be kept to the manufacturer's recommendations for each machine, and idling time will be minimized to the extent practicable.	Limiting the amount of time that equipment is allowed to idle helps to control the amount of fuel burned and the amount of GHG emitted during fuel burning.
Equipment Maintenance – A preventative maintenance program to confirm that equipment remains in an effective operating condition will be performed.	A proactive maintenance schedule helps confirm that equipment is running efficiently. Inefficiently operating equipment can be responsible for increased fuel consumption and GHG emissions.
Onsite Soil Treatment and Containment – Soil containing DNAPL will be treated onsite via ISS.	The onsite treatment and containment of impacted soil minimizes the number of loads of soil that would otherwise be transported for offsite disposal at a landfill, which preserves valuable landfill space and lessens truck traffic, fuel consumption, and GHG emissions. This also eliminates the need for a sheetpile wall associated with deep excavation (26 feet) and limits the amount of excavation dewatering that would be needed, thereby reducing the amount of natural resources consumed.
Recycling of Asphalt Materials – Excavated and milled asphalt will be transported offsite for recycling.	Recycling asphalt materials reduces the need for asphalt batch plant facilities to import non-renewable material from external sources and eliminates the need for transport and disposal of the asphalt material to an offsite disposal facility.
Salvage of Steel and Scrap Metals – Steel and scrap metal deemed acceptable for salvage will be separated (if practical) and segregated into various types for shipment to salvage/scrap yards.	The salvage of steel and scrap metals helps preserve natural resources by using existing material rather than creating new. Additionally, salvaging eliminates the need to dispose the material in a landfill, allowing landfill space for other material.

Potential Green Remediation Strategy	Potential Environmental Benefit
Electronic Files – As part of the IRM, practices will be employed to reduce paper. The reduction of paper will be accomplished through the use of a SharePoint site to communicate Contractor submittals and minimize the need for hard copy files.	Preservation of the use of paper minimizes waste and use of natural resources, such as trees.

7 Construction Completion Report

After the IRM activities described in Section 3 are completed, the Engineer will prepare a CCR in accordance with Section 5.8 or DER-10. The CCR will be submitted to the NYSDEC within approximately 90 days after construction is completed. The report will be organized as outlined in Section 5.8(b) of DER-10 and be prepared in a format based on the available template on the NYSDEC's website. The CCR will generally present, but not be limited to, relevant background information, a step-by-step summary description of the activities undertaken to construct and implement the remedial action, a description of any issues encountered during construction and the resolution, changes made to the design and reasons why the changes were made, quantities and concentrations of constituents removed or treated, an identification of the performance standards achieved by the remedy, a chronology of events, and a certification by a Professional Engineer licensed to practice in New York State. The report will be supported by tables, drawings, and attachments, such as the following:

- ISS mixing cell summary table identifying the following for each ISS cell: the cell ID, mixing date, top and bottom elevations, treated soil volume and mass, volumes/weights of grout reagents mixed into each cell, QA/QC sampling locations/intervals, and UCS and permeability test results.
- Waste shipment summary table identifying manifest numbers, weights, and disposal locations for each waste load transported for offsite treatment and disposal.
- Data tables presenting laboratory analytical results for waste characterization samples and imported fill material samples.
- A summary sheet identifying quantities of materials recycled, treated, and disposed, and corresponding facility locations (as applicable).
- "As-built" drawings bearing the stamp and signature of a Professional Engineer licensed to practice in New York State and showing:
  - Surveyed excavation/ISS limits and elevations, demarcation layer locations and elevations, and geotechnical verification soil sampling locations/elevations.
  - Permanent survey markers for horizontal and vertical control for site management.
- Soil boring logs for core holes completed to confirm the integrity of the ISS mixing.
- Fully executed manifests/certificates of disposal documenting the offsite transportation and treatment/disposal of waste materials generated as part of the IRM.
- Copies of weekly field reports and air monitoring logs documenting results of air monitoring performed in accordance with the CAMP.
- Laboratory analytical data reports and data validation reports (as needed).
- Key project documents summarizing previous investigation and IRM.
- Correspondence with NYSDEC and others documenting changes to the remedial construction and other information, as deemed relevant to the IRM.

The CCR will ultimately be an attachment to the Final Engineering Report for the site, which will be prepared after the final remedy is designed and implemented.

8 Schedule

This section presents the preliminary project schedule for the IRM implementation. A summary of the preliminary project schedule is presented in Table 8.1 below.

Table 8.1 – Preliminary Project Schedule

Activity	Milestone Completion Date
Contractor Bidding and Procurement	March-April 2025
NYSDEC Approval of IRM Design	April 2025
Pre-Mobilization Meeting	
Contractor Preparation of Plans and Submittals	April-May 2025
Initial Contractor Mobilization / Initial Site Preparation	
Remedial Construction	May-June 2025
Restoration / Demobilization	July 2025
CCR Preparation	October 2025

National Grid anticipates that excavation, waste transportation and disposal, ISS, and backfilling activities will take at approximately two to three months to complete. The schedule for completing the IRM could be impacted by NYSDEC review time frames, unexpected field conditions requiring additional excavation or material handling, and/or weather conditions. National Grid will notify the NYSDEC regarding delays that impact the schedule for completing the IRM.

9 References

Arcadis. 2016. Feasibility Study Report, North Albany Former Manufactured Gas Plant Site. January 2016.

Arcadis. 2017. Remedial Design Work Plan, North Albany Former Manufactured Gas Plant Site, NYSDEC Site Number: 4-01-040. February 2017.

Arcadis. 2018. Pre-Design Investigation Summary Report, North Albany Former Manufactured Gas Plant Site, NYSDEC Site No. 4-01-040. March 2018.

Arcadis. 2024a. Vehicle Maintenance Building Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan. North Albany Manufactured Gas Plant Site, NYSDEC Site Number: 4-01-040. October 17, 2024.

Arcadis. 2024b. Response to NYSDEC Conditions: Conceptual Remedial Work Plan for Vehicle Maintenance Building Addition, National Grid, North Albany Former MGP. E-mail Correspondence to NYSDEC dated December 12, 2024.

NMPC, 1994. Initial Submittal, North Albany (Broadway Avenue) MGP Site. January 1994.

NYSDEC. 2003. Order on Consent (Index No. A4-0473-000) between Niagara Mohawk and NYSDEC, signed by NYSDEC on November 7, 2003.

NYSDEC. 2004. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1). Reissued June 1998 and addended April 2000 and June 2004.

NYSDEC. 2006. Environmental Remediation Programs. NYSDEC, Division of Environmental Remediation, 6 NYCRR Part 375. December 14, 2006.

NYSDEC. 2010. DER-10 Technical Guidance for Site Investigation and Remediation, May 2010, last updated April 2019.

NYSDEC. 2011. DER-31 Green Remediation, January 2011.

NYSDEC, 2016a. Record of Decision, NM – North Albany State Superfund Project, RCRA Corrective Action Program, March 2016.

NYSDEC. 2016b. New York State Standards and Specifications for Erosion and Sediment Control. July 2016.

NYSDEC. 2023. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances under NYSDEC's Part 375 Remedial Programs. April 2023.

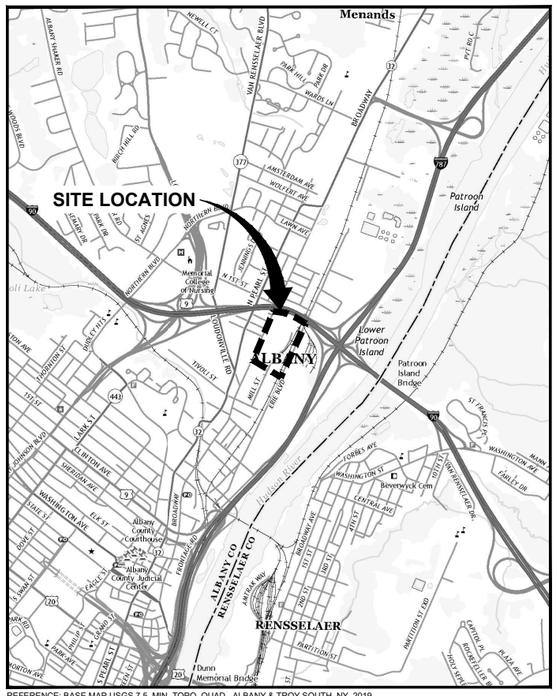
NYSDEC. 2024. Vehicle Maintenance Building Addition Geotechnical/Environmental Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan – Conditional Approval, National Grid, North Albany Service Center. Letter from NYSDEC dated November 18, 2024.

Design Drawings

DESIGN DRAWINGS

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

NORTH ALBANY FORMER MGP SITE



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., ALBANY & TROY SOUTH, NY, 2019.

LOCATION MAP
0 2000' 4000'
Approximate Scale: 1 in. = 2000 ft.

NEW YORK

1125 BROADWAY
ALBANY, NEW YORK 12204

DATE ISSUED
MARCH 2025

ARCADIS

ARCADIS OF NEW YORK, INC.

IMPORTANT TELEPHONE NUMBERS

UDIG NY
1-800-962-7962 or 811

NATIONAL GRID (ELECTRIC AND GAS UTILITIES)
1-800-867-5222

SPECTRUM (TELEPHONE AND CABLE UTILITIES)
1-877-636-3278 (TECHNICAL SUPPORT)
1-866-874-2389 (LOCAL OFFICE)

VERIZON (TELEPHONE AND CABLE UTILITIES)
1-855-661-6323 (MAIN SWITCHBOARD)

ALBANY DEPARTMENT OF GENERAL SERVICES
518-427-7480

ALBANY DEPARTMENT OF WATER
518-434-5300

ALBANY POLICE DEPARTMENT
518-438-4000

ALBANY FIRE DEPARTMENT
518-447-7879

SAMARITAN HOSPITAL - ALBANY MEMORIAL CAMPUS
518-471-3221

IN CASE OF EMERGENCY CALL 911

INDEX TO DRAWINGS

GENERAL REQUIREMENTS NOTES:

SURVEY:

1. COORDINATE SYSTEM IS THE NEW YORK STATE PLANE COORDINATE SYSTEM OF 1983, EAST ZONE. HORIZONTAL REFERENCE DATUM IS NAD83. VERTICAL REFERENCE DATUM IS NAVD88.
2. BASE MAPPING WAS COMPILED FROM A SURVEY PERFORMED BY C.T. MALE ASSOCIATES ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C., OF ALBANY, NEW YORK, DATED SEPTEMBER 21, 2017 AND NATIONAL GRID, DATED JUNE 27, 2024.
3. ACTUAL SITE CONDITIONS AT THE TIME OF CONSTRUCTION MAY DIFFER FROM THOSE SHOWN OR INDICATED ON THE DRAWINGS. VERIFY SITE CONDITIONS BEFORE STARTING WORK. PROMPTLY NOTIFY ENGINEER OF ANY DISCREPANCIES WITH THE POTENTIAL TO AFFECT THE WORK.
4. ESTABLISH AND MAINTAIN CONSTRUCTION SURVEY CONTROL AND VERIFY GRADES DURING THE PERFORMANCE OF WORK USING A NEW YORK STATE-LICENSED LAND SURVEYOR.

SAFETY:

1. INITIATE, MAINTAIN, AND SUPERVISE ALL SAFETY MEASURES AND PROGRAMS IN CONNECTION WITH THE PROJECT. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE THE NECESSARY PRECAUTIONS TO PROTECT SITE WORKERS, CONSTRUCTION OVERSIGHT PERSONNEL, AND SITE VISITORS. CONTRACTOR IS RESPONSIBLE FOR THE HEALTH AND SAFETY OF ITS DIRECT EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, AND OTHER ON-SITE PARTIES UNDER CONTRACTOR'S DIRECTION.
2. COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF PUBLIC BODIES HAVING JURISDICTION FOR THE SAFETY OF PERSONS OR PROPERTY OR TO PROTECT THEM FROM DAMAGE, INJURY, OR LOSS, INCLUDING WITHOUT LIMITATION, THE DEPARTMENT OF LABOR SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION PROMULGATED UNDER THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (PL 91-596) AND UNDER SECTION 107 OF THE CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (PL 91-54) AND AMENDMENTS THERETO.
3. FURNISH, ERECT, AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND THE PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR THE SAFETY AND PROTECTION OF PERSONS AND PROPERTY, INCLUDING EXCAVATION SHORING/BRACING, SCAFFOLDING, SHIELDING, MECHANICAL/ELECTRICAL PROTECTION, SPECIAL GROUNDING, SAFETY RAILINGS, BARRIERS, AND ALL APPLICABLE RECOMMENDATIONS OF THE MANUAL OF ACCIDENT PREVENTION IN CONSTRUCTION OF THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC.
4. MATERIALS SUBJECT TO HANDLING DURING THE PROJECT MAY CONTAIN HAZARDOUS CONSTITUENTS OR CHEMICALS AND SHALL BE HANDLED IN ACCORDANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. CONTRACTOR SHALL DEVELOP AND IMPLEMENT APPROPRIATE HEALTH AND SAFETY MEASURES FOR ITS EMPLOYEES, SUBCONTRACTORS, AND SITE VISITORS, AND FOR THE PROTECTION OF THE ENVIRONMENT AND SURROUNDING COMMUNITY. CONTRACTOR'S HASP SHALL BE DEVELOPED IN ACCORDANCE WITH ALL APPLICABLE OSHA, FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS, INCLUDING 29 CFR 1910.120 AND 29 CFR 1926.65.
5. SEVERAL CONTRACTOR ACTIVITIES WILL BE PERFORMED ADJACENT TO, OR IN THE VICINITY OF UTILITIES, INCLUDING (BUT NOT LIMITED TO) UTILITY POLES, GUY WIRES, OVERHEAD AND UNDERGROUND ELECTRIC DISTRIBUTION LINES, NATURAL GAS PIPES, SANITARY AND STORM SEWERS, WATER MAINS, FIBER OPTIC CABLES, AND TELEPHONE LINES. CONTRACTOR'S HASP SHALL RECOGNIZE THESE HAZARDS AND INCORPORATE SPECIAL PRECAUTIONS AND CONTROLS SPECIFIC TO WORKING NEAR SUCH HAZARDS.
6. MAINTAIN THE MINIMUM APPROACH DISTANCE FOR ENERGIZED OVERHEAD LINES AND EXPOSED ENERGY CIRCUITS FOR UNQUALIFIED PERSONS AS SET FORTH IN OSHA 29 CFR 1910.333(c)(3)(i)(A).

WASTE MANAGEMENT:

1. SCHEDULE, COORDINATE, LOAD, TRANSPORT, AND DISPOSE OF WASTE MATERIALS AT APPROPRIATE, NATIONAL GRID-APPROVED FACILITIES IN ACCORDANCE WITH LAWS AND REGULATIONS AND SPECIFICATION SECTIONS 01 74 19 (CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL) AND 02 60 05 (CONTAMINATED WASTE MANAGEMENT AND DISPOSAL).
2. EXISTING SITE FEATURES NOT SPECIFICALLY SHOWN OR INDICATED ON THE DRAWINGS MAY REQUIRE REMOVAL BY CONTRACTOR TO ACCOMMODATE THE WORK. THE REMOVAL OF SUCH FEATURES SHALL NOT BE PERFORMED WITHOUT THE PRIOR APPROVAL OF NATIONAL GRID OR ENGINEER.

SITE MANAGEMENT AND TEMPORARY CONTROLS:

1. WORK ACTIVITIES ARE PERMITTED ON NON-HOLIDAY WEEKDAYS (MONDAY THROUGH FRIDAY) BETWEEN THE HOURS OF 7:00 AM AND 6:00 PM. NO WORK SHALL BE PERFORMED OUTSIDE OF THESE HOURS WITHOUT PRIOR APPROVAL FROM NATIONAL GRID/ENGINEER.
2. CONTRACTOR IS RESPONSIBLE FOR ALL FEDERAL, STATE, AND LOCAL PERMITS THAT MAY BE REQUIRED TO PERFORM THE WORK
3. ALL WORK SHALL BE PERFORMED WITHIN THE PROJECT WORK LIMITS. NO WORK SHALL BE PERFORMED BEYOND THE PROJECT WORK LIMITS WITHOUT NATIONAL GRID'S PRIOR APPROVAL.
4. ALL WORK SHALL BE PERFORMED IN A NEAT AND ORDERLY MANNER, IN CONFORMANCE WITH BEST MODERN TRADE PRACTICE, AND BY COMPETENT, EXPERIENCED PERSONNEL. MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH ALL LAWS AND REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
5. CONSTRUCTION VEHICLES AND EQUIPMENT SHALL BE DECONTAMINATED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS BEFORE ARRIVING ON-SITE AND BEFORE LEAVING THE SITE. VEHICLES AND EQUIPMENT THAT COME IN CONTACT WITH CONTAMINATED MATERIAL SHALL BE APPROPRIATELY DECONTAMINATED BEFORE HANDLING OFF-SITE FILL MATERIALS OR ON-SITE RE-USE MATERIALS.
6. PROVIDE AND MAINTAIN SITE SECURITY MEASURES IN ACCORDANCE WITH SPECIFICATION SECTION 01 57 33 (SECURITY) TO PREVENT UNAUTHORIZED ENTRY OF PERSONS/VEHICLES INTO THE PROJECT WORK LIMITS DURING WORKING HOURS.
7. SURFACE STRUCTURES AND FACILITIES DAMAGED OR DISTURBED DURING THE WORK SHALL BE RESTORED AT CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION OR AS SHOWN OR INDICATED IN THE CONTRACT DOCUMENTS.
8. COMPLY WITH ALL NOISE ORDINANCES AND MAKE EVERY EFFORT TO MINIMIZE NOISE CAUSED BY CONSTRUCTION OPERATIONS. EQUIPMENT SHALL BE EQUIPPED WITH SILENCERS OR MUFFLERS DESIGNED TO OPERATE WITH THE LEAST POSSIBLE NOISE IN COMPLIANCE WITH LAWS AND REGULATIONS.
9. PROVIDE MEANS, METHODS, AND FACILITIES REQUIRED TO CONTROL MGP-RELATED ODORS, VAPORS, AND DUST GENERATED DURING THE WORK. COMPLY WITH ODOR, VAPOR, AND DUST CONTROL REQUIREMENTS OF SPECIFICATION SECTION 01 57 05 (TEMPORARY CONTROLS).
10. PERFORM COMMUNITY AIR MONITORING ON A CONTINUOUS BASIS DURING ALL GROUND-INTRUSIVE WORK OR DUST-GENERATING WORK, AND COMPLY WITH SPECIFICATION SECTION 01 35 49 (COMMUNITY AIR MONITORING PLAN).
11. TEMPORARY MATERIAL STOCKPILES SHALL BE COVERED AT ALL TIMES (I.E. DURING BOTH WORK AND NON-WORK HOURS) WITH A MINIMUM 10-MIL THICK PLASTIC LINER WHEN NOT IN USE. PLASTIC LINERS SHALL BE PROPERLY ANCHORED TO PREVENT UPLIFT DUE TO WIND CONDITIONS AND SHALL BE INSTALLED TO MINIMIZE PONDING OF PRECIPITATION.

EXISTING STRUCTURES AND UNDERGROUND FACILITIES:

1. THE LOCATIONS, ALIGNMENTS, AND CONSTRUCTION OF EXISTING STRUCTURES AND UNDERGROUND FACILITIES SHOWN OR INDICATED ON THE DRAWINGS ARE APPROXIMATE, ARE BASED ON INFORMATION READILY AVAILABLE TO NATIONAL GRID AND ENGINEER, AND ARE NOT GUARANTEED TO BE CORRECT, ACCURATE, OR COMPLETE. CONTRACTOR SHALL VERIFY THE ACCURACY AND COMPLETENESS OF THE INFORMATION SHOWN OR INDICATED ON THE DRAWINGS.
2. LOCATIONS OF UNDERGROUND UTILITIES (INCLUDING ON-SITE STORM SEWERS, SANITARY SEWERS, TELEPHONE LINES, ELECTRICAL LINES, NATURAL GAS MAINS, WATER MAINS, AND CABLE LINES) WERE DIGITIZED FROM NIAGARA MOHAWK POWER CORPORATION DRAWING NO. D-29734-E, FILE INDEX NO. 20.3-A1.1-B2, DATED JUNE 27, 1994, ENTITLED NORTH ALBANY SERVICE CENTER SITE PLAN - PAVING (OUTSIDE FENCE). LOCATION OF UNDERGROUND TELEPHONE LINES, ELECTRICAL LINES, NATURAL GAS MAINS, AND CABLE LINES, WERE UPDATED BASED ON ELECTROMAGNETIC UTILITY SURVEY CONDUCTED BY UNDERGROUND SERVICES, INC. DURING OCTOBER 2012 AND NATIONAL GROUND PENETRATING RADAR SERVICE, INC. DURING AUGUST 2017.
3. COMPLY WITH 16 NYCRR 753 (PROTECTION OF UNDERGROUND FACILITIES) AND OTHER LAWS AND REGULATIONS REGARDING THE PROTECTION OF UNDERGROUND FACILITIES.
4. MAINTAIN AND PROTECT ALL EXISTING STRUCTURES, UTILITIES, AND UNDERGROUND FACILITIES THAT MAY BE AFFECTED BY THE WORK. ALL UTILITIES, UNLESS OTHERWISE SHOWN OR INDICATED, SHALL REMAIN ACTIVE FOR THE DURATION OF THE WORK. IN ADDITION, ALL EXISTING STRUCTURES AND UNDERGROUND FACILITIES, UNLESS OTHERWISE SHOWN OR INDICATED, SHALL REMAIN USEABLE FOR THE DURATION OF THE WORK.
5. CONTACT AND COORDINATE WITH APPROPRIATE UTILITY OWNERS TO FIELD-VERIFY THE STATUS (ACTIVE OR INACTIVE) OF UNDERGROUND FACILITIES, AND FOR THE TEMPORARY BRACING, DEACTIVATION, REMOVAL, RELOCATION, OR REPLACEMENT OF ANY UNDERGROUND FACILITIES, OVERHEAD WIRES, UTILITY POLES, OR GUY WIRES LOCATED NEAR OR WITHIN WORK AREAS, OR THAT MAY BE AFFECTED BY THE WORK.

ABBREVIATIONS:

ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
BGS	BELOW GROUND SURFACE
CFR	CODE OF FEDERAL REGULATIONS
CPM	CORRUGATED METAL PIPE
CONC.	CONCRETE
CY	IN-SITU CUBIC YARDS
ELEV.	ELEVATION
FT	FEET
HASP	HEALTH AND SAFETY PLAN
HDPE	HIGH-DENSITY POLYETHYLENE
INV.	INVERT
ISS	IN-SITU SOIL SOLIDIFICATION
LF	LINEAL FEET
MGP	MANUFACTURED GAS PLANT
NAD83	NORTH AMERICAN DATUM OF 1983
NAVD88	NORTH AMERICAN VERTICAL DATUM OF 1988
NYCRR	NEW YORK CODES, RULES, AND REGULATIONS
NYSDOT	NEW YORK STATE DEPARTMENT OF TRANSPORTATION
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
SAN	SANITARY
TYP.	TYPICAL
VIT	VITRIFIED

LEGEND:

- BUILDING/STRUCTURE
- TREES/BUSHES
- HANDICAP PARKING
- PROJECT WORK LIMITS
- REMEDIAL WORK LIMITS
- PROPERTY LINE (APPROXIMATE)
- EASEMENT (APPROXIMATE)
- 367.5 — TOPOGRAPHIC CONTOUR (0.5-FOOT INTERVAL)
- 396 — TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- 395 — TOPOGRAPHIC CONTOUR (5-FOOT INTERVAL)
- 267 — PROPOSED EXCAVATION/BACKFILL GRADING CONTOUR
- EDGE OF VEGETATION
- EDGE OF BUILDING
- EDGE OF GRAVEL
- EDGE OF PAVEMENT/CONCRETE
- CTRL-1 — SURVEY CONTROL POINT
- PROPOSED VIBRATION MONITORING LOCATION
- PROPOSED SETTLEMENT MONITORING LOCATION
- SIGN
- PDI SOIL BORING
- RI SOIL BORING
- DNAPL EXTRACTION WELL
- GROUNDWATER EXTRACTION WELL
- MONITORING WELL
- DESTROYED MONITORING WELL
- CATCH BASIN
- MANHOLE
- FIRE HYDRANT
- ELECTRIC VAULT
- UTILITY POLE WITH GUY WIRE
- UTILITY POLE WITH LIGHT (LP)
- STREET LIGHT
- VALVE
- CHAIN-LINK FENCE
- FENCE
- BRICK FENCE POST
- SLIDING GATE
- EXCELSIOR AVENUE PHASE 1 PROPOSED FENCE
- EXCELSIOR AVENUE PHASE 2 PROPOSED FENCE
- SHEETPILE WALL
- OH — OVERHEAD WIRES
- UE — ELECTRICAL LINE
- G — GAS LINE
- SA — 12" SAN — SANITARY SEWER WITH FLOW ARROW (UNKNOWN DIAMETER) (KNOWN DIAMETER)
- ST — 12" STORM — STORM SEWER WITH FLOW ARROW (UNKNOWN DIAMETER) (KNOWN DIAMETER)
- T — UNDERGROUND TELEPHONE LINE
- W — WATER LINE
- ? — UNKNOWN UTILITY LINE
- X / XX — PROFILE/SECTION/DETAIL REFERENCE
- XX — DRAWING REFERENCE
- X / XX — CROSS SECTION ALIGNMENT

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL		
Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK — JOHN C. BRUSSEL — 075208 — LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE ● ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

GENERAL REQUIREMENTS NOTES, ABBREVIATIONS, AND LEGEND

ARCADIS Project No.: 30003953

Date: MARCH 2025

ARCADIS
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110 W FAYETTE STREET
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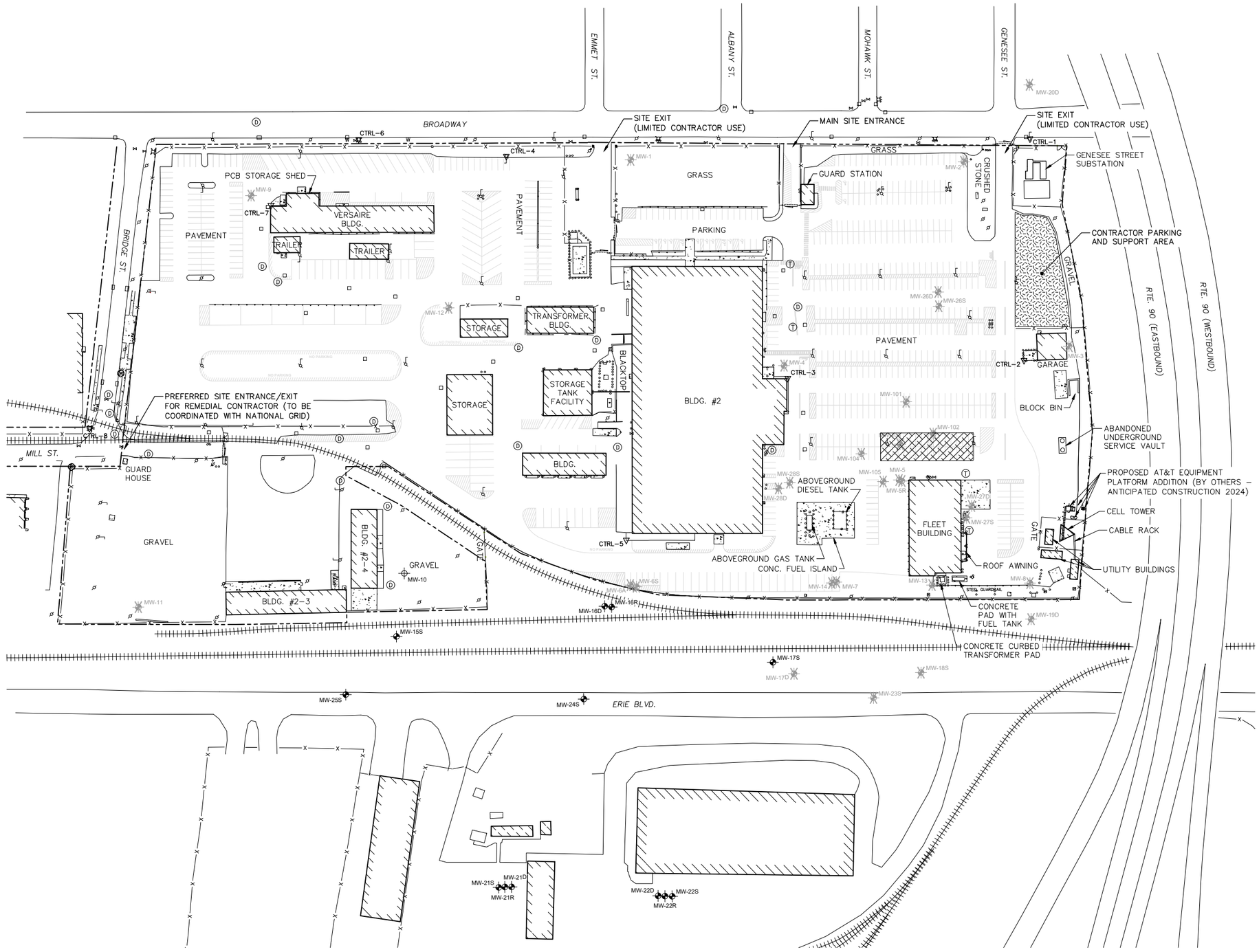
G-002



TRUE NORTH

PLANT NORTH

LEGEND:

- APPROXIMATE PROPERTY LINE
- BUILDING
- CONCRETE PAD
- FENCE
- GUARD RAIL
- RAILROAD
- UTILITY POLE
- UTILITY POLE WITH LIGHT
- TELECOMMUNICATIONS MANHOLE
- HYDRANT
- DRAINAGE MANHOLE
- CATCH BASIN
- MISCELLANEOUS UTILITY
- UTILITY VAULT
- BOLLARD
- MW-17S MGP/RCRA GROUNDWATER MONITORING WELL LOCATION
- MW-10 PSA/IRM GROUNDWATER MONITORING WELL LOCATION
- MW-17D DESTROYED/LOST/DECOMMISSIONED GROUNDWATER MONITORING WELL
- CONTRACTOR PARKING AND SUPPORT AREA
- CONTRACTOR VEHICLE PARKING AREA (NO MATERIAL STAGING ALLOWED IN THIS AREA)
- CTRL–1 SURVEY CONTROL POINT

SURVEY CONTROL LOCATION SUMMARY TABLE			
ID	NAD 83		NAVD 88
	NORTHING	EASTING	ELEVATION
CTRL-1	1398488.66	696630.85	31.28
CTRL-2	1398341.34	696937.91	22.62
CTRL-3	1397999.12	696814.84	20.56
CTRL-4	1397743.82	696327.10	24.30
CTRL-5	1397671.33	696940.29	20.99
CTRL-6	1397547.50	696210.74	27.36
CTRL-7	1397383.02	696248.17	20.52
CTRL-8	1396988.92	696446.86	21.32

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X_Remedial Design_Base

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80' 0 80' 160'
1"=80'

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL		
Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK JOHN C. BRUSSEL 075208 LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

GENERAL SITE PLAN

ARCADIS Project No.: 30003953

Date: MARCH 2025

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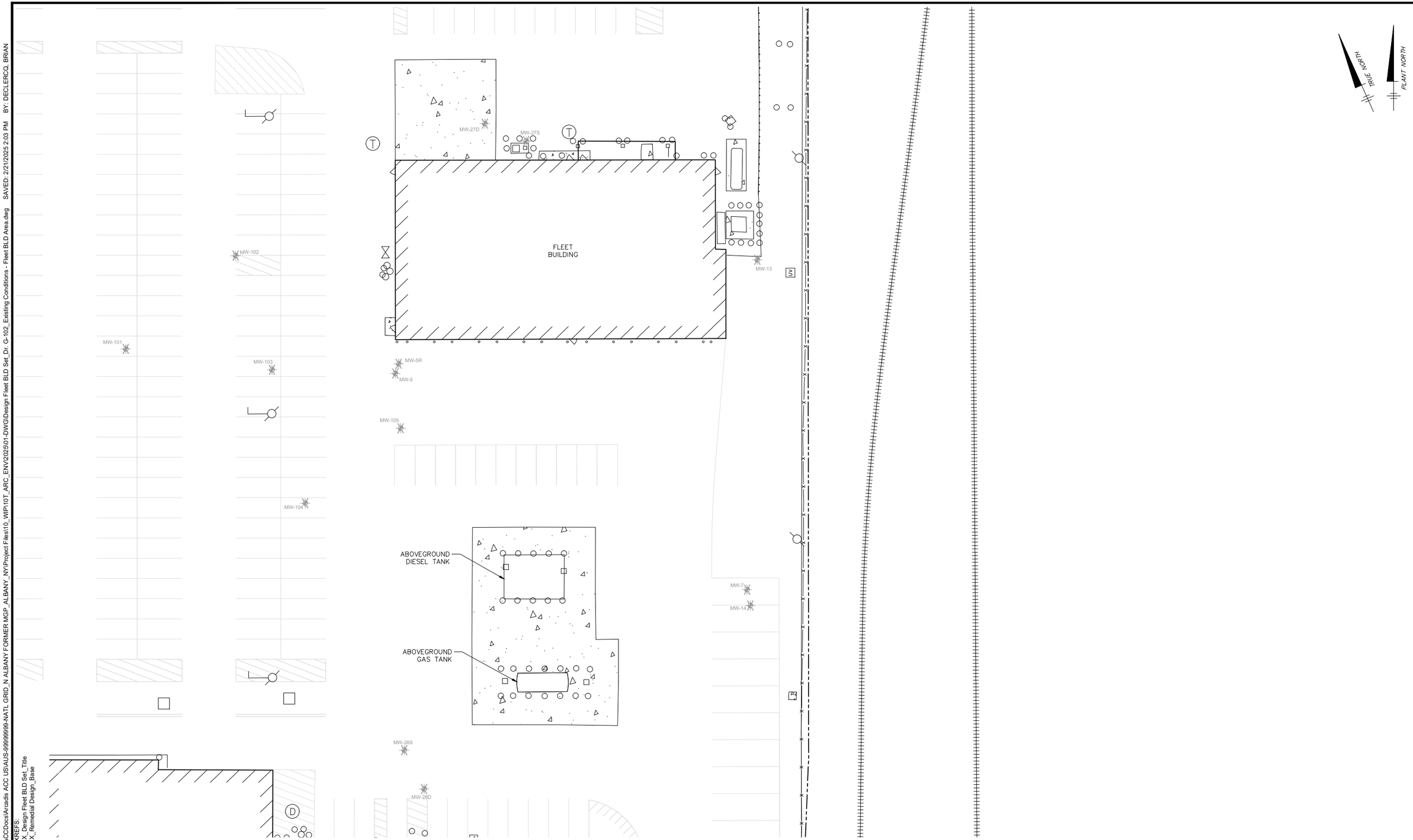
G-101



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20' 0 20' 40'
1"=20'

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name	JOHN C. BRUSSEL	
Professional Engineer's No.	075208	
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

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FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

EXISTING SITE CONDITIONS - FLEET BUILDING ADDITION AREA

ARCADIS Project No.
30003953

Date
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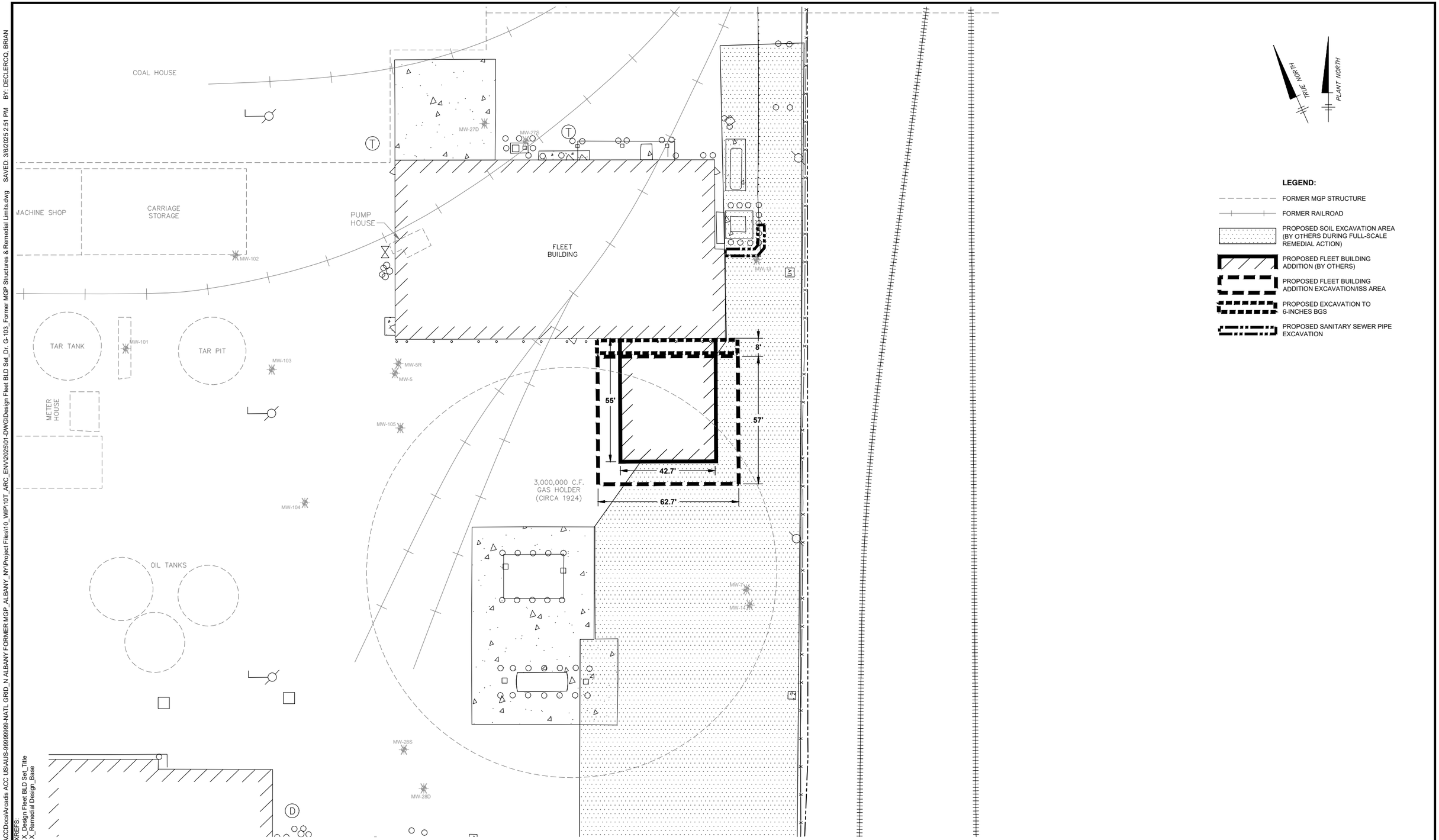
G-102



LEGEND:

- FORMER MGP STRUCTURE
- FORMER RAILROAD
- PROPOSED SOIL EXCAVATION AREA (BY OTHERS DURING FULL-SCALE REMEDIAL ACTION)
- PROPOSED FLEET BUILDING ADDITION (BY OTHERS)
- PROPOSED FLEET BUILDING ADDITION EXCAVATION/ISS AREA
- PROPOSED EXCAVATION TO 6-INCHES BGS
- PROPOSED SANITARY SEWER PIPE EXCAVATION

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1"=20'

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No.	Date	Revisions	By	Cko

Professional Engineer's Name: JOHN C. BRUSSEL
Professional Engineer's No.: 075208

State	Date Signed	Project Mgr.
NY	3/7/2025	JCB
Designed by	Drawn by	Checked by
MSH	BKD	APC

STATE OF NEW YORK · JOHN C. BRUSSEL · 075208 · LICENSED PROFESSIONAL ENGINEER

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FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

FORMER MGP STRUCTURES AND SOIL REMEDIAL LIMITS

ARCADIS Project No.
30003953

Date
MARCH 2025

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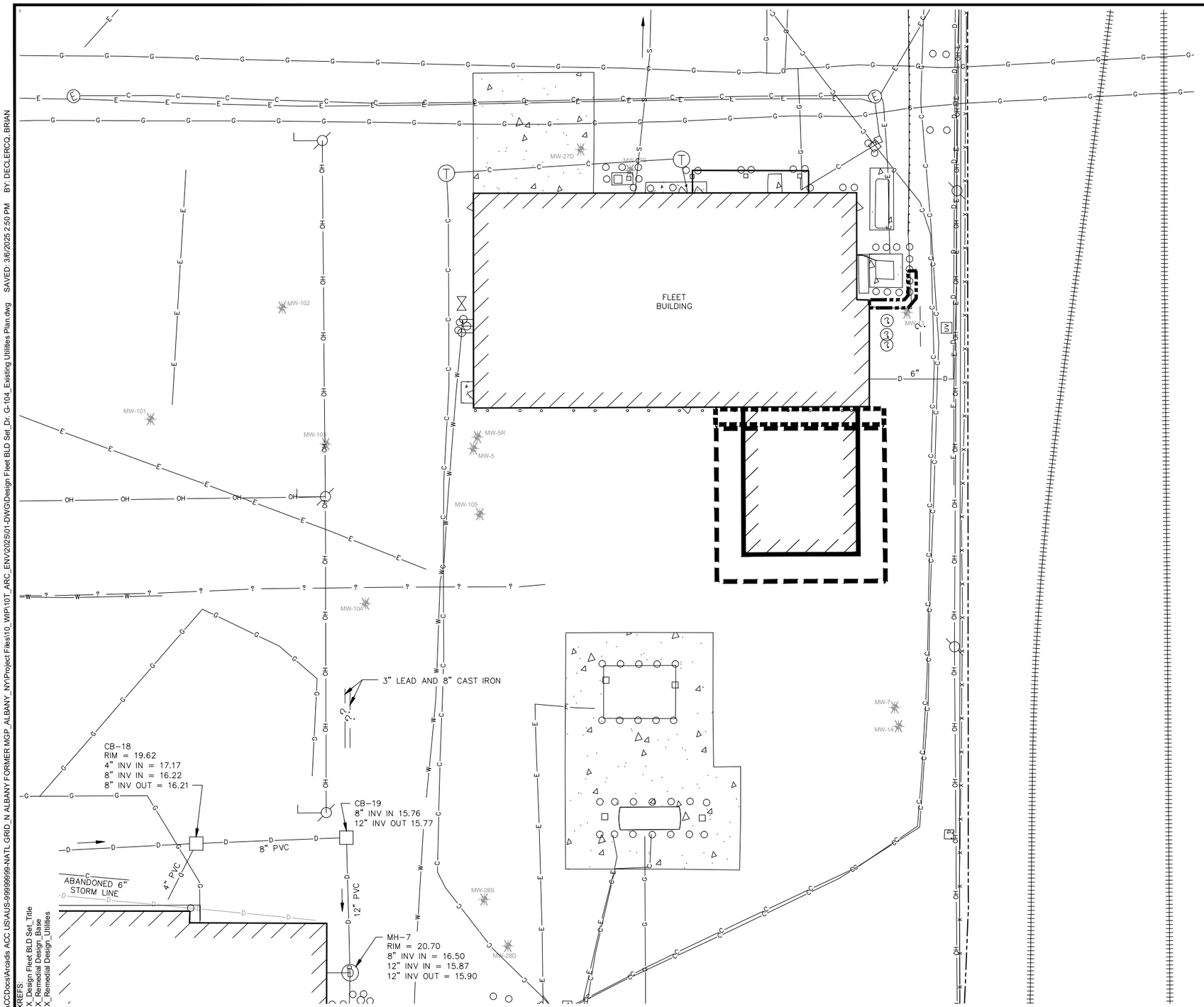
G-103



PLOT NORTH

PLANT NORTH

LEGEND:

- OH — OVERHEAD WIRES
- E — UNDERGROUND ELECTRIC LINE
- C — UNDERGROUND COMMUNICATIONS LINE
- W — UNDERGROUND WATER MAIN
- S — UNDERGROUND SANITARY SEWER MAIN
- D — UNDERGROUND STORM SEWER MAIN
- D — UNDERGROUND STORM SEWER MAIN (ABANDONED)
- FLOW DIRECTION
- ? — UNDERGROUND UNKNOWN UTILITY
- G — UNDERGROUND NATURAL GAS MAIN
- (E) ELECTRIC MANHOLE
- (?) UNKNOWN UTILITY VAULT
- UV — UNDERGROUND VAULT
- CATCH BASIN
- (D) DRAINAGE MANHOLE
- (T) TELECOMMUNICATIONS MANHOLE
- PROPOSED FLEET BUILDING ADDITION (BY OTHERS)
- PROPOSED FLEET BUILDING ADDITION EXCAVATION/ISS AREA
- PROPOSED EXCAVATION TO 6-INCHES BGS
- PROPOSED SANITARY SEWER PIPE EXCAVATION

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1"=20' (20' 0 20' 40')

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Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK — JOHN C. BRUSSEL — No. 075208 — LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

EXISTING UTILITIES PLAN

ARCADIS Project No.
30003953

Date
MARCH 2025

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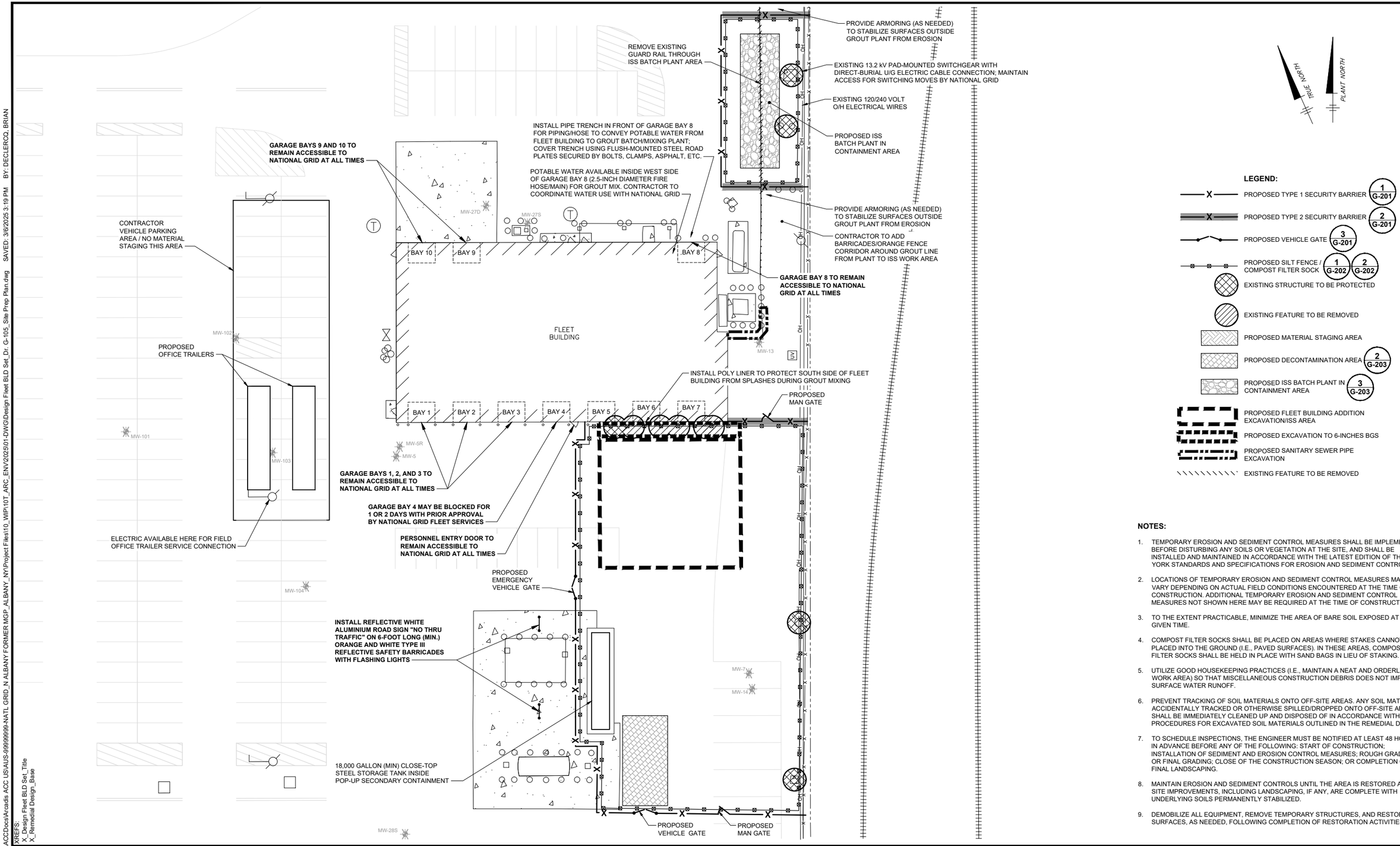
G-104



NOTES:

1. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED BEFORE DISTURBING ANY SOILS OR VEGETATION AT THE SITE, AND SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LATEST EDITION OF THE NEW YORK STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
2. LOCATIONS OF TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES MAY VARY DEPENDING ON ACTUAL FIELD CONDITIONS ENCOUNTERED AT THE TIME OF CONSTRUCTION. ADDITIONAL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES NOT SHOWN HERE MAY BE REQUIRED AT THE TIME OF CONSTRUCTION.
3. TO THE EXTENT PRACTICABLE, MINIMIZE THE AREA OF BARE SOIL EXPOSED AT ANY GIVEN TIME.
4. COMPOST FILTER SOCKS SHALL BE PLACED ON AREAS WHERE STAKES CANNOT BE PLACED INTO THE GROUND (I.E., PAVED SURFACES). IN THESE AREAS, COMPOST FILTER SOCKS SHALL BE HELD IN PLACE WITH SAND BAGS IN LIEU OF STAKING.
5. UTILIZE GOOD HOUSEKEEPING PRACTICES (I.E., MAINTAIN A NEAT AND ORDERLY WORK AREA) SO THAT MISCELLANEOUS CONSTRUCTION DEBRIS DOES NOT IMPACT SURFACE WATER RUNOFF.
6. PREVENT TRACKING OF SOIL MATERIALS ONTO OFF-SITE AREAS. ANY SOIL MATERIALS ACCIDENTALLY TRACKED OR OTHERWISE SPILLED/DROPPED ONTO OFF-SITE AREAS SHALL BE IMMEDIATELY CLEANED UP AND DISPOSED OF IN ACCORDANCE WITH THE PROCEDURES FOR EXCAVATED SOIL MATERIALS OUTLINED IN THE REMEDIAL DESIGN.
7. TO SCHEDULE INSPECTIONS, THE ENGINEER MUST BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE BEFORE ANY OF THE FOLLOWING: START OF CONSTRUCTION; INSTALLATION OF SEDIMENT AND EROSION CONTROL MEASURES; ROUGH GRADING, OR FINAL GRADING; CLOSE OF THE CONSTRUCTION SEASON; OR COMPLETION OF FINAL LANDSCAPING.
8. MAINTAIN EROSION AND SEDIMENT CONTROLS UNTIL THE AREA IS RESTORED AND SITE IMPROVEMENTS, INCLUDING LANDSCAPING, IF ANY, ARE COMPLETE WITH UNDERLYING SOILS PERMANENTLY STABILIZED.
9. DEMOBILIZE ALL EQUIPMENT, REMOVE TEMPORARY STRUCTURES, AND RESTORE SURFACES, AS NEEDED, FOLLOWING COMPLETION OF RESTORATION ACTIVITIES.

20' 0 20' 40'
1"=20'

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL
Professional Engineer's No.: 075208

State	Date Signed	Project Mgr.
NY	3/7/2025	JCB
Designed by	Drawn by	Checked by
MSH	BKD	APC

STATE OF NEW YORK JOHN C. BRUSSEL 075208 LICENSED PROFESSIONAL ENGINEER

ARCADIS
ARCADIS OF NEW YORK, INC.

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK
FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

SITE PREPARATION PLAN

ARCADIS Project No.: 30003953
Date: MARCH 2025

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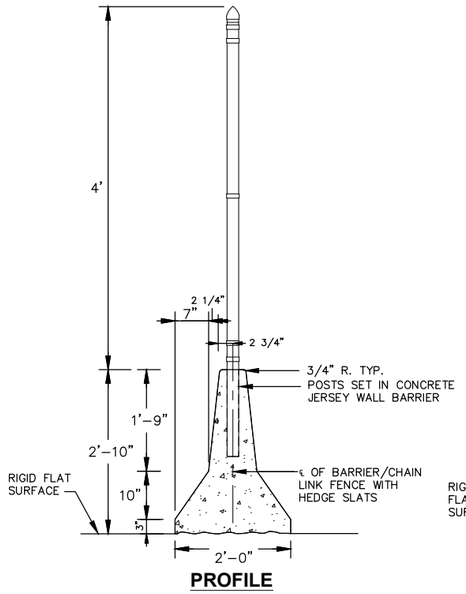
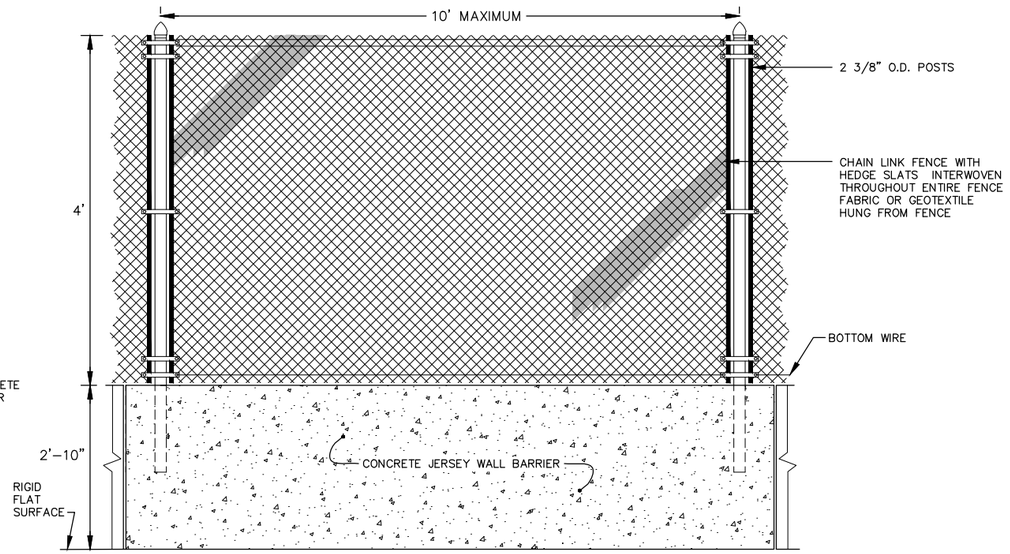
G-105



PROFILE



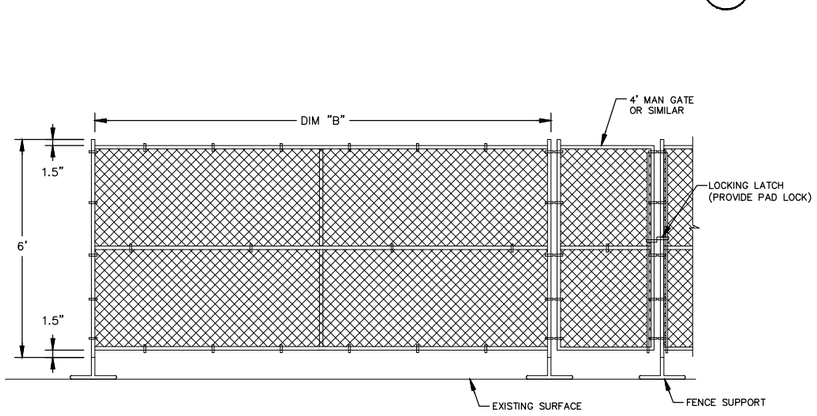
FRONT

TYPE 1 SECURITY BARRIER (1)

NOT TO SCALE

NOTES:

1. BARRIERS SHALL BE IN GOOD CONDITION AND CONSISTENT IN SIZE AND QUALITY.
2. BARRIERS SHALL HAVE CONSISTENT COLOR OF NATURAL CONCRETE OR WHITE.
3. BARRIERS SHALL BE FASTENED TOGETHER WHEREVER PRACTICAL TO PREVENT MOVEMENT.
4. SIDES OF TEMPORARY CONCRETE BARRIERS FACING ONSITE TRAFFIC AND PARKING AREAS SHALL HAVE THREE INCH MINIMUM LENGTH YELLOW RETRO–REFLECTORS MOUNTED ON THE TOP OR SIDE OF THE BARRIERS ON 25 FOOT CENTERS. RETRO–REFLECTORS SHOULD BE MOUNTED AT A UNIFORM HEIGHT OF AT LEAST TWO FEET ABOVE THE PAVEMENT OR GROUND SURFACE.
5. TEMPORARY JERSEY WALL BARRIERS WITH CHAIN LINK FENCING SHALL HAVE CHAIN LINK POSTS SET IN THE CONCRETE WITH 4–FEET OF FENCING FABRIC FASTENED TO THE TOP. GREEN HEDGE SLATS SHALL BE INSERTED BETWEEN THE WEAVES OF THE CHAIN LINKS OR GEOTEXTILE, MEETING THE SPECIFICATIONS OF FENCE SCREEN 130 SERIES PRIVACY AIR OR EQUIVALENT, SHALL BE HUNG FROM THE TOP OF THE FENCE TO PROVIDE PRIVACY AND ACT AS A NOISE AND DUST BARRIER FOR CONSTRUCTION ACTIVITIES.



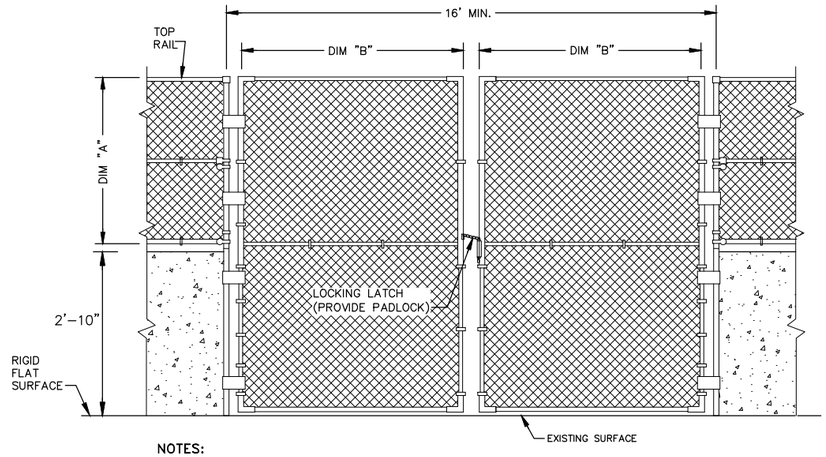
NOTES:

1. INSTALL SECURITY FENCE AND MAN GATES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. INSTALL MAN GATES, AS NECESSARY, TO PROVIDE ACCESS AND EGRESS TO SITE WORKERS AND NATIONAL GRID PERSONNEL.
3. INSTALL A WOVEN GEOTEXTILE VISUAL BARRIER MEETING THE SPECIFICATIONS OF US FABRIC INC. FENCE SCREEN 130 SERIES PRIVACY AIR OR EQUIVALENT.
4. WIRE TIES OR CLIPS WILL BE A MINIMUM OF 6 GAUGE. HOG RINGS MAY BE USED TO TIE FABRIC TO FENCE SUPPORTS.
5. UNLESS STATED OTHERWISE, DIMENSIONS AND WEIGHTS SHALL BE AS LISTED IN TABLE G–201–A.

TYPE 2 SECURITY BARRIER AND MAN GATE DETAIL (2)

NOT TO SCALE

TABLE G-201-A – MINIMUM FENCING CONSTRUCTION MATERIALS				
OUTSIDE DIAMETER (INCHES)		WEIGHT/FOOT (POUNDS)		
DIM "A"	DIM "B"	TUBING MATERIAL	CHAIN LINK WIRE	
			GAUGE	DIAMOND SIZE
4'	10'	1 3/8" x 16 GAUGE	11.5	2 3/8"
4'	12'	1 5/8" x 16 GAUGE	11.5	2 3/8"

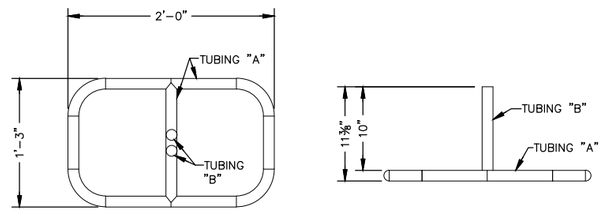


NOTES:

1. INSTALL SECURITY FENCE AND VEHICLE GATES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. INSTALL A MINIMUM OF TWO VEHICLE GATES (ENTRANCE AND EXIT) TO PROVIDE VEHICLE ACCESS AND EGRESS TO SUBCONTRACTORS, SUPPLIERS, SITE WORKERS AND NATIONAL GRID PERSONNEL.
3. INSTALL A WOVEN GEOTEXTILE VISUAL BARRIER MEETING THE SPECIFICATIONS OF FENCE SCREEN 130 SERIES PRIVACY AIR OR EQUIVALENT.
4. WIRE TIES OR CLIPS WILL BE A MINIMUM OF 6 GAUGE. HOG RINGS MAY BE USED TO TIE FABRIC TO FENCE SUPPORTS.
5. UNLESS STATED OTHERWISE, DIMENSIONS AND WEIGHTS SHALL BE AS LISTED IN TABLE G–201–A.

TYPE 1 SECURITY BARRIER AND VEHICLE ACCESS GATE DETAIL (3)

NOT TO SCALE



TUBING "A"	TUBING "B"
1–⅜"x16 GAUGE	1"x16 GAUGE

NOTES:

1. ALTERNATE SECURITY FENCE SUPPORTS MAY BE USED WITH NATIONAL GRID/ENGINEER APPROVAL.
2. WEIGH DOWN SECURITY FENCE SUPPORTS WITH SAND BAGS AS NECESSARY.

SECURITY FENCE SUPPORT DETAIL (4)

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Professional Engineer's Name: JOHN C. BRUSSEL		
Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK
FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

SITE PREPARATION DETAILS

ARCADIS Project No.: 30003953
Date: MARCH 2025

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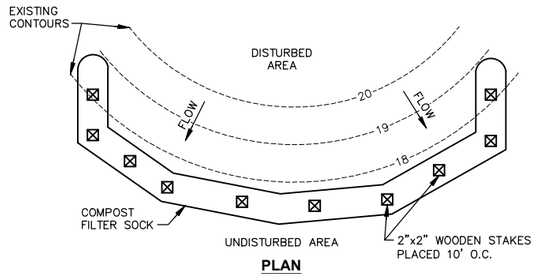
G-201

TABLE 1 – COMPOST SOCK FABRIC MINIMUM SPECIFICATIONS					
MATERIAL TYPE	3 MIL HDPE	5 MIL HDPE	5 MIL HDPE	MULTI–FILAMENT POLYPROPYLENE (MFPP)	HEAVY DUTY MULTI–FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO–DEGRADABLE	PHOTO–DEGRADABLE	BIO–DEGRADABLE	PHOTO–DEGRADABLE	PHOTO–DEGRADABLE
SOCK DIAMETERS	12"	12"	12"	12"	12"
	18"	18"	18"	18"	18"
		24"	24"	24"	24"
		32"	32"	32"	32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 PSI	26 PSI	44 PSI	202 PSI
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G–155)	23% AT 1000 HR.	23% AT 1000 HR.		100% AT 1000 HR.	100% AT 1000 HR.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS

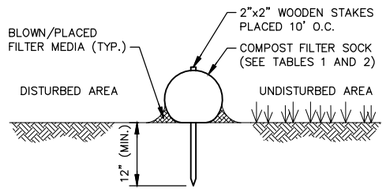
TABLE 2 – COMPOST STANDARDS	
ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
PH	6.0 – 8.0
MOISTURE CONTENT	30% – 60%
PARTICLE SIZE	100% PASSING A 1" SCREEN AND 10%–50% PASSING A 3/8" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 DS/M (MMHOS/CM) MAXIMUM

TABLE 3 – MAXIMUM SLOPE LENGTH FOR COMPOST FILTER SOCK					
Slope (%)	MAXIMUM SLOPE LENGTH ABOVE COMPOST FILTER SOCK (FEET)				
	8" DIA.	12" DIA.	18" DIA.	24" DIA.	32" DIA.
2 (or less)	225*	250	275	350	450
5	200	225	250	275	325
10	100	125	150	200	275
20	50	65	70	130	150
25	20	50	55	100	120
33	––	40	45	60	75
50	––	25	30	35	50

* LENGTH IN FEET



PLAN



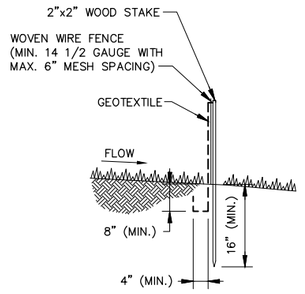
SECTION

NOTES:

1. SOCK FABRIC SHALL MEET THE STANDARDS OF TABLE 1, THIS DRAWING. COMPOST SHALL MEET THE STANDARDS OF TABLE 2, THIS DRAWING.
2. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY SOCK SHALL NOT EXCEED THAT SHOWN ON TABLE 3, THIS DRAWING. STAKES MAY BE INSTALLED IMMEDIATELY DOWNSLOPE OF THE SOCK IF SO SPECIFIED BY THE MANUFACTURER.
3. A MINIMUM OF 12 INCH DIAMETER SOCKS ARE TO BE USED. THE FLAT DIMENSION OF THE SOCK SHALL BE AT LEAST 1.5 TIMES THE NOMINAL DIAMETER.
4. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
5. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
6. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
7. BIODEGRADABLE FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
8. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES AND SOCKS SHALL BE REMOVED.

COMPOST FILTER SOCK 1

NOT TO SCALE



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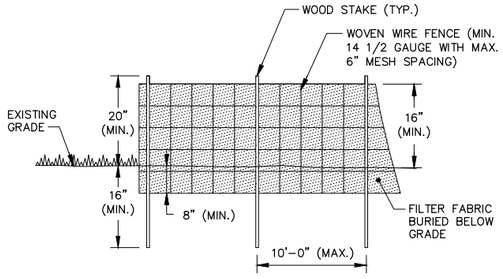

PROFILE

NOTES:

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED A MINIMUM OF 6 INCHES, FOLDED, AND SECURED TO POST. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
4. PREFABRICATED UNITS MAY BE GEOFAB, ENVIROFENCE OR APPROVED EQUAL IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
5. SEDIMENT DEPOSITS SHALL BE REMOVED WHEN "BULGES" IN THE FILTER FABRIC DEVELOP OR AS DIRECTED BY ENGINEER.

SILT FENCE 2

NOT TO SCALE

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XREFS:
X_Design Fleet BLD Set_Title

NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL
Professional Engineer's No.: 075208

State	Date Signed	Project Mgr.
NY	3/7/2025	JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK · JOHN C. BRUSSEL · No. 075208 · LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

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NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

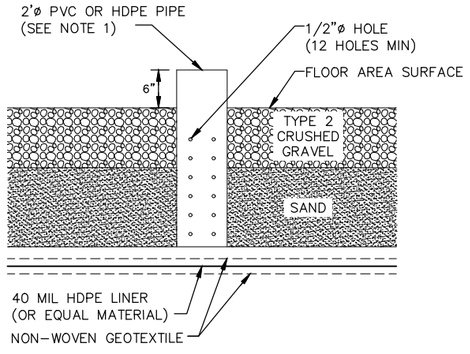
EROSION AND SEDIMENT CONTROL DETAILS

ARCADIS Project No.: 30003953

Date: MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

G-202

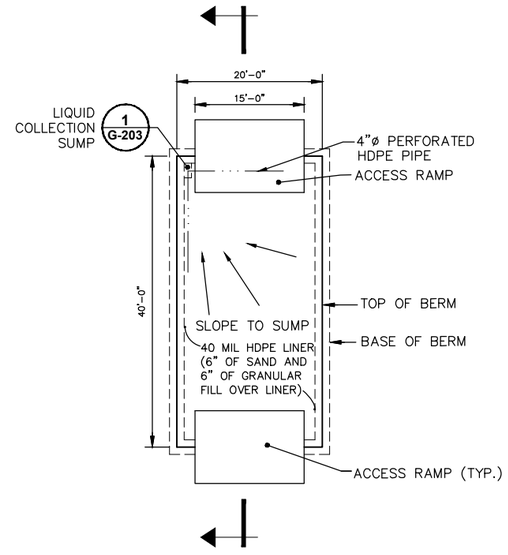


NOTE:

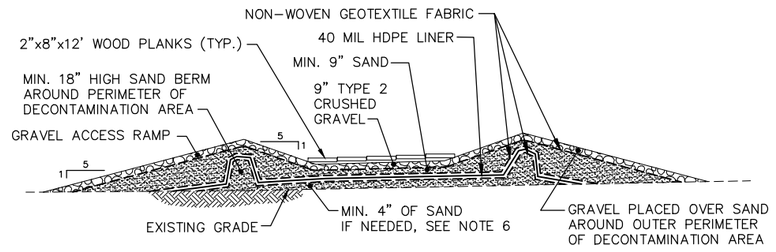
1. LIQUID COLLECTION SUMP TO CONSIST OF PERFORATED PVC OR HDPE PIPE INSTALLED VERTICALLY.

LIQUID COLLECTION SUMP (1)

NOT TO SCALE



PLAN



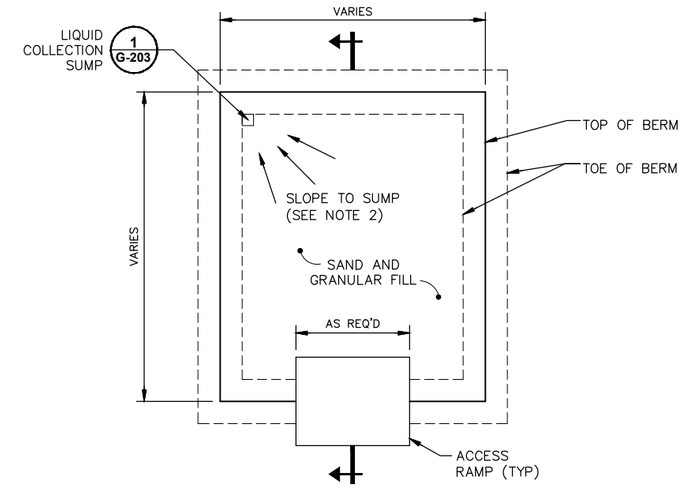
SECTION

NOTES:

1. SLOPE DECONTAMINATION AREA TOWARD A COLLECTION SUMP TO FACILITATE COLLECTION AND REMOVAL OF DECONTAMINATION LIQUIDS. PUMP LIQUIDS FROM COLLECTION SUMP TO FRAC TANK OR ON-SITE TEMPORARY WATER TREATMENT SYSTEM, AS DIRECTED BY ENGINEER.
2. PREPARE SUBGRADE TO BE UNIFORM AND FREE OF DELETERIOUS MATERIALS (E.G., SHARP STONES, WOODY DEBRIS, CONSTRUCTION DEBRIS) THAT COULD DAMAGE THE HDPE LINER. ADD ADDITIONAL MATERIAL (AS NECESSARY) TO STABILIZE AND GRADE THE GROUND SURFACE TO FACILITATE CONSTRUCTION OF THE DECONTAMINATION AREA.
3. SUFFICIENTLY COMPACT GRANULAR FILL TO PROVIDE A FIRM AND UNIFORM SURFACE. COMPACT MATERIAL (AS NECESSARY) IN A MANNER AND USING APPROPRIATE EQUIPMENT THAT AVOIDS DAMAGE TO THE GEOSYNTHETICS.
4. REMOVE ALL DECONTAMINATION AREA MATERIALS FOR OFF-SITE DISPOSAL UPON COMPLETION OF THE CONSTRUCTION ACTIVITIES.
5. PREFABRICATED STEEL PADS MAY BE USED IN LIEU OF CONSTRUCTION WOOD PLANKS.
6. SAND CUSHIONING LAYER BETWEEN EXISTING GRADE AND BOTTOM NON-WOVEN GEOTEXTILE FABRIC MAY NOT BE REQUIRED IF CONSTRUCTED ON ASPHALT.
7. CONCRETE JERSEY BARRIER OR MAFIA BLOCKS MAY BE USED IN LIEU OF SAND BERM EXCEPT AT ENTRANCE/EXIT RAMPS.

EQUIPMENT DECONTAMINATION AREA (2)

NOT TO SCALE



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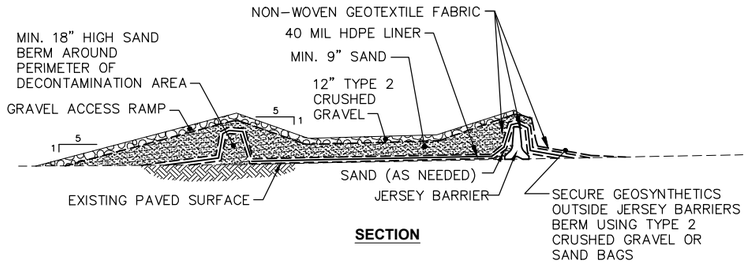

SECTION

NOTES:

1. THIS DETAIL SHALL BE USED FOR THE GROUT PLANT CONTAINMENT AND FOR IMPACTED MATERIAL STAGING, UNLESS IMPACTED MATERIAL IS MANAGED WITHIN AN EXCAVATED AREA OR DIRECT-LOADED FOR OFFSITE TRANSPORTATION AND DISPOSAL.
2. COVER MATERIALS WITHIN STAGING AREA WITH 10 MIL PLASTIC SHEETING AT ALL TIMES EXCEPT WHEN MATERIALS ARE BEING LOADED IN OR REMOVED FROM THE STAGING AREA. SECURE THE COVER TO RESIST WIND FORCES.
3. SLOPE STAGING AREA TOWARD A COLLECTION SUMP TO FACILITATE COLLECTION AND REMOVAL OF LIQUIDS. PUMP LIQUIDS FROM COLLECTION SUMP TO FRAC TANK OR ON-SITE TEMPORARY WATER TREATMENT SYSTEM, AS DIRECTED BY ENGINEER.
4. PREPARE SUBGRADE TO BE UNIFORM AND FREE OF DELETERIOUS MATERIALS (E.G., SHARP STONES, WOODY DEBRIS, CONSTRUCTION DEBRIS) THAT COULD DAMAGE THE HDPE LINER. ADD ADDITIONAL MATERIAL (AS NECESSARY) TO STABILIZE AND GRADE THE GROUND SURFACE TO FACILITATE CONSTRUCTION OF THE STAGING AREA.
5. SUFFICIENTLY COMPACT GRANULAR FILL TO PROVIDE A FIRM AND UNIFORM SURFACE. COMPACT MATERIAL (AS NECESSARY) IN A MANNER AND USING APPROPRIATE EQUIPMENT THAT AVOIDS DAMAGE TO THE GEOSYNTHETICS.
6. REMOVE ALL STAGING AREA MATERIALS FOR OFF-SITE DISPOSAL UPON COMPLETION OF THE CONSTRUCTION ACTIVITIES.

CONTAINMENT / STAGING AREA (3)

NOT TO SCALE

NOT TO SCALE

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL
Professional Engineer's No.: 075208

State	Date Signed	Project Mgr.
NY	3/7/2025	JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

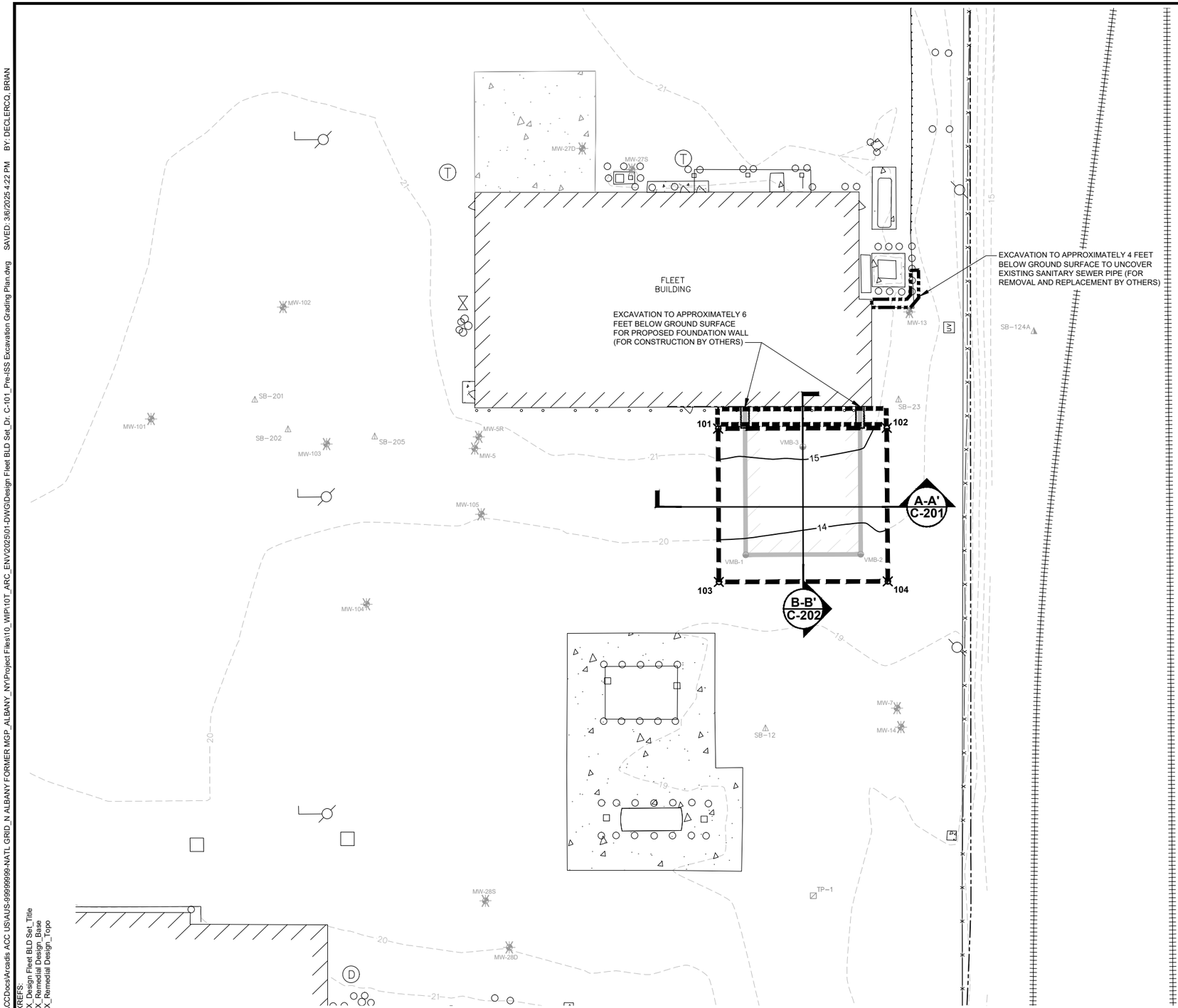
NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK
FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

MISCELLANEOUS DETAILS

ARCADIS Project No.: 30003953
Date: MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

G-203



TRUE NORTH

PLANT NORTH

LEGEND:

- 101 — SURVEY CONTROL POINT
- 17 — EXCAVATION BOTTOM ELEVATION
- PROPOSED FLEET BUILDING ADDITION (BY OTHERS)
- PROPOSED FLEET BUILDING ADDITION EXCAVATION AREA
- PROPOSED SANITARY SEWER PIPE EXCAVATION
- PROPOSED EXCAVATION TO 6-INCHES BGS
- PROPOSED FOUNDATION WALL EXCAVATION
- A-A' C-201 — CROSS SECTION ALIGNMENT

SURVEY CONTROL POINT COORDINATES

POINT ID	NORTHING (Y)	EASTING (X)
101	1398061.15	697112.66
102	1398035.85	697169.88
103	1398009.10	697089.70
104	1397983.72	697147.02

NOTES:

1. PROMOTE POSITIVE DRAINAGE AND MINIMIZE SURFACE WATER RUNOFF INTO EXCAVATION AREAS.
2. INFORMATION RELATED TO SUBSURFACE CONDITIONS SHOULD BE CONSIDERED APPROXIMATE AND SHOULD NOT BE RELIED UPON AS A COMPLETE DEPICTION OF SITE CONDITIONS.
3. COMPLETE EXCAVATION ACTIVITIES IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, FEDERAL, AND OSHA REQUIREMENTS.
4. EXCAVATION ELEVATION CONTOURS AND SPOT ELEVATIONS SHOWN REPRESENT PRE-ISS EXCAVATION GRADE.
5. BACKFILL EXCAVATION AREA AND RESTORE IN ACCORDANCE WITH DRAWING C-104.
6. COMPLY WITH SPECIFICATION SECTIONS 31 09 13 (GEOTECHNICAL INSTRUMENTATION AND MONITORING) AND 31 00 00 (EARTHWORK).
7. CONSTRUCT DEWATERING SUMP(S) AS NEEDED DURING EXCAVATION TO MANAGE STORMWATER RUNOFF. ALL STORMWATER RUNOFF SHALL BE PUMPED TO AN ONSITE STORAGE CONTAINER FOR TREATMENT OR OFFSITE DISPOSAL.
8. ISS PRE-EXCAVATION TO BE PERFORMED IN ACCORDANCE WITH OSHA REQUIREMENTS FOR SLOPING/BENCHING.
9. EXTENT OF FORMER MGP HOLDER AND SUPPORT PILES (IF ANY) TO BE IDENTIFIED DURING PRE-ISS EXCAVATION.
10. FORMER MGP HOLDER TO BE DEMOLISHED AND SUPPORT PILES TO BE REMOVED (IF ANY) WITHIN THE REMEDIAL LIMITS.
11. PRE-ISS EXCAVATION ELEVATIONS MAY BE HIGHER THAN SHOWN IF GROUNDWATER IS ENCOUNTERED SHALLOWER THAN 6 FEET BGS.

XREFS:
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X_Remedial Design_Base
X_Remedial Design_Topo

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1"=20'

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Professional Engineer's Name: JOHN C. BRUSSEL		
Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

ARCADIS

ARCADIS OF NEW YORK, INC.

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE ● ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

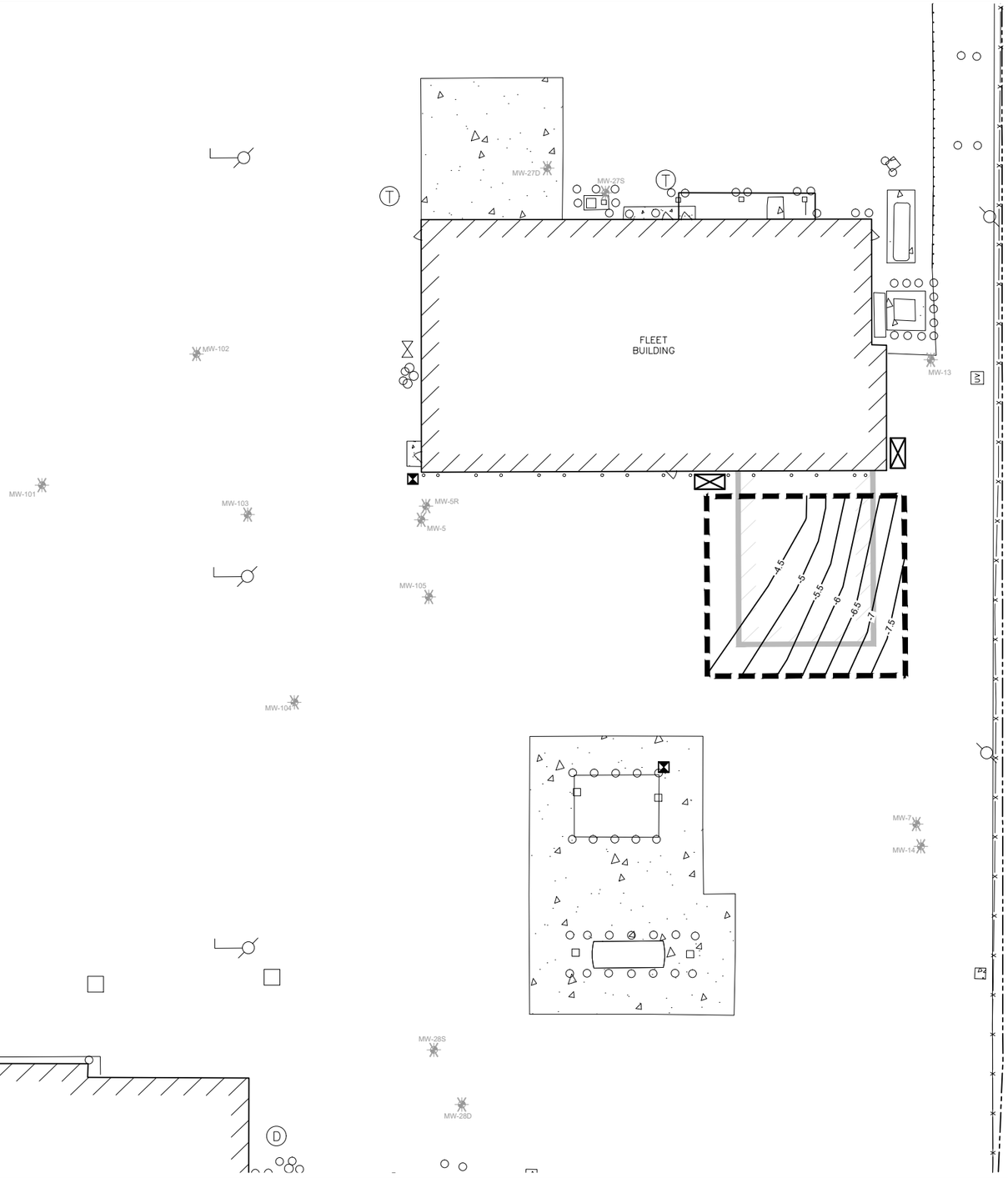
PRE-ISS EXCAVATION GRADING PLAN

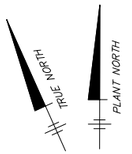
ARCADIS Project No.: 30003953

Date: MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

C-101





LEGEND:

- -6 — ISS BOTTOM ELEVATION (SEE NOTE 18)
- PROPOSED FLEET BUILDING ADDITION (BY OTHERS)
- PROPOSED FLEET BUILDING ADDITION ISS AREA
- ENGINEERING SEISMOGRAPH AND OPTICAL MONITORING LOCATION
- OPTICAL MONITORING POINT

NOTES:

1. REFER TO DRAWING C-101 FOR PRE-ISS EXCAVATION INFORMATION.
2. ISS BOTTOM ELEVATIONS REPRESENT APPROXIMATE ELEVATIONS TO EXTEND ISS 2 FEET INTO WEATHERED BEDROCK. THESE ELEVATIONS ARE INFERRED BASED ON PREVIOUS INVESTIGATIONS. THE ACTUAL ELEVATIONS OF WEATHERED BEDROCK MAY VARY IN THE ISS AREA AND WILL BE VERIFIED IN THE FIELD BY THE ENGINEER BASED ON SUBSURFACE CONDITIONS ENCOUNTERED (e.g., EQUIPMENT REFUSAL) AND THROUGH POST-ISS ROCK CORING IN ACCORDANCE WITH NYSDEC REQUIREMENTS.
3. REFER TO DRAWING G-002 FOR ADDITIONAL LEGEND AND BASEMAP INFORMATION.
4. CONTRACTOR SHALL MAINTAIN AND PROTECT ALL OVERHEAD/UNDERGROUND SITE FEATURES AND UTILITIES, THAT UNLESS STATED OTHERWISE, THAT MAY BE AFFECTED BY THE WORK.
5. EXCAVATION AND ISS ACTIVITIES SHALL BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, FEDERAL, AND OSHA REQUIREMENTS.
6. CONTRACTOR SHALL CONSTRUCT DEWATERING SUMP(S) AS NEEDED DURING EXCAVATION TO MANAGE STORMWATER RUNOFF. ALL STORMWATER RUNOFF SHALL BE PUMPED TO AN ON-SITE STORAGE CONTAINER FOR DISPOSAL.
7. ANY WALKING/WORKING SURFACE (HORIZONTAL AND VERTICAL SURFACE) WITH AN UNPROTECTED SIDE OR EDGE WHICH IS 4 FEET OR MORE ABOVE A LOWER LEVEL SHALL BE PROTECTED FROM FALLING BY THE USE OF GUARDRAIL SYSTEMS, SAFETY NET SYSTEMS, OR PERSONAL FALL ARREST SYSTEMS PER OSHA 1926.501. PROPOSED PERMANENT RIGID BARRIER SHALL BE SUBMITTED BY THE SHORING CONTRACTOR AND APPROVED BY ARCADIS.
8. CONTRACTOR SHALL UTILIZE PORTABLE RIGID BARRIERS TO CREATE TEMPORARY WORK ZONES DURING REMEDIATION ACTIVITIES AS DIRECTED BY THE SITE SAFETY OFFICER (SSO). PROPOSED PORTABLE RIGID BARRIER SHALL BE SUBMITTED BY THE CONTRACTOR FOR REVIEW BY ARCADIS AND NATIONAL GRID.
9. SAW-CUT ASPHALT PAVEMENT TO FACILITATE SOIL EXCAVATION.
10. INFORMATION RELATED TO SUBSURFACE CONDITIONS SHOULD BE CONSIDERED APPROXIMATE AND SHOULD NOT BE RELIED UPON AS A COMPLETE DEPICTION OF SITE CONDITIONS.
11. ALL SOIL EXCAVATED SHALL BE TRANSPORTED OFF-SITE TO NATIONAL GRID APPROVED DISPOSAL FACILITY.
12. EXCAVATION AREA SHALL BE BACKFILLED AND RESTORED IN ACCORDANCE WITH DRAWING C-107 AND SPECIFICATION 31 23 23 (FILL MATERIALS).
13. REFER TO NATIONAL GRID TRENCHING AND EXCAVATION PROGRAM GUIDELINES FOR ADDITIONAL EXCAVATION AND PERMIT REQUIREMENTS.
14. INSTALL GEOTECHNICAL MONITORING INSTRUMENTATION/EQUIPMENT AND PERFORM MONITORING IN ACCORDANCE WITH SPECIFICATION 31 09 13, GEOTECHNICAL INSTRUMENTATION AND MONITORING. LOCATIONS SHOWN ARE APPROXIMATE AND MAY BE ADJUSTED, AS NECESSARY, BASED ON FIELD CONDITIONS.
15. CONTRACTOR SHALL SCHEDULE EXCAVATION AND BACKFILLING TO ACCOMMODATE SAMPLING AND SURVEY ACTIVITIES. PRIOR TO BACKFILLING, CONTRACTOR SHALL OBTAIN APPROVAL FROM ENGINEER THAT EXCAVATION LIMITS AND DEPTHS ARE ACCEPTABLE.

XREFS:
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X_Remedial Design_Base

20' 0 20' 40'
1"=20'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL		
Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK · JOHN C. BRUSSEL · No. 075208 · LICENSED PROFESSIONAL ENGINEER

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NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

ISS CONSTRUCTION PLAN

ARCADIS Project No.: 30003953

Date: MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
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TELEPHONE: 315-446-9120

C-102

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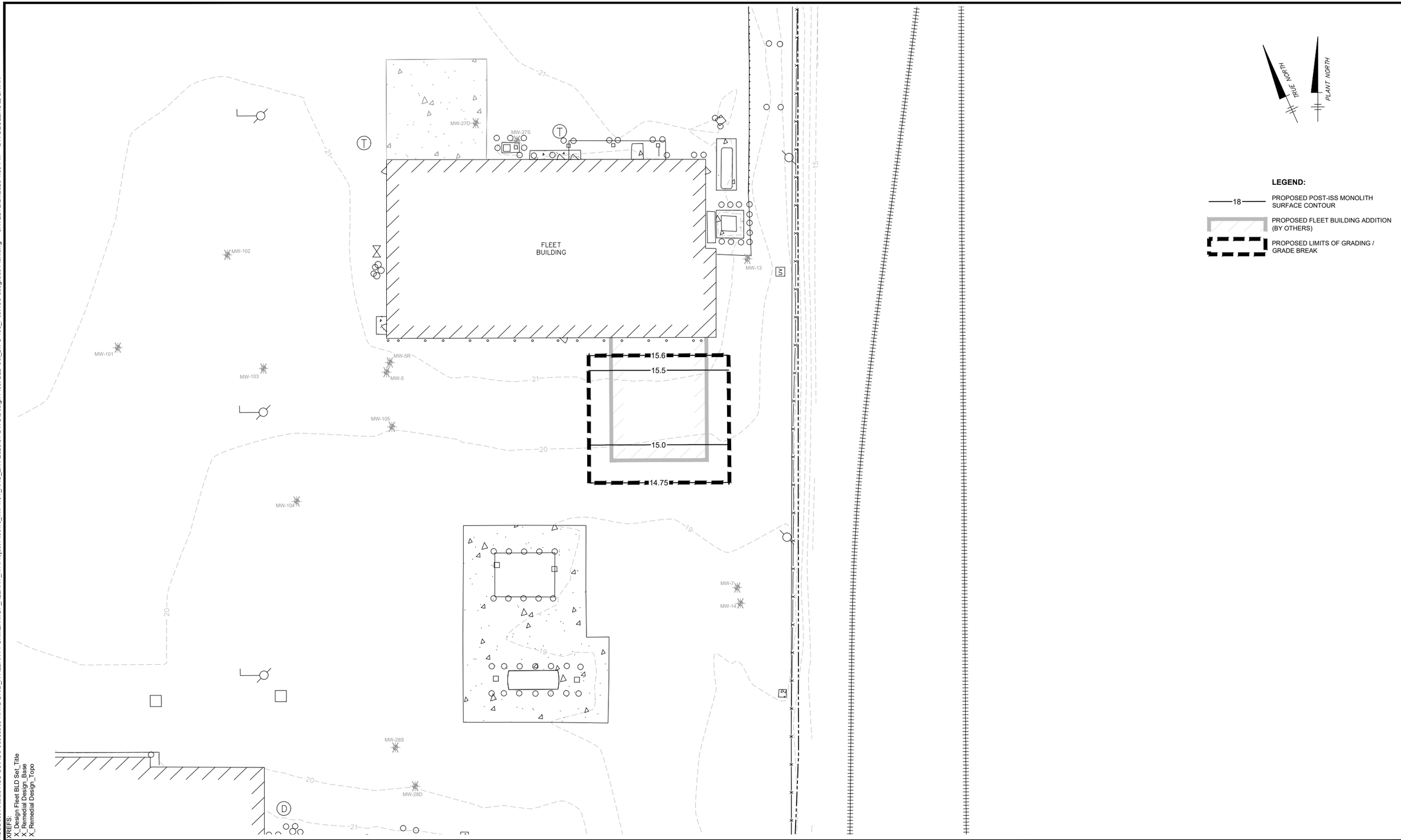

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1"=20' 20' 0 20' 40'

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USE TO VERIFY FIGURE REPRODUCTION SCALE

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STATE OF NEW YORK · JOHN C. BRUSSEL · 075208 · LICENSED PROFESSIONAL ENGINEER

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FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

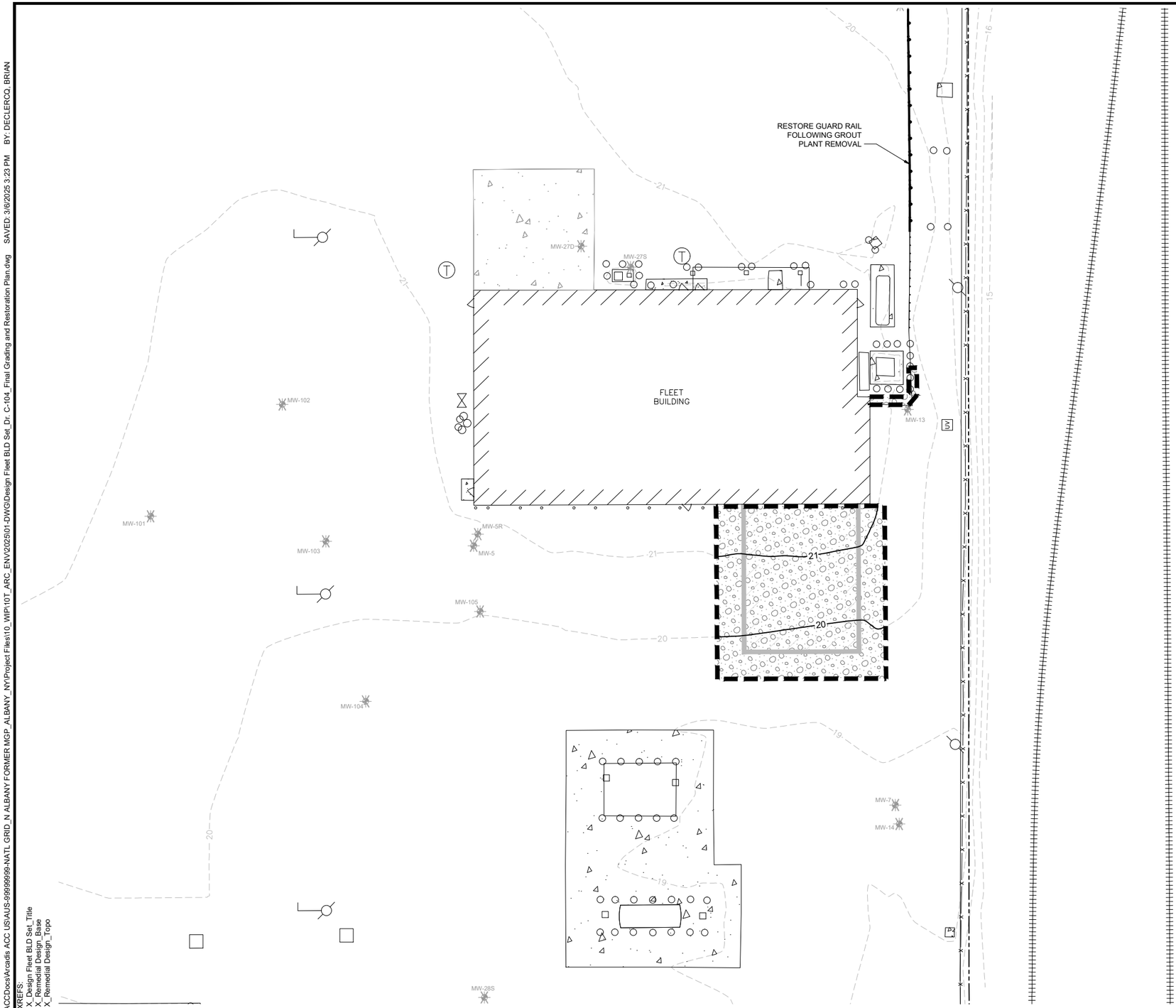
POST-ISS MONOLITH SURFACE GRADING PLAN

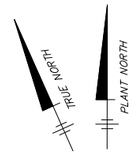
ARCADIS Project No.
30003953

Date
MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

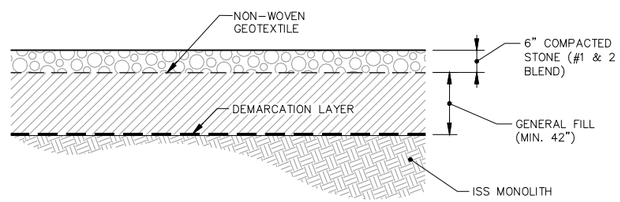
C-103





LEGEND:

- 20 — PROPOSED FINAL GRADE CONTOUR
- PROPOSED FLEET BUILDING ADDITION (BY OTHERS)
- PROPOSED RESTORATION AREA
- GRAVEL SURFACE COVER
- GUARD RAIL TO BE RESTORED



GRAVEL SURFACE COVER RESTORATION DETAIL 1

NOT TO SCALE

XREFS:
X_Design Fleet BLD Set_Title
X_Remedial Design_Base
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20' 0 20' 40'
1"=20'

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STATE OF NEW YORK · JOHN C. BRUSSEL · 075208 · LICENSED PROFESSIONAL ENGINEER

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ARCADIS OF NEW YORK, INC.

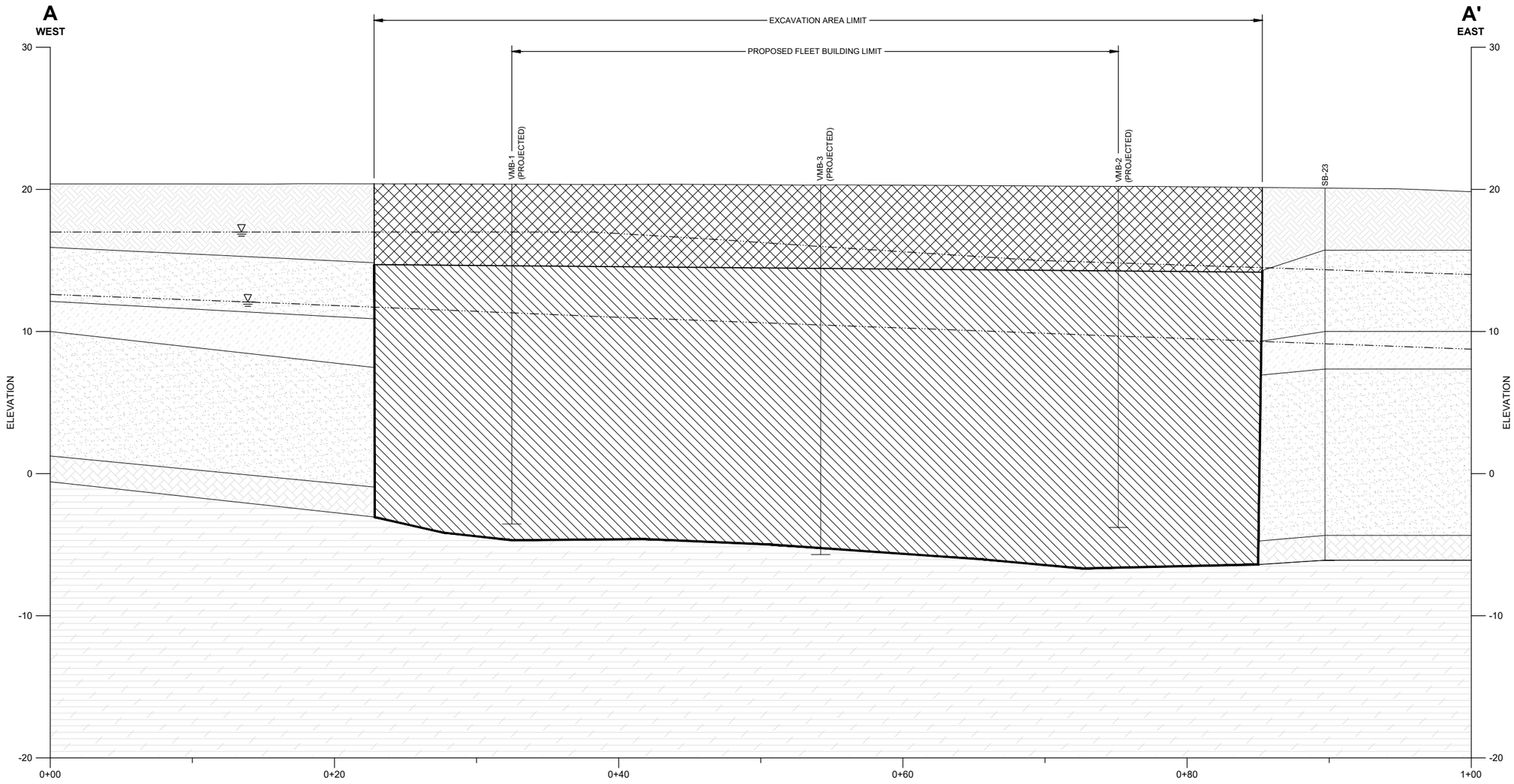
NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK
FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

FINAL GRADING/RESTORATION PLAN AND DETAIL

ARCADIS Project No.: 30003953
Date: MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

C-104



LEGEND:

- MW-103 — WELL/BORING ID
- GROUND SURFACE
- APPROXIMATE HIGH GROUNDWATER LEVEL (DECEMBER 2010)
- APPROXIMATE LOW GROUNDWATER LEVEL (JUNE 1997)
- LITHOLOGICAL CONTACT
- BOTTOM OF BORING

- FILL
- SAND, LITTLE GRAVEL
- SILT & CLAY
- WEATHERED SHALE
- BEDROCK
- PRE-ISS EXCAVATION
- PROPOSED ISS MONOLITH

NOTES:

1. COORDINATES ARE BASED ON THE NORTH AMERICAN DATUM OF 1983, NEW YORK EAST ZONE.
2. ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
3. ALL LOCATION ARE APPROXIMATE.
4. SOIL LAYERS AND GROUNDWATER ELEVATION WERE IDENTIFIED USING SOIL BORINGS INSTALLED PREVIOUSLY DURING THE REMEDIAL INVESTIGATIONS. SOIL LAYERS AND GEOLOGICAL CONTACT LOCATIONS ARE APPROXIMATE AND INFERRED BETWEEN BORING LOCATIONS. ACTUAL SUBSURFACE CONDITIONS ENCOUNTERED DURING REMEDIAL CONSTRUCTION ACTIVITIES MAY BE DIFFERENT FROM THESE SHOWN.
5. HORIZONTAL SCALE ON SECTION REPRESENTS STATIONING IN FEET.
6. COMPLY WITH SPECIFICATION SECTIONS 31 09 13 (GEOTECHNICAL INSTRUMENTATION AND MONITORING), 31 00 00 (EARTHWORK), AND 02 55 00 (IN-SITU SOLIDIFICATION/STABILIZATION).
7. ISS BOTTOM ELEVATIONS REPRESENT APPROXIMATE ELEVATIONS TO EXTEND ISS 2 FEET INTO WEATHERED BEDROCK. THESE ELEVATIONS ARE INFERRED BASED ON PREVIOUS INVESTIGATIONS. THE ACTUAL ELEVATIONS OF WEATHERED BEDROCK MAY VARY IN THE ISS AREA AND WILL BE VERIFIED IN THE FIELD BY THE ENGINEER BASED ON SUBSURFACE CONDITIONS ENCOUNTERED (e.g., EQUIPMENT REFUSAL) AND THROUGH POST-ISS ROCK CORING IN ACCORDANCE WITH NYSDEC REQUIREMENTS.

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XREFS:
X_Design Fleet BLD Set_Title

1"=4' (4' 0 4' 8')

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: JOHN C. BRUSSEL		
Professional Engineer's No.: 075208		
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK · JOHN C. BRUSSEL · No. 075208 · LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

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

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

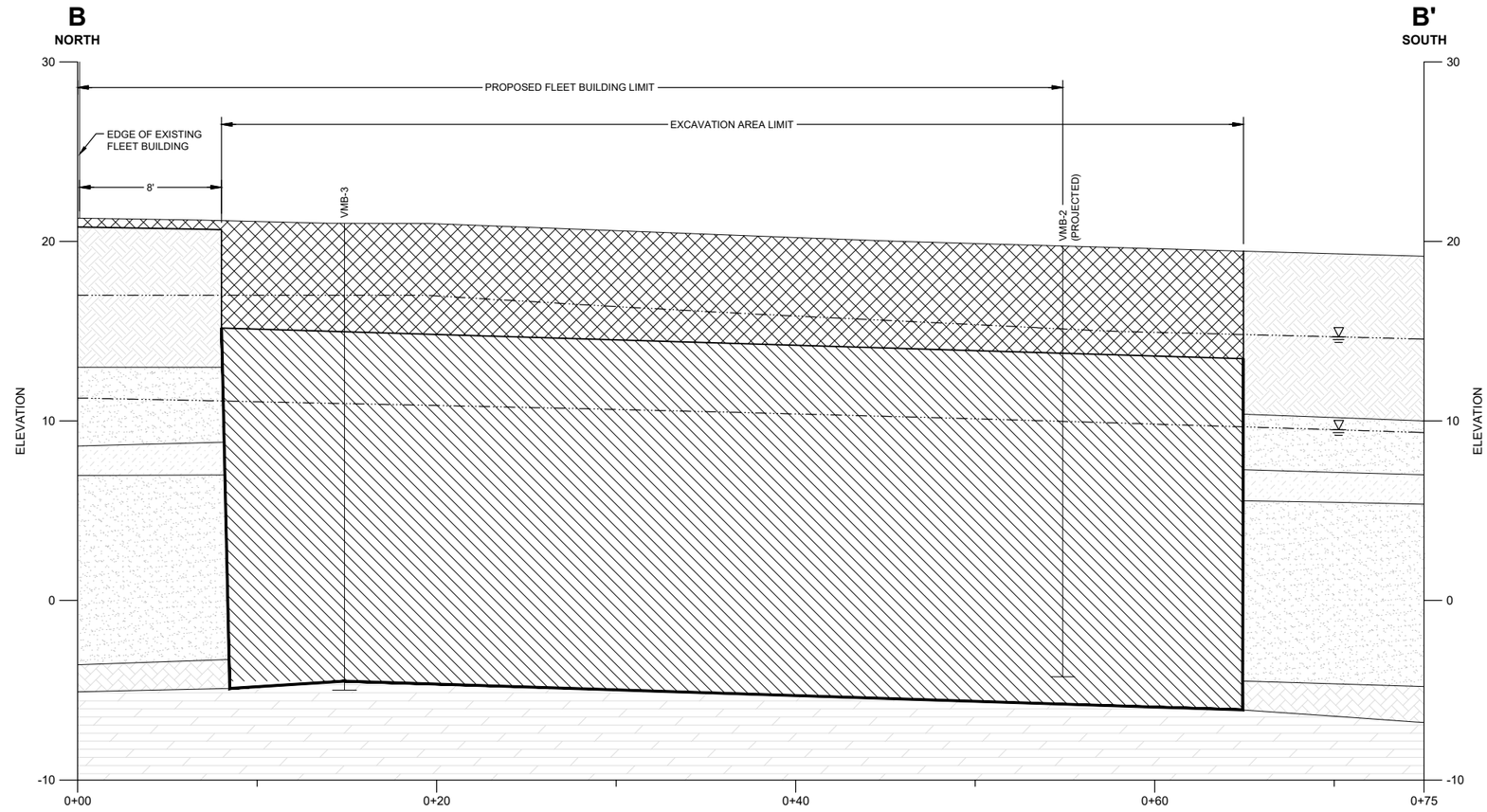
CROSS SECTION A-A'

ARCADIS Project No.: 30003953

Date: MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

C-201



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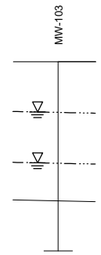

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XREFS:
X_Design Fleet BLD Set_Title

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1"=4' (4' 0 4' 8')

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name	JOHN C. BRUSSEL	
Professional Engineer's No.	075208	
State: NY	Date Signed: 3/7/2025	Project Mgr.: JCB
Designed by: MSH	Drawn by: BKD	Checked by: APC

STATE OF NEW YORK · JOHN C. BRUSSEL · No. 075208 · LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

NATIONAL GRID, NORTH ALBANY FORMER MGP SITE • ALBANY, NEW YORK

FLEET BUILDING ADDITION INTERIM REMEDIAL MEASURE DESIGN

CROSS SECTION B-B'

ARCADIS Project No.
30003953

Date
MARCH 2025

ARCADIS
ONE LINCOLN CENTER
110 W FAYETTE STREET
SYRACUSE, NY 13202
TELEPHONE: 315-446-9120

C-202

Appendices

Appendix A

Specifications

TABLE OF CONTENTS

Notes:
[1] = Specification included in Contractor Bid Package only.

END OF TABLE OF CONTENTS

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 LOCATION AND DESCRIPTION OF WORK

A. The former manufactured gas plant (MGP) site is located in the northern portion of the National Grid North Albany Service Center in Albany, New York. Land use in the surrounding area is primarily commercial/industrial, with residential areas located to the west of the facility. The site is bordered by Interstate I-90 to the north, Bridge Street to the south, a Canadian Pacific (CP) Railroad right-of-way to the east, and Broadway to the west. The Hudson River is located approximately 0.5 miles east of the site. The site consists of the following areas: (1) former MGP area consists of the paved area immediately north and east of Building #2 where the former MGP operations were located; (2) Hazardous Waste Storage Tank Area consists of the aboveground storage tank area immediately south of Building #2; (3) Yard Storage Area consists of the equipment storage area located south of Building #2; and (4) Offsite Downgradient Area consists of the area east of the National Grid property to approximately 200 feet east of Erie Boulevard. The site operates as an active utility service center that serves as the primary maintenance, supply, storage, and office support facility for National Grid's operations in Eastern New York State. The North Albany Service Center is located on an approximately 25-acre parcel that consists of several buildings, parking lots, and storage areas. A natural gas regulator station and an electrical substation (the Genesee Street Substation) are located in the northwestern corner of the property.

B. The Work to be performed under this Contract includes, but is not limited to, the following:
   1. Excavating approximately 792 in-situ cubic yards of impacted subsurface soil, concrete, asphalt, and gravel, to a depth of approximately 6 feet below ground surface in preparation for ISS of underlying soils and the installation (by others) of a new sanitary sewer pipe from the oil-water separator inside the Fleet Building.
   2. Selectively demolishing and removing the former gas holder and pile foundations supporting the holder.
   3. ISS of approximately 2,632 in-situ cubic yards of MGP-impacted material to elevations of approximately -4.5 to -7.5 feet NAVD 88.
   4. Excavating bulked material generated by ISS, assumed to be 10% of the in-place mixing volume (263 cubic yards).
   5. Removal of demolition, excavation, and construction waste from the site and disposal at appropriate, National Grid-approved facilities in accordance with Laws and Regulations.
   6. Removing construction wastewater from the site for disposal at appropriate, National Grid-approved facilities in accordance with Laws and Regulations.
   7. Performing community air monitoring, geotechnical monitoring (vibration and settlement), and noise monitoring.
   8. Backfilling excavation areas.
   9. Performing pre- and post-remediation structural surveys of nearby buildings and facilities.
   10. Restoring the site.

C. Contracting Method: Work shall be performed under one prime contract.

D. Contaminants: Work related to Manufactured Gas Plant Waste, described in reports referenced in the Supplementary Conditions, is included in the Work.

1.02 SEQUENCE AND PROGRESS OF WORK

A. Sequencing:
   1. Incorporate sequencing of the Work into the Progress Schedule.

1.03 CONTRACTOR'S USE OF THE SITE

A. Use of Premises:
   1. Confine construction operations to the work areas shown or indicated on the Design Drawings. Do not disturb portions of the site beyond areas of the Work.
   2. Confine storage of materials and equipment, and locations of temporary facilities to the areas shown. Move stored products that interfere with National Grid's operations, other contractors, and others performing work for National Grid.
   3. Authorities having jurisdiction at the site and others performing work for National Grid shall, for all purposes that may be required by their contracts, have access to the site and the premises used by Contractor, and Contractor shall provide safe and proper access.

B. Promptly repair damage to premises caused by construction operations. Upon completion of the Work, restore premises to specified condition. If condition is not specified, restore to pre-construction condition.

1.04 EASEMENTS AND RIGHTS-OF-WAY

A. Easements and rights-of-way will be provided by National Grid in accordance with the General Conditions. Confine construction operations within public rights-of-way, easements obtained by National Grid, and the limits shown. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic. Do not enter private property outside the construction limits without permission from the owner of the property.

1.05 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify National Grid and Construction Manager when prosecution of the Work may affect adjacent properties or use of adjacent properties. National Grid will notify adjacent property owners; do not contact adjacent property owners directly unless authorized by National Grid to do so.

B. When it is necessary to temporarily obstruct access to property, provide notices sufficiently in advance to enable affected persons to provide for their needs. Conform notices to Laws and Regulations and, whether delivered orally or in writing, include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Notify utility owners and other concerned entities at least two working days, but not more than 10 working days, prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

PART 2– PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 15 00

CONTRACTOR'S PROJECT OPERATIONS PLAN

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Prepare and submit a Project Operations Plan (POP) in accordance with this Section.
   2. POP shall clearly describe Contractor's proposed means, methods, and sequence of construction operations, and shall demonstrate compliance with the Contract Documents.

B. Related Sections:
   1. Section 01 32 16, Construction Progress Schedule

1.02 SUBMITTALS

A. Informational Submittals:
   1. Contractor's POP: Submit in accordance with Article 1.03 of this Section.

1.03 POP SUBMITTAL

A. Contractor's POP shall address and include the following:
   1. Contractor's Organizational Structure: Specific chain of command and overall responsibilities of Contractor personnel. Include the following:
      a. Name, and general functions and responsibilities of the following:
         1) Project manager.
         2) Site superintendent.
         3) Foreman.
         4) Equipment operators and laborers.
         5) Others as appropriate.
      b. Designation of Contractor personnel that will reside at the site for the duration of the Project.
   2. Work Schedule: Proposed workdays and work hours. Include copy of Contractor's initial Progress Schedule, prepared in accordance with Paragraph 2.06 of the General Conditions and Section 01 32 16.
   3. List of major construction equipment. Include make, model, and size or rating of each.
   4. List of major Subcontractors and Suppliers. Include name, role, and contact information for the following:
      a. Safety representative.
      b. Air monitoring Subcontractor.
      c. Geotechnical laboratory Subcontractor.
      d. Structural engineering Subcontractor.
      e. Analytical laboratory Subcontractor.
      f. Surveyor.
      g. Suppliers and sources of offsite fill, aggregates, and topsoil.
      h. Treatment, disposal, and recycling facilities.
      i. Others as appropriate.
   5. Site Utilization Plan: Site plan showing the proposed location and layout of the following:
      a. Temporary utilities.
      b. Temporary pumping system.
      c. Field offices and sheds, sanitary facilities, and first-aid facilities.

d. Temporary parking areas.
e. Equipment storage and fueling area(s).
f. Grout batch plant and reagent silo(s). Clearly identify location and size of each.
g. Temporary decontamination area(s). Clearly identify location and size of each.
h. Temporary containment area(s). Clearly identify location and size of each.

6. Comprehensive Work Plan: Written description of the general sequence and scope of the following:
   a. Pre-construction activities.
      1) Excavation/ISS area survey layout.
      2) Pre-remediation structural surveys.
      3) Utility clearance, mark-out, and verification.
      4) Pre-excavation waste characterization sampling.
   b. Mobilization and site preparation.
   c. Site access controls and security.
   d. Erosion and sediment control.
   e. Odor, vapor, and dust control.
   f. Community air monitoring.
   g. Geotechnical monitoring.
   h. Excavation, including material handling and staging approach.
   i. In-situ soil solidification.
   j. Dewatering.
   k. Backfilling and grading.
   l. Site restoration.
   m. Waste management.
   n. Demobilization.

B. Submit POP to Engineer within 2 weeks of project award.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. This Section expands upon the provisions of the General Conditions and Supplementary Conditions, and includes administrative and procedural requirements for the following:
      a. Requests for interpretation.
      b. Clarification notices.
      c. Minor changes in the Work and Field Orders.
      d. Work Change Directives.
      e. Proposal requests.
      f. Change Order requests.
      g. Change Orders.

B. Submit Contract modification documents to Engineer.

C. Retain at Contractor's office and at the site or support area a complete copy of each Contract modification document and related documents, and Engineer's response.

D. Electronic copies of documents (provided in Adobe portable document format [PDF]) may be used in lieu of the hardcopies identified herein.

1.02 REQUESTS FOR INTERPRETATION

A. General:
   1. Submit requests for interpretation to obtain clarification or interpretation of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents using requests for interpretation.
   2. Do not submit request for interpretation when other form of communication is appropriate, such as submittals, requests for substitutions or "or equals", notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action.
   3. Submit written requests for interpretation to Engineer. Contractor and National Grid may submit requests for interpretation.

B. Procedure:
   1. Submit one original and one copy of each request for interpretation. Submit each request for interpretation with separate letter of transmittal.
   2. Engineer will provide timely review of requests for interpretation. Allow sufficient time for review and response.
   3. Engineer will maintain a log of all requests for interpretation. A copy of the log will be provided upon request.
   4. Engineer will provide written response to each request for interpretation. One copy of Engineer's response will be distributed to:
      a. Contractor.
      b. National Grid.
      c. Engineer.

5. If Engineer requests additional information to make an interpretation, provide requested information within ten days, unless Engineer allows additional time, via correspondence referring to request for interpretation number.
6. If Contractor or National Grid believes that a change in the Contract Price or Contract Times or other change to the Contract is required, notify Engineer in writing before proceeding with the Work associated with the request for interpretation.

C. Submit each request for interpretation on the request for interpretation form included with this Section, or other form acceptable to Engineer.
1. Number each request for interpretation using a two-digit sequential number. First request for interpretation will be "01".
2. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail for Engineer's response.
3. When applicable, request for interpretation shall include Contractor's recommended resolution.

1.03 CLARIFICATION NOTICES

A. General:
1. Clarification notices provide clarification or interpretation of conflicts, errors, ambiguities, and discrepancies in the Contract Documents that are identified by the Engineer.
2. Clarification notices do not change the Contract Price or Contract Times, and do not alter the Contract Documents.
3. Clarification notices, when required, will be initiated and issued by the Engineer as correspondence with additional information as required.

B. Procedure:
1. One copy of each written clarification notice will be distributed to:
a. Contractor.
b. National Grid.
c. Engineer.
d. NYSDEC.
2. If Contractor or National Grid believes that a change in the Contract Price or the Contract Times or other change to the Contract is required, notify Engineer in writing before proceeding with the Work associated with clarification notice.
3. If clarification notice is unclear, submit request for interpretation.

1.04 MINOR CHANGES IN THE WORK AND FIELD ORDERS

A. General:
1. Field Orders authorize minor variations in the Work, but do not change the Contract Price or Contract Times.
2. Field Orders, when required, will be initiated and issued by Engineer on the Field Order form included with this Section, or other form acceptable to Engineer.
3. Engineer will maintain a log of all Field Orders issued.

B. Procedure:
1. One copy of each Field Order will be distributed to:
a. Contractor.
b. National Grid.
c. Engineer.
d. NYSDEC.

2. If Contractor or National Grid believes that a change in the Contract Price or the Contract Times or other change to the Contract is required, immediately notify Engineer in writing before proceeding with the Work associated with the Field Order.
3. If Field Order is unclear, submit request for interpretation.

1.05 WORK CHANGE DIRECTIVES

A. General:
1. Work Change Directives, when required, order additions, deletions, or revisions to the Work.
2. Work Change Directives do not change the Contract Price or Contract Times, but are evidence that the parties to the Contract expect that the change ordered or documented by the Work Change Directive will be included in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.
3. Work Change Directives, when required, will be initiated and issued by the Engineer on the Work Change Directive form included with this Section, or other form acceptable to National Grid and Engineer.

B. Procedure:
1. Four originals of Work Change Directive signed by the National Grid and Engineer will be furnished to the Contractor, who shall promptly sign each original Work Change Directive and, within five days of receipt, return all originals to the Engineer.
2. Signed Work Change Directives will be distributed as follows:
   a. Contractor: One original.
   b. National Grid: Two originals.
   c. Engineer: One original.
3. When required by the Engineer, document the Work performed under each separate Work Change Directive. For each day, document the following in a format acceptable to Engineer:
   a. Number and type of workers employed and hours worked.
   b. Equipment used, including manufacturer, model, and year of equipment, and number of hours for each.
   c. Materials used.
   d. Receipts for and descriptions of materials and equipment incorporated into the Work.
   e. Invoices and labor and equipment breakdowns for Subcontractors and Suppliers.
   f. Other information required by National Grid or Engineer.
4. Submit documentation to Engineer as a Change Order request.

1.06 PROPOSAL REQUESTS

A. General:
1. Proposal requests are for requesting the effect on the Contract Price and the Contract Times and other information relative to contemplated changes in the Work.
2. Proposal requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times, or terms of the Contract.
3. Proposal requests may be initiated by Engineer or National Grid.
4. Proposal requests will be issued on the proposal request form included with this Section, or other form acceptable to National Grid and Engineer.

B. Procedure:
1. One copy of each signed proposal request will be furnished to Contractor, with one copy each distributed to:
   a. National Grid.

b. Engineer.
2. Submit request for interpretation to clarify conflicts, errors, ambiguities, and discrepancies in proposal request.
3. Upon receipt of proposal request, prepare and submit a Change Order request, in accordance with this Section, for the proposed Work described in the proposal request.

1.07 CHANGE ORDER REQUESTS

A. General:
1. Submit written Change Order request to Engineer in response to each proposal request, and when Contractor believes a change in the Contract Price or Contract Times, or other change to the terms of the Contract is required.

B. Procedure:
1. Submit to Engineer one original and one copy of each Change Order request with accompanying documentation. Submit each Change Order request with separate letter of transmittal.
2. Engineer will review Change Order request and either request additional information from Contractor or provide to National Grid a recommendation regarding approval of the Change Order request.
3. When Engineer requests additional information to render a decision, submit required information within five days of receipt of Engineer's request, unless Engineer allows more time. Submit the required information via correspondence that identifies the Change Order request number.
4. Upon completing review, one copy of Engineer's written response, if any, will be distributed to:
   a. Contractor.
   b. National Grid.
5. If Change Order request is recommended for approval by Engineer and approved by National Grid, a Change Order will be issued.

C. Submit each Change Order request on the Change Order request form included with this Section, or other form acceptable to National Grid and Engineer.
1. Number each Change Order request using a two-digit sequential number. First Change Order request will be "01".
2. In space provided on the form:
   a. Describe the scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for Engineer's review and response. If the proposed change is submitted in response to a proposal request, write in as scope, "In accordance with Proposal Request No." followed by the proposal request number. Provide written clarifications, if any, to scope of change.
   b. Provide justification for each proposed change. If the proposed change is submitted in response to a proposal request, write in as justification, "In accordance with Proposal Request No." followed by the proposal request number.
   c. List the total change in the Contract Price and Contract Times for each proposed change.
3. Unless otherwise directed by Engineer, attach to the Change Order request detailed breakdowns of pricing (Cost of the Work and Contractor's fee), including:
   a. List of Work tasks to accomplish the change.
   b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification.
   c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each.

d. Detailed breakdown of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations.
e. Breakdowns of the Cost of the Work and fee for Subcontractors, including labor, construction equipment and machinery, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees.
f. Breakdown of other eligible costs, in accordance with the General Conditions.
g. Other information required by Engineer.
h. Contractor's fees applied to eligible Contractor costs and eligible Subcontractor costs.

1.08 CHANGE ORDERS

A. General:
1. Change Orders will be recommended by Engineer, and signed by National Grid and Contractor, to authorize additions, deletions, or revisions to the Work, or changes to the Contract Price or Contract Times.
2. Change Orders will be issued on the Change Order form included with this Section or other form acceptable to National Grid and Engineer.

B. Procedure:
1. The Engineer will furnish four originals of each Change Order to Contractor, who shall promptly sign each original Change Order and, within five days of receipt, return all originals to Engineer.
2. Engineer will sign each original Change Order and forward them to National Grid.
3. After approval and signature by National GRid, signed Change Orders will be distributed as follows:
a. Contractor: One original.
b. National Grid: Two originals.
c. Engineer: One original.

PART 2– PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 ATTACHMENTS

A. The attachments listed below, which follow after the "End of Section" designation, are part of this Section:
1. Attachment A: Request for Interpretation form (one page).
2. Attachment B: Field Order form (one page).
3. Attachment C: Work Change Directive form (two pages).
4. Attachment D: Proposal Request form (one page).
5. Attachment E: Change Order Request form (two pages).
6. Attachment F: Change Order form (two pages).

END OF SECTION

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NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

REQUEST FOR INTERPRETATION NO. ___

Contractor: _____ Purchase Order No.: _____

Date Transmitted: _____ Date Received: _____

Date Response Requested: _____ Date Response Transmitted: _____

Subject: _____

Reference(s): _____ _____
Specification Section(s) Drawing(s) / Note(s) / Detail(s)

Interpretation Requested:

Signature: _____ Date: _____

Engineer's Response:

Signature: _____ Date: _____

END OF REQUEST FOR INTERPRETATION

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NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

FIELD ORDER NO. ___

Contractor: _____ Purchase Order No.: _____

Date Issued: _____ Effective Date: _____

Subject: _____

Reference(s): _____ _____
Specification Section(s) Drawing(s) / Note(s) / Detail(s)

Attention:

Contractor is hereby directed to promptly execute this Field Order for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, please notify Engineer immediately and before proceeding with this Work.

Description:

Attachments:

Issued by Engineer:

Signature: _____ Date: _____

Receipt Acknowledged by Contractor:

Signature: _____ Date: _____

END OF FIELD ORDER

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NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

WORK CHANGE DIRECTIVE NO

Contractor: _____ Purchase Order No.: _____

Date Issued: _____ Effective Date: _____

Contractor is directed to proceed promptly with the following change(s):

Item No.	Description

Scope of Work:

Attachments:

Purpose for Work Change Directive:

Authorization for the Work described herein to proceed on the basis of Cost of the Work due to:

☐ Non-agreement on pricing of proposed change.

☐ Necessity to expedite Work described herein prior to agreeing to changes in Contract Price and Contract Times.

Estimated Change in Contract Price and Contract Times:

Contract Price:

$_____ ☐ Increase ☐ Decrease ☐ No Change

Contract Times:

_____ Days ☐ Increase ☐ Decrease ☐ No Change

Recommended for Approval by Engineer:

Signature: _____ Date: _____

Authorized by National Grid:

Signature: _____ Date: _____

Receipt Acknowledged by Contractor:

Signature: _____ Date: _____

END OF WORK CHANGE DIRECTIVE

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

PROPOSAL REQUEST NO.

Contractor: _____ Purchase Order No.: _____

Date: _____

Subject: _____

Please submit a complete Change Order request for the proposed modifications described below. If the associated Change Order request is approved, a Change Order will be issued to authorize adjustment to the scope of the Work. This proposal request is not a Change Order, Work Change Directive, or an authorization to proceed with the proposed Work described below.

Scope of Proposed Work:

Requested by Engineer:

Signature: _____ Date: _____

END OF PROPOSAL REQUEST

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NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

CHANGE ORDER REQUEST NO.

Contractor: _____ Purchase Order No.: _____

Date: _____ Submitted in Response to Proposal Request No.: _____

Subject: _____

Scope of Work:

Attach and list supporting information as required.

Justification:

Changes in Contract Price and Contract Times:

For Contract Price, when requested by Engineer, attach detailed cost breakdowns for Contractor and Subcontractors, Supplier quotations, and other information required. For the Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to the Contract Times.

The following changes are proposed to the Contract Price and Contract Times:

Description	Contract Price (dollars)	Contract Times (days)	
		Substantial	Final
1.	$		
2.	$		
Total This Change Order Proposal:	**$**		

Changes to Milestones (if any): _____

The adjustment proposed is the entire adjustment to the Contract to which Contractor believes it is entitled as a result of the proposed change.

Requested by Contractor:

Signature: _____ Date: _____

END OF CHANGE ORDER REQUEST

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

CHANGE ORDER NO.

Contractor: _____ Purchase Order No.: _____

Date Issued: _____ Effective Date: _____

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments:

Change in Contract Price:

A. Original Contract Price: $_____

B. ☐ Increase ☐ Decrease ☐ No Change
from previously approved Change Order Nos. ___ to ___: $_____

C. Contract Price prior to this Change Order (Lines A+B): $_____

D. ☐ Increase ☐ Decrease ☐ No Change
of this Change Order: $_____

E. Contract Price incorporating this Change Order (Lines C+D): $_____

Change in Contract Times:

A. Original Contract Times ☐ Working days ☐ Calendar days:

Substantial Completion (days or date): _____
Ready for Final Payment (days or date): _____

B. ☐ Increase ☐ Decrease ☐ No Change
from previously approved Change Order Nos. ___ to ___:

Substantial Completion (days or date): _____
Ready for Final Payment (days or date): _____

C. Contract Times prior to this Change Order (Lines A+B):

Substantial Completion (days or date): _____
Ready for Final Payment (days or date): _____

D. ☐ Increase ☐ Decrease ☐ No Change
of this Change Order:

Substantial Completion (days or date): _____
Ready for Final Payment (days or date): _____

E. Contract Times incorporating this Change Order (Lines C+D):

Substantial Completion (days or date): _____
Ready for Final Payment (days or date): _____

Recommended for Approval by Engineer:

Signature: _____ Date: _____

Accepted by National Grid:

Signature: _____ Date: _____

Accepted by Contractor:

Signature: _____ Date: _____

END OF CHANGE ORDER

SECTION 01 31 13

PROJECT COORDINATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for coordinating construction operations on the Project.

B. Related Sections
   1. Section 01 11 00 – Summary of Work

1.02 COORDINATION

A. Coordinate the Work with all necessary parties (whether hired by Contractor, National Grid, or others) including testing agencies, subcontractors, suppliers, and others, in accordance with this Section, to complete the Work in accordance with the Contract Documents.

B. Cooperate with other contractors, utility service companies, and other entities working at the site, in accordance with Specification Section 01 11 00.

C. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

D. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Prepare progress schedule.
   2. Install and remove temporary utilities, facilities, and controls.
   3. Deliver and process submittals.
   4. Progress meetings.
   5. Startup and adjust systems.
   6. Project closeout activities.

E. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

PART 2– PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19.13

PROJECT MEETINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. A pre-construction conference will be held for the Project. Contractor shall attend the conference and be prepared to discuss all items on the agenda.
   2. Construction Manager will distribute an agenda, preside at conference, and prepare and distribute minutes to all conference participants and others as requested.

B. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by Contractor, and review administrative and procedural requirements for the Project. Matters requiring coordination will be discussed and procedures for handling such matters will be established.

C. Date, Time, and Location: Conference will be held within 10 business days after the notice to proceed and before Work starts at the site. Engineer will establish the date, time, and location of conference and will notify the interested and involved parties a minimum of two weeks prior to the conference.

D. Prior to the conference, submit the following preliminary schedules in accordance with the General Conditions:
   1. Progress Schedule.
   2. Schedule of Submittals.

E. Provide information required and contribute appropriate items for discussion. Contractor shall bring to the conference the following, with sufficient number of copies for each attendee:
   1. Preliminary Progress Schedule.
   2. Preliminary Schedule of Submittals.

1.02 ATTENDANCE

A. Representatives present for each entity shall be qualified and authorized to act on that entity's behalf.

B. Attendance:
   1. Contractor:
      a. Project manager.
      b. Site superintendent.
      c. Safety representative.
   2. National Grid.
   3. Construction Manager.
   4. Engineer.
   5. NYSDEC and NYSDOH, if available.
   6. Others as requested by National Grid, Contractor, or Engineer.

1.03 PRELIMINARY AGENDA

A. Safety moment.

B. Procedural and Administrative:
   1. Personnel and Teams:
      a. Designation of roles and responsible personnel.
      b. Limitations of authority of personnel, including personnel who will sign Contract modifications and make binding decisions.
      c. List of proposed Subcontractors and Suppliers.
      d. Authorities having jurisdiction.
   2. Procedures for communication and correspondence.
   3. Community relations and interaction during the Project.
   4. Copies of Contract Documents and availability.
   5. The Work and Scheduling:
      a. Scope of Work.
      b. Contract Times, including Milestones (if any).
      c. Phasing and sequencing.
      d. Preliminary Progress Schedule.
      e. Critical path activities.
      f. Working hours.
   6. Safety:
      a. Responsibility for safety.
      b. Designation of Contractor's safety representative.
      c. Emergency procedures and accident reporting.
      d. Emergency contact information.
      e. Impact of Project on public safety.
   7. Permits, approvals, and access agreements.
   8. Coordination:
      a. Project coordination.
      b. Progress meetings.
   9. Products and Submittals:
      a. Preliminary Schedule of Submittals.
      b. Shop Drawings, Samples, and other submittals.
      c. Product options, "or equals", and substitutions.
   10. Contract Modification Procedures:
      a. Requests for interpretation.
      b. Clarification notices.
      c. Field Orders.
      d. Work Change Directives.
      e. Proposal requests.
      f. Change Order requests.
      g. Change Orders.
   11. Payment:
      a. Progress payment procedures.
      b. Taxes.
      c. Retainage.
   12. Testing and inspections.
   13. Record documents.
   14. Preliminary Discussion of Contract Closeout:
      a. Procedures for Substantial Completion.
      b. Contract closeout requirements.
      c. Correction period.
      d. Duration of bonds and insurance.

C. Mobilization:
   1. Field offices, trailers, and containment areas.
   2. Temporary facilities and utilities.
   3. Access to site and parking.
   4. Maintenance and protection of traffic.
   5. Use of premises.
   6. Protection of existing property.
   7. Security.
   8. Temporary Controls:
      a. Erosion and sediment control.
      b. Storm water control.
      c. Odor, vapor, and dust control.
      d. Noise control.
      e. Pollution control.
   9. Site barriers and temporary fencing.
   10. Storage of materials and equipment.
   11. Reference points and benchmarks; surveys and layouts.
   12. Site maintenance and housekeeping during the Project, including cleaning and removal of trash and debris.
   13. Restoration.

D. General discussion and questions.

E. Next meeting.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 31 19.23

PROGRESS MEETINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Progress meetings will be held on a regular basis throughout the Project. Contractor shall attend each progress meeting and be prepared to discuss in detail all items on the agenda.
   2. Construction Manager will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.

B. Date and Time:
   1. Regular Meetings: Every week on a day and time agreeable to National Grid, Construction Manager, Engineer, and Contractor.
   2. Other Meetings: As required.

C. Location: Contractor's field office at the site or other location mutually agreed upon by National Grid, Construction Manager, Engineer, and Contractor.

D. Handouts: Contractor shall bring to each progress meeting a minimum of 10 copies of each of the following:
   1. List of Work accomplished since the previous progress meeting.
   2. Up-to-date Progress Schedule.
   3. Up-to-date Schedule of Submittals.
   4. Detailed "look-ahead" schedule of Work planned for the next two weeks, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting National Grid, the Project, the site, and property owners.

1.02 ATTENDANCE

A. Representatives present for each entity shall be qualified and authorized to act on that entity's behalf.

B. Attendance:
   1. Contractor:
      a. Project manager.
      b. Site superintendent.
      c. Safety representative.
      d. Air monitoring technician.
      e. Representatives of other Subcontractors and Suppliers when needed for the discussion of a particular agenda item.
   2. National Grid.
   3. Construction Manager.
   4. Engineer.
   5. NYSDEC and NYSDOH, if available.
   6. Others as appropriate.

1.03 PRELIMINARY AGENDA

A. Review, comment, and amendment (if required) of minutes of previous progress meeting.

B. Safety and safe work practices.

C. Results of community air monitoring performed since previous progress meeting.

D. Review of progress since previous progress meeting.

E. Planned progress through next progress meeting.

F. Planned events at adjacent properties and Contractor coordination.

G. Review of Progress Schedule:
   1. Contract Times, including Milestones (if any).
   2. Critical path.
   3. Schedules for fabrication and delivery of materials and equipment.
   4. Issues potentially affecting the Contract Times, including Milestones (if any).
   5. Corrective measures, if required, to achieve Contract Times, including Milestones (if any).

H. Submittals:
   1. Status of critical submittals.
   2. Review of Schedule of Submittals and Engineer's submittal log.

I. Field observations, problems, and conflicts.

J. Quality standards, testing, and inspections.

K. Coordination between parties.

L. Site management issues, including access, security, temporary controls, maintenance and protection of traffic, and housekeeping.

M. Permits.

N. Punch list status, as applicable.

O. Other business.

P. NYSDEC and NYSDOH input.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Prepare, submit, maintain, and update Progress Schedules in accordance with this Section, unless otherwise accepted by National Grid.
   2. National Grid acceptance of the Progress Schedule, and comments or opinions concerning the activities in the Progress Schedule shall not control the Contractor's independent judgment relative to the means, methods, techniques, sequences, and procedures of construction. The Contractor is solely responsible for complying with the Contract Times.
   3. If the Progress Schedule reflects completion date(s) different than the Contract Times, the Contract Times are not thereby voided, nullified, or affected. The Contract Times govern. Where the Progress Schedule reflects completion date(s) that are earlier than the Contract Times, National Grid may accept such Progress Schedule with Contractor to specifically understand that no Claim for additional Contract Times or additions to the Contract Price shall be brought against National Grid resulting from Contractor's failure to complete the work by the earlier date(s) indicated on the accepted Progress Schedule.

B. Related Sections
   1. Section 01 11 00, Summary of Work
   2. Section 01 31 19.23, Progress Meetings
   3. Section 01 33 00, Submittal Procedures

C. Factors Affecting the Progress Schedule

   1. In preparing the Progress Schedule, take into consideration submittal requirements and submittal review times, time for fabricating and delivering materials and equipment, work by subcontractors, availability and abilities of workers, availability of construction equipment, weather conditions, restrictions in operations at the site and support area and coordination with National Grid's operations, if any, and other factors that have the potential to affect completion of the work within the Contract Times.
   2. Comply with sequencing requirements, if any, indicated in the Contract Documents.

1.02 SUBMITTALS

A. Informational Submittals
   1. Preliminary Progress Schedule: Submit preliminary Progress Schedule in accordance with this Section.
   2. Initial Progress Schedule: After making revisions in accordance with National Grid's/Engineer's comments on the preliminary Progress Schedule, submit initial Progress Schedule in accordance with this Section.
   3. Progress Schedule Updates:
      a. Submit updated Progress Schedule at each progress meeting. Bring to meeting the minimum number of copies specified in Section 01 31 19.23.
      b. Submit each updated Progress Schedule with letter of transmittal complying with requirements of Section 01 33 00 and specifically indicating the following:

1) Listing of activities and dates that have changed since the previous Progress Schedule submittal.
2) Discussion of problems causing delays, anticipated duration of delays, and proposed countermeasures.
3) Completed activities, if any, and the anticipated and actual durations of each.

c. If the Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect.

4. Look-Ahead Schedules: Submit two-week look-ahead schedule at each progress meeting.
5. Recovery Schedules: Submit in accordance with this Section.

1.03 PROGRESS SCHEDULE FORMAT AND CONTENT

A. Format
1. Type: Gantt chart prepared using Microsoft Project 2007 or later edition.
2. Data Format: Submit as Microsoft Project and in Portable Document Format in accordance with Specification Section 01 33 00.
3. Submit and maintain onsite a hard copy of the schedule printed on a format of suitable size. The Portable Document Format version shall be formatted to print on 11 x 17.
4. Time Scale: Indicate first date of each work week.
5. Organization:
   a. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.
   b. Group construction into a separate sub-schedule (that is part of the Progress Schedule) by activity.
   c. Group Work by Subcontractors into a separate sub-schedule (that is part of the Progress Schedule) by activity.
   d. Group critical activities that dictate the rate of progress (the “critical path”) into a separate sub-schedule that is part of the Progress Schedule. Clearly indicate the critical path on the Progress Schedule.
   e. Organize each sub-schedule by Specification Section or payment item number.
6. Activity Designations: Indicate title and related Specification Section or payment item number.

B. Content
1. At a minimum, the following major work items and in the general sequence provided in Section 01 11 00 should be included, with appropriate subtasks included as necessary, in the general sequence listed below:
   a. Site preparation.
   b. Excavation of approximately 804 in-situ cubic yards of impacted surface and subsurface soil, concrete, asphalt, and gravel, to a depth of approximately 6 feet below ground surface in preparation for in-situ soil solidification of underlying soils and the installation (by others) of a new sanitary sewer pipe from the oil-water separator inside the Fleet Building.
   c. Selective demolition and removal of the former gas holder and pile foundations supporting the holder.
   d. ISS of approximately 2,632 in-situ cubic yards of MGP-impacted material to elevations of approximately -4.5 to -7.5 feet NAVD 88.
   e. Excavation of bulked material generated by ISS, assumed to be 10% of the in-place mixing volume (263 cubic yards).
   f. Removal of demolition, excavation, and construction waste from the site and disposal at appropriate, National Grid-approved facilities in accordance with Laws and Regulations.

g. Removal of construction wastewater from the site and disposal at appropriate, National Grid-approved facilities in accordance with Laws and Regulations.
h. Performance of community air monitoring, geotechnical monitoring (vibration and settlement), and noise monitoring.
i. Backfilling excavation areas.
j. Restoration of the site.

2. Progress Schedules shall also indicate the following:
   a. Dates for shop-testing.
   b. Delivery dates for materials and equipment to be incorporated into the Work.
   c. Dates for beginning and completing each phase of the Work by activity and by trade.
   d. Dates for start-up, check-out, and field-testing.
   e. Dates corresponding to the Contract Times, and planned completion date associated with each Milestone (if any), Substantial Completion, and readiness for final payment.
   f. Manpower for each item and percent complete for each task.

C. Progress Schedule Updates: Update Progress Schedule on a bi-weekly basis (i.e., every two weeks) and to reflect changes to the Contract Times, if any.

D. Coordinate the Progress Schedule with the Schedule of Submittals.

1.04 RECOVERY SCHEDULES

A. General
   1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls two or more weeks behind schedule, and there is no excusable delay, Change Order, or Work Change Directive to support an extension of the Contract Times, Contractor shall prepare and submit a Progress Schedule demonstrating Contractor's plan to accelerate the work to achieve compliance with the Contract Times ("recovery schedule") for National Grid's acceptance.
   2. Submit recovery schedule within three days after submittal of updated Progress Schedule where need for recovery schedule is indicated.

B. Implementation of Recovery Schedule
   1. At no additional cost to National Grid, do one or more of the following: furnish additional labor, provide additional construction equipment, provide suitable materials, employ additional work shifts, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.
   2. Upon acceptance of recovery schedule by National Grid, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action: Refusal, failure, or neglect to take appropriate recovery action, or to submit a recovery schedule, shall constitute reasonable evidence that Contractor is not prosecuting the work or separable part thereof with the diligence that will ensure completion within the Contract Times.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 32 26

CONSTRUCTION PROGRESS REPORTING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Prepare and submit construction progress reports in accordance with this Section.
   2. Construction progress reports include:
      a. Daily construction reports.
      b. Field condition reports.

B. Related sections
   1. Section 01 26 00, Contract Modification Procedures
   2. Section 01 35 29, Contractor's Health and Safety Plan

1.02 SUBMITTALS

A. Informational Submittals:
   1. Daily Construction Reports: Submit in accordance with Article 1.03 of this Section.
   2. Field Condition Reports: Submit in accordance with Article 1.04 of this Section.

1.03 DAILY CONSTRUCTION REPORTS

A. Prepare daily construction reports throughout the Project. Include in each report, at a minimum, the following:
   1. Contractor's name.
   2. National Grid's name.
   3. Project name.
   4. Site name and location.
   5. Date and day of the week.
   6. High and low temperatures and general weather conditions.
   7. Number of Contractor employees at the site.
   8. Number of employees at the site for each Subcontractor.
   9. Breakdown of employees by trades.
   10. Major construction equipment used.
   11. Material and equipment deliveries.
   12. Waste shipments.
   13. Meter readings and similar recordings.
   14. Work performed, including field quality control measures and testing.
   15. Location of areas in which construction was performed.
   16. Major equipment and materials installed as part of the Work.
   17. Services connected and disconnected.
   18. Equipment or system tests and startups.
   19. Stoppages, delays, shortages, and losses.
   20. Accidents. Comply with accident reporting requirements of Section 01 35 29.
   21. Emergency procedures.
   22. Field meetings and significant decisions.
   23. Orders and requests of authorities having jurisdiction.
   24. Change Orders received and implemented.
   25. Work Change Directives received and implemented.

26. Field Orders received and implemented.
27. Other instructions received from National Grid or Engineer.

B. Submit daily construction reports to Engineer by 9:00 a.m. the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor's staff, such as Contractor's project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

1.04 FIELD CONDITION REPORTS

A. Immediately upon discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

B. Submit field condition reports to Engineer with request for interpretation, prepared in accordance with Section 01 26 00.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide photographic documentation of the following:
      a. Pre-construction site conditions.
      b. Construction progress.
      c. Final (post-construction) site conditions.

B. Image Quality:
   1. Photographic documentation shall be in color.
   2. Photographic images shall be suitably staged and set up (“framed”), focused, and shall have adequate lighting.
   3. For still photographs, use camera with minimum 8.0-megapixel resolution.

1.02 SUBMITTALS

A. Informational Submittals:
   1. Pre-Construction Photographic Documentation: Submit acceptable pre-construction photographic documentation prior to mobilizing to and disturbing the site. Provide pre-construction photographic documentation no later than first Application for Payment, unless other schedule is accepted by Engineer.
   2. Construction Progress Photographic Documentation: Submit acceptable construction progress photographic documentation weekly.

B. Closeout Submittals:
   1. Final Photographic Documentation: Submit acceptable final photographic documentation prior to submitting final Application for Payment.

1.03 PHOTOGRAPHIC DOCUMENTATION

A. General:
   1. For each photograph taken, furnish high-quality digital image in “JPG” file format compatible with Microsoft Windows 10 and higher operating systems.
   2. Image resolution shall be sufficient for clear, high-resolution prints. Minimum resolution shall be 300 dots per inch. Minimum size of digital images shall be 5 inches by 7 inches.
   3. Imprint date in each image. Do not imprint time.
   4. Digital image filename shall consist of the date and sequential number of the photograph. Do not submit filenames automatically created by digital camera.
      a. First part of filename shall be the date that the photograph was taken, represented as an eight-digit number (i.e., YYYYMMDD), followed by a hyphen.
      b. Second part of filename shall be a three-digit number (from 001 to 999) representing the sequential number of the photograph.
      c. Typical filename for the fifth photograph taken on January 1, 2025 would be “20250101-005.jpg”.
   5. Submitting Digital Image Files: Upload digital image files to the Project SharePoint site.

B. Pre-Construction Photographs:
   1. Take at least 50 photographs to record site conditions prior to construction. Pre-construction photographs are not part of construction progress photographs required under Paragraph 1.03.C of this Section.
   2. If disagreement arises on condition of the site and insufficient pre-construction photographic documentation was submitted prior to the disagreement, restore the grounds or area in question to extent directed by Engineer and to complete satisfaction of Engineer.

C. Progress Photographs:
   1. Take at least 25 photographs per week.
   2. Provide interior and exterior photographic documentation of each structure as directed by Engineer at the time photographic documentation is taken.

D. Final Photographs:
   1. Take photographs at time and day acceptable to Engineer. Do not take final photographs prior to Substantial Completion. Work documented in final photographs shall be generally complete, including painting and finishing, furnishings, landscaping, and other visible Work.
   2. Take at least 50 final photographs, based on scope of the Project at the time Contract Times commence running. Proportionately modify the number of final photographs if scope of Project is modified. Final photographs are not part of construction progress photographs required under Paragraph 1.03.C of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide submittals in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section.
   2. Provide submittals well in advance of the need for the material, equipment, or procedure (as applicable) in the Work and with ample time required for delivery of material or equipment and to implement procedures following Engineer's review or acceptance of the associated submittal. Unless indicated otherwise in the Contract Documents, submittals shall be provided at least four weeks before product delivery/work activity initiation, to the extent practical. Work covered by a submittal will not be included in progress payments until review or acceptance of related submittals has been obtained in accordance with the Contract Documents.
   3. Contractor is responsible for dimensions to be confirmed and corrected at the site, for information pertaining solely to the fabrication processes and to techniques of construction, and for coordinating the work of all trades. Contractor's signature of submittal's stamp and letter of transmittal shall be Contractor's representation that Contractor has met its obligations under the Contract Documents relative to that submittal.

B. Samples:
   1. Conform submittal of Samples to the General Conditions, as may be modified by the Supplementary Conditions, this Section, and the Specification Section in which the Sample is specified.
   2. Furnish at the same time Samples and submittals that are related to the same unit of Work or Specification Section. Engineer will not review submittals without associated Samples, and will not review Samples without associated submittals.
   3. Samples shall clearly illustrate functional characteristics of product, all related parts and attachments, and full range of color, texture, pattern, and material.

C. Related Sections:
   1. Section 01 78 39, Project Record Documents

1.02 TYPES OF SUBMITTALS

A. Submittals are classified as Action Submittals, Informational Submittals, Closeout Submittals, and Maintenance Material Submittals. The type of each required submittal is designated in the respective Specification Sections. When type of submittal is not specified in the associated Specification Section, submittal will be classified as follows:
   1. Action Submittals include:
      a. Shop Drawings.
      b. Product data.
      c. Delegated design submittals, which include documents prepared, sealed, and signed by a design professional retained by Contractor, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design submittals do not include submittals related to temporary construction unless specified otherwise in the related Specification Section. Delegated design submittals

include design drawings, design data including calculations, specifications, certifications, and other submittals prepared by such design professional.
   d. Samples.
   e. Testing plans, procedures, and testing limitations.
2. Informational Submittals include:
   a. Certificates.
   b. Design data not sealed and signed by a design professional retained by Contractor, Subcontractor, or Supplier.
   c. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, potential Contaminants, and similar reports.
   d. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.
   e. Source quality control submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.
   f. Field quality control submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the site.
   g. Supplier reports.
   h. Sustainable design submittals (other than sustainable design closeout documentation).
   i. Special procedure submittals, including health and safety plans and other procedural submittals.
   j. Qualifications statements.
3. Closeout Submittals include:
   a. Maintenance contracts.
   b. Operations and maintenance data.
   c. Bonds, such as maintenance bonds and bonds for a specific product or system.
   d. Warranty documentation.
   e. Record documentation.
   f. Sustainable design closeout documentation.
   g. Software.
4. Maintenance Material Submittals include:
   a. Spare parts.
   b. Extra stock materials.
   c. Tools.
5. When type of submittal is not specified and is not included in the list above, Engineer will determine the type of submittal.

B. Not Included in this Section: Administrative and procedural requirements for the following are covered elsewhere in the Contract Documents:
   1. Requests for interpretations of the Contract Documents.
   2. Field Orders, Work Change Directives, and Change Orders.
   3. Applications for Payment.
   4. Progress Schedules.
   5. Progress reports.
   6. Photographic documentation.
   7. Reports and documentation required in accordance with applicable permits.
   8. Site survey data.

1.03 SUBMITTALS REQUIRED IN THIS SECTION

A. Informational Submittals:
   1. Schedule of Submittals:
      a. Timing:
         1) Provide submittal within time frames specified in the Contract Documents.

2) Provide updated Schedule of Submittals with each submittal of the updated Progress Schedule.

b. Content: In accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path. Indicate the following for each submittal:
   1) Date by which submittal will be provided to Engineer.
   2) Whether submittal will be for a substitution or "equal". Procedures for substitutions and "or equals" are specified in the General Conditions, as may be modified by the Supplementary Conditions, and the General Requirements.
   3) Date by which Engineer's response is required. At least 21 days shall be allowed from Engineer's receipt of each submittal. Allow increased time, upwards of 28 days, for large or complex submittals.
   4) For submittals for materials or equipment, date by which material or equipment must be at the site to avoid delaying the Work and to avoid delaying the work of other contractors.

c. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules.

d. Coordinate Schedule of Submittals with the Progress Schedule.

e. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.

f. In preparing Schedule of Submittals:
   1) Considering the nature and complexity of each submittal, allow sufficient time for review and revision.
   2) Reasonable time shall be allowed for Engineer's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to Contractor.
   3) Identify and accordingly schedule submittals that are expected to have long anticipated review times and submittals that may be subject to review by authorities having jurisdiction.

1.04 PROCEDURE FOR SUBMITTALS

A. Submittal Identification System: Use the following submittal identification system, consisting of submittal number and review cycle number.
   1. Submittal number shall be separate and unique number correlating to each individual submittal required. Assign submittal number as follows:
      a. First part of submittal number shall be the applicable Specification Section number, followed by a hyphen.
      b. Second part of submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique submittal provided under the associated Specification Section.
      c. Typical submittal number for the third submittal provided for Section 31 23 23 would be "31 23 23-003".
   2. Review cycle number shall be a letter designation indicating the initial submittal or re-submittal associated with each submittal number:
      a. "A" = Initial (first) submittal.
      b. "B" = Second submittal (i.e., first re-submittal).
      c. "C" = Third submittal (i.e., second re-submittal).

3. Typical submittal identification for the second submission (first re-submission) of the third submittal provided for Section 31 23 23 would be “31 23 23-003-B”.

B. Letter of Transmittal for Submittals:
   1. Provide separate letter of transmittal with each submittal. Each submittal shall be for one Specification Section.
   2. Each letter of transmittal shall contain the following:
      a. Contractor’s name.
      b. National Grid’s name.
      c. Project name.
      d. Contract or Purchase Order number.
      e. Transmittal number.
      f. Submittal number and review cycle.
      g. Submittal date and dates of any previous submissions.
      h. Reference to appropriate Specification Section number, page, and paragraph(s).
      i. Reference to appropriate Drawing sheet(s) and detail(s).
      j. Clear space at least three inches by three inches in size for affixing Engineer’s review stamp.
      k. Clear space suitably sized for affixing Contractor’s stamp.
   3. For submittals with proposed deviations from the requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

C. Contractor’s Review and Stamp:
   1. Contractor’s Review: Before transmitting submittals to Engineer, review submittals to:
      a. Ensure proper coordination of the Work.
      b. Determine that each submittal is in accordance with Contractor’s desires.
      c. Verify that submittal contains sufficient information for Engineer to determine compliance with the Contract Documents.
   2. Incomplete or inadequate submittals will be returned without review.
   3. Contractor’s Stamp and Signature:
      a. Each submittal provided shall bear Contractor’s stamp of approval and signature, as evidence that submittal has been reviewed by Contractor and verified as complete and in accordance with the Contract Documents.
      b. Submittals without Contractor’s stamp and signature will be returned without review.
      c. Contractor’s stamp shall contain the following certification statement:

         “By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data, and I have checked and coordinated each item with other applicable Shop Drawings and all Project requirements.”

D. Submittal Marking and Organization:
   1. Mark each page of submittal, and each individual component submitted, with submittal number and applicable Specification paragraph.
   2. Arrange submittal information in same order as requirements are written in the associated Specification Section.
   3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to Engineer.
   4. Package together submittals for the same Specification Section. Do not provide required information piecemeal.

E. Format of Submittals:
   1. Action Submittals and Informational Submittals: Submit electronic copies, except that submittals of Samples shall be as specified in Paragraph 1.04.E.2 of this Section.

2. Samples:
    a. Securely label or tag Samples with submittal identification number. Label or tag shall include clear space at least three inches by three inches in size for affixing Engineer's review stamp. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.
    b. Submit number of Samples required in Specifications. If number of Samples is not specified in the associated Specification Section, provide at least three identical Samples of each item required for Engineer's review. Samples will not be returned to Contractor. If Contractor requires Sample(s) for Contractor's use, notify Engineer in writing and provide additional Sample(s). Contractor is responsible for furnishing, shipping, and transporting additional Samples.
    c. Deliver one Sample to Engineer's field office at the site. Deliver balance of Samples to Engineer's office, unless otherwise directed by Engineer.
3. Closeout Submittals:
    a. Submit electronic copies of the following Closeout Submittals:
        1) Maintenance contracts.
        2) Operations and maintenance data.
        3) Bonds for specific products or systems.
        4) Warranty documentation.
        5) Sustainable design closeout documentation.
    b. Record Documentation: Submit in accordance with Section 01 78 39.
    c. Software: Submit number of copies required in Specification Section where the software is specified. If number of copies is not specified, provide two copies on compact disc in addition to software loaded on to National Grid's computer(s) or microprocessor(s).
4. Maintenance Material Submittals: For spare parts, extra stock materials, and tools, submit quantity of items specified in associated Specification Section.

F. Electronic Submittals:
1. Format: Electronic files shall be in Portable Document Format (PDF). Files shall be electronically searchable.
2. Organization and Content:
    a. Each electronic submittal shall be one file; do not divide individual submittals into multiple files each.
    b. When submittal is large or contains multiple parts, provide PDF file with bookmark for each section of submittal.
    c. Content shall be identical to paper submittal. First page of electronic submittal shall be Contractor's letter of transmittal.
3. Quality and Legibility: Electronic submittal files shall be made from the original and shall be clear and legible. Do not provide scans of faxed copies. Electronic file shall be full size of original paper documents. All pages shall be properly oriented for reading on a computer screen.
4. Provide sufficient Internet service and e-mail capability for Contractor's use in transferring electronic submittals and electronic correspondence. Check at least once per day for distribution of electronic submittals and electronic correspondence related to submittals.
5. Submitting Electronic Files: Upload electronic copies of submittals to the Project SharePoint site.

G. Distribution:
1. Engineer will upload electronic copy of each reviewed or accepted submittal requiring Engineer's written response to the Project SharePoint site.
2. Distribute hard copy reproductions of reviewed or accepted submittals, where required, to the job site file and elsewhere, as directed by Engineer. Number of hardcopies shall be as directed by Engineer, but will not exceed six.

H. Resubmittals: Refer to the General Conditions, as may be modified by the Supplementary Conditions, for resubmittal requirements.

I. Engineer's Submittal Log:
   1. Engineer will maintain a log of required submittals using the form included with this Section. Updated submittal log will be provided to Contractor upon request.
   2. Review submittal log and status of each submittal with Engineer on a weekly or more frequent basis.
   3. Coordinate updates to Schedule of Submittals with Engineer's updates to submittal log.

1.05 ENGINEER'S REVIEW

A. Timing: Engineer's review will conform to timing accepted by Engineer in the accepted Schedule of Submittals.

B. Submittals not required in the Contract Documents will not be reviewed by Engineer and will not be recorded in Engineer's submittal log. Hardcopies, if any, of such submittals will be returned to Contractor.

C. Results of Engineer's Review:
   1. Action Submittals: Each submittal will be given one of the following dispositions:
      a. Reviewed: Upon return of submittal marked "Reviewed", order, ship, or fabricate materials and equipment included in the submittal (pending Engineer's review or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents.
      b. Reviewed and Noted: Upon return of submittal marked "Reviewed and Noted", order, ship, or fabricate materials and equipment included in the submittal (pending Engineer's review or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, provided it is in accordance with corrections indicated.
      c. Revise and Resubmit: Upon return of submittal marked "Revise and Resubmit", make the corrections indicated and re-submit to Engineer for review.
      d. Rejected: This disposition indicates material or equipment that cannot be reviewed. Upon return of submittal marked "Rejected", repeat initial submittal procedure utilizing reviewable material or equipment.
   2. Informational Submittals:
      a. Each submittal will be given one of the following dispositions:
         1) Accepted: Information included in submittal conforms to the applicable requirements of the Contract Documents, and is acceptable. No further action by Contractor is required relative to this submittal, and the Work covered by the submittal may proceed, and products with submittals with this disposition may be shipped or operated, as applicable.
         2) Not Accepted: Submittal does not conform to applicable requirements of the Contract Documents and is not acceptable. Revise submittal and re-submit to indicate acceptability and conformance with the Contract Documents.
      b. The following types of Informational Submittals, when acceptable to Engineer, will not receive a written response from Engineer. Disposition as "Accepted" will be recorded in Engineer's submittal log. When submittals of the following are not acceptable, Engineer will provide written response to Contractor:
         1) Safety data sheets.
         2) Manifests and other shipping documents.
         3) Delivery tickets.
         4) Geotechnical testing reports.
         5) Compaction testing reports.

6) Concrete testing reports.
7) Manufacturer's instructions.

3. Closeout Submittals: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Closeout Submittals will not receive a written response from Engineer. Disposition as "Accepted" will be recorded in Engineer's submittal log. When Closeout Submittal is not acceptable, Engineer will provide written response to Contractor.
4. Maintenance Material Submittals: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Maintenance Material Submittals will not receive a written response from Engineer. Disposition as "Accepted" will be recorded in Engineer's submittal log. When Maintenance Material Submittal is not acceptable, Engineer will provide written response to Contractor, and Contractor is responsible for costs associated with transporting and handling of maintenance materials until compliance with the Contract Documents is achieved.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 ATTACHMENTS

A. The attachments listed below, which follow after the "End of Section" designation, are part of this Section:
   1. Attachment A: Engineer's submittal log form (two pages).

END OF SECTION

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Attachment A
Contractor Submittal Log

National Grid
North Albany Former MGP Site
Albany, New York

Submittal Reference No.	Specification / Document Reference	Submittal Description	Date Received	Review Conducted by:		Interim Status/Date (see Note 1)	Final Status/Date (see Note 1)	Notes
				Project Manager	Design Engineer			
	Section 01 15 00	Contractor's Project Operation Plan (POP) (see specification for requirements)						
	Section 01 26 00	Contractor Modifications (as necessary)						
	Section 01 31 19.13	Preliminary Progress Schedule						
		Preliminary Schedule of Submittals						
	Section 01 32 16	Preliminary Progress Schedule (same as for Section 01 31 19.13)						
		Initial Progress Schedule						
		Progress Schedule Updates (as necessary)						
		Look-Ahead Schedule						
		Recovery Schedules (as necessary)						
	Section 01 32 26	Daily Construction Reports						
		Field Condition Reports (as necessary)						
	Section 01 32 33	Pre-Construction Photographic Documentation						
		Construction Progress Photographic Documentation (weekly)						
		Final Photographic Documentation						
	Section 01 33 00	Schedule of submittals (as necessary)						
	Section 01 35 23	Qualifications Statements - Safety Representative						
		Emergency Contact Information						
		Safety Citations						
		Accident Reports						
		Daily Health and Safety Field Reports						
		Personnel Training Certificates						
		Site Plan showing Temporary Facilities						
		Emergency Response Plan						
	Section 01 35 29	Site-Specific Health and Safety Plan (see specification for requirements)						
		Qualification Statements - HASP Preparer						
	Section 01 35 43.13	Hazardous materials proposed for use at the site (see specification for requirements)						
		Hazardous material generated at the site (see specification for requirements)						
		Permits for storing, handling, using, transporting, and disposing of hazardous materials						
		Hazardous Materials Communication Plan						
		Emergency/Spill Response Plan						
	Section 01 35 49	Air Monitoring Plan						
		Qualification Statements - air monitoring firm and technician						
		Weekly Air Monitoring Reports						
		Air Monitoring Exceedance Reports (as needed)						
		Community Air Monitoring and Weather Data						
	Section 01 41 26	Storm Water Permit Certification Statement						
		Qualifications Statement - Inspector						
		Storm Water Inspection Reports						
	Section 01 52 13	Field Office submittal: site plan, utility providers, layout of trailer, details, and product data						
	Section 01 55 26	Traffic Control Plan (see specification for requirements)						
	Section 01 57 05	Erosion Control Plan						
		Noise Control Plan						
		Dust Control Plan						
		Pollution Control Plan						
		Product data - silt fencing product data						
		Product data - erosion control blankets, staples, and anchors (if used)						
		Product data - vapor mitigation agent (for each product)						
	Section 01 57 33	Shop drawing - locations and extent of temporary fencing and gates						
		Product data for temporary fencing, gates, and privacy screens						
		Daily security logs						
	Section 01 58 13	Shop drawing - temporary signs						
	Section 01 71 23	Plan for conducting all survey work						
		Survey field book						
		Qualifications Statement - Crew Chief						
		Qualifications Statement - Surveyor						
		Certificates (as necessary)						
	Section 01 74 19	Waste Management Plan (see specification for requirements)						
		Waste Profile - Preliminary						
		Waste Profile - Final						
		Disposal Records - Recycling and Processing						
		Disposal Records - Landfill						
		Disposal Records - Incineration/Thermal Treatment						
	Section 01 78 39	Record documents (see specification for requirements)						
	Section 02 21 19	Qualifications Statement						
		Notification of intended survey start						
		Pre-Construction Structural Survey Report						
		Post-Construction Structural Survey Report						

Attachment A
Contractor Submittal Log

National Grid
North Albany Former MGP Site
Albany, New York

Submittal Reference No.	Specification / Document Reference	Submittal Description	Date Received	Review Conducted by:		Interim Status/Date (see Note 1)	Final Status/Date (see Note 1)	Notes
				Project Manager	Design Engineer			
	Section 02 41 19	Selective Demolition Plan						
		Notification of intended demolition start						
		Lifting and Rigging Plan for Piles below former gas holder						
	Section 02 55 00	Product data - grout admixtures						
		ISS Implementation Plan (see specification for requirements)						
		Resumes of key project personnel						
		Daily ISS summary report (see specification for requirements)						
		Weekly ISS summary report (see specification for requirements)						
	Section 02 60 05	Product data - soil drying agent						
		Contaminated Waste Management Plan						
		Waste Profile - Preliminary						
		Waste Profile - Final						
		Waste transporter permits						
		Waste characterization results						
		Disposal records						
	Section 02 81 00	Proposed disposal facilities						
		Waste transporter permits (same as for Section 02 60 05)						
		Waste manifests						
		Daily summary of waste materials transported off-site						
		Waste disposal certifications						
	Section 31 00 00	Earthwork Plan (see specification for requirements)						
		Geotechnical test results						
	Section 31 05 19.13	Manufacturer's quality control manual						
		Certificates of compliance						
	Section 31 05 19.16	Manufacturer's quality control manual						
		Certification from Manufacturer (see specification for requirements)						
		Manufacturer's quality control test results						
		Installer's letter of approval or license from the Manufacturer						
		Resume of the "Master Seamer"						
		Shop drawings (see specification for requirements)						
		Certification from Installer that final surface for HDPE geomembrane to be installed is acceptable						
		Certification from Contractor the field-delivered HDPE geomembrane had not been damaged						
		Copies of Installer's field quality control paperwork						
		Record drawings						
		Warranties						
	Section 31 09 13	Shop drawings (see specification for requirements)						
		Qualifications Statement - instrumentation personnel						
		Monitoring Plan and Installation Plan (see specification for requirements)						
		Shop drawings and manufacturer's data						
		Instrument installation methods						
		Monitoring reports						
		Pre-Construction Structural Survey Report (same as for Section 02 21 19)						
		Post-Construction Structural Survey Report (same as for Section 02 21 19)						
	Section 31 23 19	Water Management and Dewatering Plan (see specification for requirements)						
		Shop drawings of dewatering system						
	Section 31 23 23	Fill source information						
		Physical test results						
		Analytical test results						

Notes:
1. Submittal status nomenclature is as follows:
   R - Reviewed
   N - Reviewed and noted
   S - Resubmit
   J - Rejected
   I - For your information

SECTION 01 35 23

SAFETY REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. General:
      a. This Section expands upon the requirements elsewhere in the Contract Documents regarding Contractor's responsibilities for safety and protection, and includes requirements for Contractor's safety representative and other safety requirements applicable to the Project.
      b. National Grid safety programs that are applicable to the Work are identified elsewhere.
   2. Provide all labor, materials, tools, equipment, training, certifications, protective measures, and incidentals shown, specified, and required to comply with Contractor's obligations under the Contract for safety and protection of personnel and property.
   3. Participate in a Process Hazard Analysis (PHA) meeting prior to mobilization. The PHA meeting will be led by National Grid's Safety Department.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor's Safety Representatives:
      a. Employ and retain the services of a third-party full-time onsite safety industry professional to manage, oversee, and enforce Contractor's health and safety program at the site, and ensure throughout the Project compliance with Contractor's site-specific health and safety plan (HASP), National Grid's safety programs applicable to the Work, and applicable Laws and Regulations.
      b. Contractor's employed safety representatives shall possess not less than 10 years of experience serving as the safety representative on projects similar to or larger in size than this Contract, and for type(s) of construction similar in nature to the Work (including remediation and hazardous waste handling experience).
      c. Contractor's safety representatives shall be experienced in the types of Work to be performed under the Contract and shall be experienced with safety precautions, procedures, and equipment appropriate for the safe performance of the Work.
      d. Prior to the Effective Date of the Contract, safety representatives shall have successfully completed (and maintain current refresher status for), at a minimum, a 30-hour OSHA construction safety and health training course, a 40-hour OSHA Hazardous Waste operations and emergency response (HAZWOPER) training course, OSHA Supervisor training, OSHA Excavation Competent Person training course, and other training required by Laws and Regulations.
      e. Contractor's safety representatives shall be completely experienced with and knowledgeable of all applicable health and safety Laws and Regulations and with good safety practices and shall ensure compliance with such Laws and Regulations and practices at the site.
      f. Minimum responsibilities of Contractor's safety representatives are indicated in Part 3.1 of this Section.
      g. Engineer's acceptance of Contractor's safety representatives' qualifications does not in any way mitigate or relieve Contractor of Contractor's safety obligations under the Contract Documents.

h. Contractor's safety representatives may not change during the Project unless prior written approval is obtained from National Grid. Contractor is solely responsible for any costs incurred or delays if Contractor's safety representative is not available and an acceptable substitute has not been approved by National Grid.

B. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses.
      b. 29 CFR 1910, Occupational Safety and Health Standards.
      c. 29 CFR 1926, Safety and Health Regulations for Construction.
      d. 40 CFR 261.3, 264, and 265, Resource Conservation and Recovery Act (RCRA).
      e. 49 CFR 171.8, Transportation, Definitions and Abbreviations.
      f. 6 NYCRR 371, Identification and Listing of Hazardous Wastes.
      g. 6 NYCRR 375, Environmental Remediation Programs.
      h. 12 NYCRR 23, Protection in Construction, Demolition, and Excavation Operations.
      i. 12 NYCRR 56, Asbestos.
      j. 12 NYCRR 57, High Voltage Proximity.
      k. 12 NYCRR 59, Workplace Safety and Loss Prevention Program.
      l. 12 NYCRR 61, Occupational Licensing and Certification.
      m. 16 NYCRR 753, Protection of Underground Facilities.
      n. 17 NYCRR 32, Oil Spill Prevention and Control – Actions to be Taken in Case of Discharge.
      o. Occupational Safety and Health Administration (OSHA) Regulations.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Qualifications Statements: Submit name and qualifications of safety representative, including summary of experience, training received, and copy of valid certifications applicable to the Project.
   2. Emergency Contact Information: Submit in accordance with Part 1.4 of this Section.
   3. Citations: Submit copies of safety citations from authorities having jurisdiction and insurance companies within 24 hours of Contractor's receipt of such citations.
   4. Reports:
      a. Accident Reports: Submit in accordance with Part 3.2 of this Section.
      b. Daily Health and Safety Field Reports: Submit in accordance with Article 1.5 of this Section.
   5. Submit in accordance with Part 1.6 of this Section, the following valid training certificates:
      a. Initial 40-hour HAZWOPER training.
      b. Eight-hour HAZWOPER supervisor training.
      c. Annual eight-hour HAZWOPER refresher training.
      d. Excavation competent person training.
   6. Site plan, including temporary facilities onsite, in accordance with Section 01 15 00 (Contractor's Project Operations Plan).
   7. Emergency Response Plan, in accordance with Section 01 35 29 (Contractor's Health and Safety Plan).

1.4 EMERGENCY CONTACT INFORMATION

A. Contractor shall submit list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, furnish updated emergency contact information list at the next progress meeting.

B. Contractor's list of emergency contact information shall include, at a minimum, the following:
   1. Contractor:
      a. Project manager's office, field office, and cellular telephone numbers.
      b. Site superintendent's office, field office, and cellular telephone numbers.
      c. Foreman's field office and cellular telephone numbers.
      d. Safety representative's field office and cellular telephone numbers.
      e. Major Subcontractors' and Suppliers' office and cellular telephone numbers of project manager and foreman (when applicable).
   2. National Grid:
      a. Project manager's office and cellular telephone numbers.
      b. Assistant project manager's office and cellular telephone numbers.
   3. Engineer:
      a. Engineer of record's office and cellular telephone numbers.
      b. Project manager's office and cellular telephone numbers.
      c. Assistant project manager's office and cellular telephone numbers.
   4. Utility companies' 24-hour contact telephone number(s), including gas, electric, water, sewer, telecommunications, and other companies having utilities in the vicinity of the Work.
   5. Highway and street owners' 24-hour telephone number(s).
   6. Emergency telephone numbers for the hospital, ambulance service, police department, and fire department nearest to the site. Furnish names of each of these institutions.
   7. Authorities having jurisdiction.
   8. Other involved entities as applicable.

C. Include with list of emergency contact information an 8.5-inch by 11-inch map showing route from the site to the nearest hospital.

1.5 DAILY HEALTH AND SAFETY FIELD REPORTS

A. Prepare daily health and safety field reports throughout the Project. Include in each report, at a minimum, the following:
   1. Contractor's name.
   2. National Grid's name.
   3. Project name.
   4. Site name and location.
   5. Date and day of the week.
   6. Weather conditions.
   7. Delays encountered in construction.
   8. Copy of daily job safety briefing form.
   9. Acknowledgment of deficiencies noted along with corrective actions taken on current and previous deficiencies.
   10. Daily health and safety exposure monitoring results.
   11. Documentation of instrument calibrations performed.
   12. New hazards encountered.
   13. PPE utilized.
   14. Description of problems, real or anticipated, encountered during the Work that should be brought to the attention of National Grid, Construction Manager, and Engineer.
   15. Deviations from planned Work described in previously-submitted daily health and safety field report(s).

B. Submit daily health and safety field reports to Construction Manager and Engineer by 9:00 a.m. the next working day after the day covered in the associated report. Daily reports shall be signed by Contractor's safety representative.

1.6 HEALTH AND SAFETY RECORDS

A. Retain at the site complete and accurate health and safety records for all Contractor and Subcontractor employees assigned to the Project. Records shall include, at a minimum, the following:
   1. Valid training certificates for the following:
      a. Initial 40-hour HAZWOPER training.
      b. Eight-hour HAZWOPER supervisor training.
      c. Annual eight-hour HAZWOPER refresher training.
      d. Ten-hour construction safety training.
      e. First-aid/cardiopulmonary resuscitation training.
      f. Other training required by Contractor's HASP.
   2. Valid medical clearance certificates.
   3. Valid respirator fit test certificates.
   4. Accident reports, prepared in accordance with Article 1.7 of this Section.
   5. Daily health and safety field reports, prepared in accordance with Article 1.8 of this Section.
   6. Other records required by National Grid or Laws and Regulations.

B. Keep records up-to-date throughout the Project and readily available for audit by the Engineer.

C. Contractor's safety representative shall meet at least monthly with National Grid, Construction Manager, and Engineer to review Contractor's health and safety records and verify compliance with this Section.

1.7 PHA MEETING

A. Attendance:
   1. Contractor:
      a. Project manager.
      b. Site superintendent.
      c. Safety representative.
      d. Representatives of other Subcontractors and Suppliers when needed for the discussion of a particular agenda item.
   2. National Grid.
   3. Engineer.
      a. Project Manager
      b. Lead Project Engineer/Engineer of Record
   4. Others as appropriate

PART 2 – PRODUCTS

2.1 SAFETY EQUIPMENT

A. General:
   1. Provide proper safety and rescue equipment, adequately maintained and readily available, for any foreseeable contingency.
   2. Such equipment shall include items such as safety ropes and harnesses, fall-prevention devices, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, fire extinguishers, and first-aid equipment, and similar equipment.

3. Keep safety equipment in protected areas. Check safety equipment at scheduled intervals.
4. Temporary First-Aid Facilities: Comply with Section 01 52 16 – First-Aid Facilities.

B. Safety Equipment Log:
1. Maintain a log indicating the person who checked the equipment, when equipment was checked, and that equipment was acceptable.
2. Update equipment log not less-often than monthly.
3. Include in safety representative's onsite records copies of equipment calibration records.

C. Provide replacement safety equipment when primary safety equipment is unavailable due to use or when undergoing maintenance.

D. Personal Protective Equipment (PPE):
1. All persons entering the work areas shall wear appropriate PPE required for the particular area and task.
2. Remove from the site any person failing to comply with this or any other safety requirement.
3. Continuously provide all necessary PPE for visitors to the site.

PART 3– EXECUTION

3.1 MINIMUM RESPONSIBILITIES OF SAFETY REPRESENTATIVES

A. General:
1. Contractor's safety representatives shall be at the site full-time when Work is in progress. When Contractor employs multiple shifts, furnish additional safety representatives as necessary. Each safety representative shall be qualified in accordance with Paragraph 1.2.A.1 of this Section.
2. Contractor's safety representatives shall have no other duties on the Project except those directly related to safety. Safety representatives shall not be Contractor's project manager, superintendent, or other supervisory personnel working on the Project.
3. Contractor's safety representatives shall have appropriate space at the site to maintain and keep available safety records, up-to-date copies of pertinent safety Laws and Regulations, safety data sheets, Contractor's HASP, copies of National Grid's safety programs with which Contractor shall comply, and emergency contact information as required in Article 1.5 of this Section.

B. Contractor's safety representatives' responsibilities include, but are not necessarily limited to, the following:
1. Supervising the implementation of Contractor's HASP throughout the Project and ensuring that all contractors implement their respective programs.
2. Coordinating with Contractor's "competent person" required under Laws and Regulations.
3. Attending pre-construction conference, progress meetings, and other Project meetings in accordance with the Contract Documents.
4. Scheduling and conducting safety meetings and safety training programs as required by Laws and Regulations, Contractor's HASP, and good safety practices. Advise the Engineer prior to the time and place of such meetings.
5. Leading and documenting daily job safety briefings.

6. Instruct Contractor's employees (and Subcontractors, Suppliers with personnel at the site, and others for whom Contractor is responsible) on recognition of hazards, observance of precautions, of the contents of the HASP and other safety programs with which Contractor shall comply, and use of personal protective equipment (PPE) and safety equipment.
7. Determining that operators of specific construction equipment (and permanent equipment used for construction operations) are qualified by training and experience before such personnel are allowed to operate such equipment.
8. Developing and implementing emergency response procedures, including names, locations, and contact telephone numbers for emergency services and medical assistance as indicated in requirements for the emergency contact list in Article 1.05 of this Section.
9. Posting appropriate notices regarding health and safety Laws and Regulations at locations at the site and Contractor's field office that afford maximum exposure to personnel.
10. Posting appropriate instructions and warning signs in regard to all hazardous areas and hazardous conditions that cannot be eliminated. Identification of such areas shall be based on experience, site surveillance, and severity of the associated hazard. Signage shall not be used in place of appropriate workplace controls.
11. Providing appropriate orientation to employees, visitors, Subcontractors, and Supplier personnel at the site.
12. Performing all related tasks necessary to achieve the highest degree of safety that the nature of the Work allows.
13. Attending all safety inspections conducted by National Grid.

C. Contractor's Third-Party Safety Representative shall be present at the site at all times when work is being performed and will be responsible for the above items and the following:
1. Ascertaining via personal inspection that safety Laws and Regulations and safety program requirements are enforced. Make inspections not less than once per work shift to ensure that machines, tools, and equipment are in a safe operating condition; and that all work areas are free of hazards to the extent practicable. Implement necessary and timely corrective actions to eliminate unsafe acts and unsafe conditions, and submit to Engineer daily copy of findings resulting from inspection, using inspection checklist forms established in Contractor's HASP.
2. Submitting to National Grid and Engineer copies of safety citations from authorities having jurisdiction and insurance companies within 24 hours of Contractor's receipt of such citations.
3. Preparing and submitting accident reports in accordance with Article 3.2 of this Section.
4. Leading accident investigations on Contractor's behalf.
5. Preparing and submitting daily health and safety field reports in accordance with Article 1.5 of this Section.
6. Preparing and maintaining health and safety records and statistics in accordance with Article 1.6 of this Section.
7. Implementing the community air monitoring program, if the Contractor elects.
8. Maintaining records and managing compliance with site COVID protocols as outlined in the Contractor's HASP, and/or in accordance with local, state, or federal requirements and guidelines are being followed at the site.

3.2 ACCIDENT REPORTING AND INVESTIGATION

A. Immediately notify National Grid and Engineer of all accidents that:
1. Result in bodily injury, illness, or property damage.
2. Affect the environment.

3. Involve the public.

B. Submit accident report to National Grid and Engineer within 24 hours after accident occurs. Include in each report the following:
   1. Date, time, and location of accident.
   2. Names of all site personnel involved in or affected by accident.
   3. Description of accident and activities being performed when accident occurred.
   4. Medical treatment administered, if any.
   5. Nature and seriousness of injury or damage.
   6. Other information requested by National Grid to complete National Grid's incident analysis.

C. Comply with 29 CFR 1904.29, including using OSHA Forms 300, 300A, and 301 (or equivalent) to document all accidents that result in bodily injury.

D. Based upon results of accident investigation, modify HASP as required by changing tasks or procedures to prevent reoccurrence of accident.

E. Post current copy of Contractor's OSHA Form 300A at conspicuous place at the site during period of February 1 through April 30 of each year.

END OF SECTION

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SECTION 01 35 29

CONTRACTOR'S HEALTH AND SAFETY PLAN

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Prepare and maintain a written, site-specific Health and Safety Plan (HASP), and conduct all construction activities in a safe manner that avoids:
      a. Injuries to employees, Subcontractors, and other persons with an interest at or near the site.
      b. Employee exposures to health hazards above occupational limits established respectively by OSHA, the American Conference of Governmental Industrial Hygienists (ACGIH), and the Nuclear Regulatory Commission (NRC), as applicable.
      c. Exposure of the public and National Grid's employees/subcontractors to air contaminants above levels established for public exposure by USEPA, NRC, NYSDEC, NYSDOH, and other authorities having jurisdiction at the site.
      d. Significant increases in concentrations of contaminants in soil, water, or sediment near the site.
      e. Violations of the Occupational Safety and Health Act, or other Laws or Regulations.

B. Related Sections:
   1. Section 01 35 23, Safety Requirements
   2. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

1.02 QUALITY ASSURANCE

A. Qualifications:
   1. HASP Preparer:
      a. Engage a certified industrial hygienist, accredited by the American Board of Industrial Hygiene, or safety professional certified by the Board of Certified Safety Professionals, to prepare or supervise preparation of Contractor's HASP.

B. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses.
      b. 29 CFR 1910, Occupational Safety and Health Standards.
      c. 29 CFR 1926, Safety and Health Regulations for Construction.
      d. 40 CFR 261.3, 264, and 265, Resource Conservation and Recovery Act (RCRA).
      e. 49 CFR 171.8, Transportation, Definitions and Abbreviations.
      f. 6 NYCRR 371, Identification and Listing of Hazardous Wastes.
      g. 6 NYCRR 375, Environmental Remediation Programs.
      h. 12 NYCRR 23, Protection in Construction, Demolition, and Excavation Operations.
      i. 12 NYCRR 56, Asbestos.
      j. 12 NYCRR 57, High Voltage Proximity.
      k. 12 NYCRR 59, Workplace Safety and Loss Prevention Program.
      l. 12 NYCRR 61, Occupational Licensing and Certification.
      m. 16 NYCRR 753, Protection of Underground Facilities.
      n. 17 NYCRR 32, Oil Spill Prevention and Control – Actions to be Taken in Case of Discharge.

o. Occupational Safety and Health Administration (OSHA) Regulations.

1.03 SUBMITTALS

A. Informational Submittals:
1. Contractor's HASP: Submit in accordance with Article 1.04 of this Section.
2. Qualifications Statements:
a. HASP Preparer: Submit name and qualifications of certified industrial hygienist or safety professional, including summary of experience and copy of valid certifications.

1.04 HASP SUBMITTAL

A. General:
1. Each employer working at the site shall develop and implement a written HASP for its employees involved in Hazardous Waste operations. HASP shall include procedures that will be used to ensure the safe handling of Hazardous Waste during excavating, loading, and transporting activities.
2. Comply with 29 CFR 1904, 29 CFR 1910, 29 CFR 1926, 12 NYCRR 23, 12 NYCRR 56, 12 NYCRR 57, 12 NYCRR 59, 12 NYCRR 61, 16 NYCRR 753, 17 NYCRR 32, and other Laws and Regulations.
3. Include in HASP requirements for complying with National Grid's health and safety requirements, as set forth in the General Conditions and Supplementary Conditions, and site-specific hazard/emergency response plans, if any.
4. HASP shall be kept at the site, shall address safety and health hazards of each phase of operations at the site, and shall include requirements and procedures for employee protection.

B. HASP Contents: HASP shall address and include the following:
1. Organizational Structure:
a. Specific chain of command and overall responsibilities of supervisors and employees. Include the following:
1) Designation of general supervisor who has responsibility and authority to direct all Hazardous Waste operations.
2) Name of site safety representative who has responsibility and authority to implement and modify the HASP and verify compliance.
3) Other personnel required for Hazardous Waste operations at the site and emergency response, and general functions and responsibilities of each.
4) Lines of authority, responsibility, and communication.
b. Review and update organizational structure as necessary to reflect current status of site operations and personnel.
2. Site description, background, and scope of Work.
3. Safety and health risk or hazard analysis, and planned hazard controls, for each task and operation required to complete the Project.
4. Site control measures, including:
a. Preventing trespassing.
b. Preventing unqualified or unprotected workers from entering restricted areas.
c. Preventing the "tracking" of Contaminants out of the site.
d. Maintaining a log of employees at the site and visitors to the site.
e. Delineating exclusion, contamination reduction, and support zones.
f. Locating personnel and equipment decontamination zones.
g. Communicating routes of escape and gathering points.
5. Training Program:
a. Initial training requirements for site workers and supervisors.
b. Exceptions to initial training requirements.

c. Site briefings for visitors and workers.
d. Refresher training requirements.
e. Certification of training for all Contractor and Subcontractor employees assigned to the Project.

6. Medical Surveillance Program:
   a. Provisions of the site medical surveillance program.
   b. Communication protocols between the site, physicians, and workers.
   c. Medical recordkeeping procedures.
   d. Certification of medical clearance for all Contractor and Subcontractor employees assigned to the Project.
7. Personal Protective Equipment (PPE):
   a. PPE selection criteria.
   b. Site- and task-specific PPE ensembles.
   c. Training in the use of PPE.
   d. Respiratory protection.
   e. Hearing conservation.
   f. PPE maintenance and storage.
8. Exposure Monitoring Program:
   a. Monitoring procedures to detect the presence of hazardous substances.
   b. Monitoring procedures to determine worker exposures to hazardous substances and physical hazards.
   c. Action levels and required responses for known and expected hazardous substances and physical hazards.
   d. Calibration and maintenance procedures for monitoring equipment.
9. Heat and cold stress prevention programs.
10. Spill containment program. Comply with Section 01 35 43.13.
11. Decontamination Program:
   a. Location and type of temporary decontamination facilities.
   b. General and specific decontamination procedures for personnel and PPE.
   c. General and specific decontamination procedures for equipment and vehicles.
   d. Disposal of residual waste from decontamination.
   e. Decontamination equipment and materials.
   f. Monitoring procedures used to evaluate the effectiveness of decontamination.
12. Emergency Response Plan:
   a. Potential emergencies that may occur at the site.
   b. Pre-emergency planning.
   c. Onsite emergency response equipment, materials, and PPE.
   d. Emergency Maps: Evacuation routes, gathering points, and route to nearest hospital.
   e. Emergency roles and responsibilities.
   f. Emergency alerting and evacuation procedures for site personnel.
   g. Procedures for notifying, and list of emergency contact information for:
      1) Emergency responders, including fire officials, ambulance service, poison control, police, and local hospitals.
      2) Authorities having jurisdiction.
      3) National Grid, Construction Manager, and Engineer.
      4) Contractor's project manager, site superintendent, safety representative, and foreman.
      5) Other entities, as required.
   h. Emergency response procedures.
   i. Emergency decontamination, medical treatment, and first-aid.
   j. Emergency response training.
13. Crane, Hoist, and Rigging Safety Program
   a. Lifting roles and responsibilities.
   b. Training requirements and qualifications.

c. General lifting safety requirements.
d. Crane operation safety requirements.
e. Slings/rigging safety requirements.
f. Lift planning and operations.
g. Inspection, testing, and maintenance requirements.
h. Recordkeeping.

14. Confined space entry program.
15. Other standard operating procedures applicable to the Work.

C. Submittal Procedure:
1. Submit HASP to Engineer the sooner of: seven days prior to pre-construction conference, or 30 days prior to Contractor's scheduled mobilization to the site.
2. Engineer's review and acceptance of HASP will be only to determine if the topics covered in HASP comply with the Contract Documents. Engineer's review and acceptance will not extend to safety measures, means, methods, techniques, procedures of construction, or whether representations made in the HASP comply with Laws and Regulations, or standards of good practice.
3. Do not perform Work at the site until written HASP has been accepted by Engineer.
4. Notwithstanding other provisions of the Contract Documents, changes in the Contract Price or Contract Times will not be authorized due to delay by Contractor in developing, submitting, or revising the HASP.

PART 2– PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 43.13

ENVIRONMENTAL PROCEDURES FOR HAZARDOUS MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Develop, implement, and maintain a Hazardous Materials management program (HMMP) throughout the Project, in accordance with Laws and Regulations.
      a. Hazardous Materials Brought to site by Contractor: Transport, handle, store, label, use, and dispose of in accordance with this Section, and Laws and Regulations.
      b. Hazardous Material Generated by Contractor:
         1) Hazardous Material shall be properly handled, stored, labeled, transported, and disposed of by Contractor in accordance with Laws and Regulations, and this Section.
         2) If Contractor will generate or has generated Hazardous Material at the site, obtain National Grid's USEPA identification number listing National Grid's name and address of the site as generator of the Hazardous Material.
         3) Contractor shall be responsible for identifying, characterizing, profiling, transporting, and disposing of Hazardous Material generated by Contractor.
      c. Fines or civil penalties levied against National Grid for violations committed at the site by Contractor, and costs to National Grid (if any) associated with cleanup of Hazardous Materials shall be paid by Contractor.

B. Enforcement of Laws and Regulations:
   1. Interests of National Grid are that accidental spills and emissions, site contamination, and injury of personnel at the site are avoided.
   2. When National Grid is aware of suspected violations, National Grid will notify Contractor, and authorities having jurisdiction if National Grid reasonably concludes that doing so is required by Laws or Regulations.

C. Related Sections:
   1. Section 01 35 29, Contractor's Health and Safety Plan.

1.02 DEFINITIONS

A. The following terms are defined for this Section and supplement the terms defined in the General Conditions:
   1. Hazardous Material: Material, whether solid, semi-solid, liquid, or gas, that, if not stored or used properly, may cause harm or injury to persons through inhalation, ingestion, absorption or injection, or that may negatively impact the environment through use or discharge of the material on the ground, in water (including groundwater), or to the air. Hazardous Material includes, but is not limited to, chemicals, Asbestos, Hazardous Waste, PCBs, Petroleum, Lead, Radioactive Material, and which is or becomes listed, regulated, or addressed pursuant to the following:
      a. Comprehensive Environmental Response, Compensation, and Liability Act, 42 United States Code (USC) §§9601 et seq. ("CERCLA").
      b. Hazardous Materials Transportation Act, 49 USC §§1801 et seq.
      c. Resource Conservation and Recovery Act, 42 USC §§6901 et seq. ("RCRA").
      d. Toxic Substances Control Act, 15 USC §§2601 et seq.
      e. Clean Water Act, 33 USC §§1251 et seq.

f. Clean Air Act, 42 USC §§7401 et seq.
g. Any other Law or Regulation regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
a. 29 CFR 1910, Occupational Safety and Health Standards.
b. 29 CFR 1926, Safety and Health Regulations for Construction.
c. 40 CFR 261.3, 264, and 265, Resource Conservation and Recovery Act (RCRA).
d. 49 CFR 171.8, Transportation, Definitions and Abbreviations.
e. 6 NYCRR 364, Waste Transporter Permits.
f. 6 NYCRR 371, Identification and Listing of Hazardous Wastes.
g. 6 NYCRR 372, Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities.
h. 6 NYCRR 375, Environmental Remediation Programs.
i. 6 NYCRR 596, Hazardous Substance Bulk Storage Regulations.
j. 6 NYCRR 597, List of Hazardous Substances.
k. 6 NYCRR 598, Handling and Storage of Hazardous Substances.
l. 6 NYCRR 613, Handling and Storage of Petroleum.
m. 17 NYCRR 32, Oil Spill Prevention and Control – Actions to be Taken in Case of Discharge.
2. Comply with applicable provisions and recommendations of the following:
a. NYSDEC Spill Guidance Manual.

1.04 SUBMITTALS

A. Informational Submittals:
1. Hazardous Materials (including Chemicals) Proposed for Use at the Site: Submit current (dated within the past two years) safety data sheets (SDSs) in accordance with 29 CFR 1910.1200 (OSHA Hazard Communication Standard), manufacturer, Supplier (if different than manufacturer), container size(s) and number of containers proposed to be at the site, minimum and maximum volume of material intended to be stored at the site, and description of process or procedures in which Hazardous Material will be used. Furnish information in sufficient time to obtain National Grid's acceptance no later than at least three days before bringing Hazardous Material to the site.
2. Hazardous Material Generated at the Site: Submit for each Hazardous Material generated at the site identification number, analysis results, and number and size of storage containers at the site. Furnish information not less than three days after Contractor's receipt of analytical results.
3. Permits: Submit copies of permits for storing, handling, using, transporting, and disposing of Hazardous Materials, obtained from authorities having jurisdiction.
4. Hazardous Materials Communication Plan: Submit in accordance with Article 1.05 of this Section.
5. Emergency/Spill Response Plan: Submit in accordance with Article 1.06 of this Section.

1.05 HAZARDOUS MATERIALS COMMUNICATION PLAN

A. Develop and implement a Hazardous Materials communication plan. At a minimum, maintain at the site two notebooks containing the following:
1. Inventory of Hazardous Materials, including all chemicals.

2. Current (dated within the past two years) SDSs for all materials being used to accomplish the Work, whether or not defined as Hazardous Material in this Section. Keep one notebook in Contractor's field office at the site; keep second notebook at location acceptable to National Grid and Engineer. Keep notebooks up-to-date as materials are brought to and removed from the site.

1.06 EMERGENCY/SPILL RESPONSE PLAN

A. Develop, implement, and maintain an emergency/spill response plan, for each Hazardous Material or each class/group of Hazardous Materials as applicable. Response plan shall include, at a minimum, the following:
   1. Description of equipment and materials available at the site to contain a spill of, or respond to an emergency related to, the material.
   2. Procedures for notifying, and list of emergency contact information for:
      a. Authorities having jurisdiction.
      b. Emergency responders.
      c. Contractor's project manager, site superintendent, safety representative, and foreman.
      d. National Grid, Construction Manager, and Engineer.
      e. Other entities as required.
   3. Response coordination procedures between Contractor, National Grid, and others as appropriate.
   4. Site plan showing proposed location of Hazardous Materials storage area, location of spill containment/response equipment and materials, and location of storm water drainage inlets and drainage routes.
   5. Description of Hazardous Material handling and spill response training provided to Contractor's and Subcontractors' employees, in accordance with 29 CFR 1926.21(b) and other Laws and Regulations.

B. Emergency/spill response plan shall be incorporated into Contractor's site-specific health and safety plan in accordance with Section 01 35 29.

1.07 HAZARDOUS MATERIALS MANAGEMENT

A. Obtain National Grid's acceptance before bringing each Hazardous Material to the site.

B. Storage of Hazardous Materials and Non-Hazardous Materials:
   1. Hazardous Materials containers shall bear applicable hazard diamond(s).
   2. Container Labeling:
      a. Properly label each container of consumable materials, whether or not classified as Hazardous Materials under this Section.
      b. Stencil Contractor's name and, as applicable, Subcontractor's name, on each vessel containing Hazardous Material and, for non-Hazardous Materials, on each container over five-gallon capacity. Containers shall bear securely-attached label clearly identifying contents. Label containers that are filled from larger containers.
      c. If National Grid becomes aware of unlabeled containers at the site, National Grid will notify Contractor. Properly label container(s) within one hour of receipt of notification or remove container from the site.
   3. To greatest extent possible, store Hazardous Materials offsite until required for use in the Work.

C. Hazardous Materials Storage Area:
   1. Maintain designated storage area for Hazardous Materials that includes secondary containment. Storage area shall include barriers to prevent vehicles from colliding with storage containers, and shall include protection from environmental factors such as weather.
   2. Provide signage in accordance with Laws and Regulations, clearly identifying the Hazardous Materials storage area.

D. Contractor's safety representative shall meet at least monthly with National Grid, Construction Manager, and Engineer to review Contractor's HMMP documents and procedures, and inspect storage areas and the site in general, to verify compliance with this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 49

COMMUNITY AIR MONITORING PLAN

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, services, and incidentals as specified and required to implement and comply with the Project's Community Air Monitoring Plan (CAMP). The CAMP is included with this Section and is part of the Contract Documents.
   2. Perform community air monitoring on a continuous basis during all ground-intrusive Work or dust-generating Work. Community air monitoring includes:
      a. Real-time air monitoring for total volatile organic compounds (TVOCs) and particulate matter less than 10 micrometers in diameter (PM_{10}).
      b. Periodic monitoring for manufactured gas plant (MGP)-related odors.
      c. Visual monitoring for dust leaving the work area.
   3. Perform community air monitoring within areas shown or indicated.

B. Coordination:
   1. Coordinate requirements of this Section with requirements for odor, vapor, and dust control in the Contract Documents.

C. Related Sections:
   1. Section 01 57 05, Temporary Controls.

D. Documents: The following are part of the Work included under this Section:
   1. CAMP: Prepared by Engineer, on behalf of National Grid, and filed with NYSDEC. The CAMP is included as Appendix B of the Fleet Building Addition Interim Remedial Measure Design and is part of the Contract Documents.

1.02 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Dust-generating Work" means any Work with the potential to generate dust. Examples of dust-generating Work include, but are not limited to, the following:
      a. Handling excavated material and fill material.
      b. Ground-intrusive Work.
   2. "Ground-intrusive Work" means any Work performed below the existing level of the ground, or that involves the disturbance of existing earth, regardless of quantity. Examples of ground-intrusive Work include, but are not limited to, the following:
      a. Selective demolition of subsurface structures/utilities.
      b. Excavating, trenching, and test pitting.
      c. In-situ soil solidification.
      d. Backfilling and grading.
   3. "Perimeter of work area" means the limits of Work, or half the distance to the nearest potential receptor or occupied residential/commercial structure, whichever is less, but in no case less than 20 feet.
   4. "Work area" means any area where ground-intrusive Work or dust-generating Work is being performed.

1.03 QUALITY ASSURANCE

A. Qualifications:
   1. Air Monitoring Technician:
      a. Retain the services of an independent, safety industry professional to implement the CAMP on Contractor's behalf. Contractor's air monitoring technician shall have a minimum of five years direct construction safety or environmental monitoring experience, and appropriate health and safety training in accordance with Laws and Regulations.
      b. Contractor's air monitoring technician shall be present at the site at all times when Work is being performed and shall be dedicated solely to the implementation of the CAMP.
      c. Responsibilities include, but are not necessarily limited to, the following:
         1) Installing the meteorological monitoring system.
         2) Selecting one upwind and two downwind monitoring locations and setting up air monitoring stations on a daily basis. If the wind direction is from the north or northeast, one of the downwind monitoring stations will be located approximately 20 feet off the northeast corner of Building 2 (within the area where parking/ driving is currently restricted).
         3) Establishing and setting up a dedicated air monitoring station adjacent to the Fleet Building that will be used daily, regardless of wind direction.
         4) Calibrating air monitoring equipment on a daily basis, or more frequently if recommended by the manufacturer.
         5) Coordinating equipment maintenance and repairs.
         6) Monitoring meteorological conditions throughout the workday and relocating air monitoring stations as necessary and appropriate.
         7) Performing hourly or more frequent inspections of air monitoring stations to verify proper function.
         8) Performing hourly or more frequent perimeter checks of the work area to monitor for MGP-related odors.
         9) Removing air monitoring stations and downloading TVOC and PM_{10} data from monitoring equipment at the end of each workday.
         10) Managing a database of TVOC, PM_{10}, and meteorological data at the site.
         11) Attending progress meetings and other Project meetings, as required.
         12) Preparing and submitting weekly air monitoring reports in accordance with Article 1.05 of this Section.
         13) Preparing and submitting exceedance reports in accordance with Article 1.06 of this Section.
         14) Preparing and submitting daily odor monitoring logs in accordance with Article 1.07 of this Section.
         15) Notifying Construction Manager, Engineer, and appropriate Contractor personnel immediately when alert or action levels are exceeded at downwind or nearest downwind occupied building monitoring locations, and when MGP-related odors are noted at the perimeter of the work area.

B. Regulatory Requirements:
   1. Comply with applicable provisions and recommendations of the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10).

C. Equipment Calibration:
   1. Calibrate air monitoring equipment on a daily basis, or more frequently as recommended by the manufacturer, in accordance with manufacturer's calibration and quality assurance requirements. Document all instrument readings, field reference checks, and calibrations in a dedicated log.

2. Preventative maintenance and repair of monitoring equipment, if required, shall only be performed by qualified personnel, or authorized representatives of the manufacturer.
3. Prepare and retain at the site electronic or written records of all equipment calibrations, preventative maintenance, and repairs. Submit to Engineer upon request.

1.04 SUBMITTALS

A. Informational Submittals:
   1. Air Monitoring Plan: Submit acceptable plan for implementing the CAMP not less than 20 working days before initiating any dust-generating Work or ground-intrusive Work at the site. Include the following:
      a. List of proposed equipment for community air monitoring.
      b. Manufacturer's product data, specifications, and installation or operating instructions for community air monitoring equipment, including the following:
         1) Real-time TVOC and PM_{10} monitoring equipment and accessories.
         2) Environmental enclosures and mounting tripods.
         3) Alarms and wireless telemetry system.
         4) Meteorological monitoring system and accessories.
      c. Manufacturer's calibration and field quality assurance requirements for real-time TVOC and PM_{10} monitoring equipment.
      d. Proposed weekly air monitoring report form.
      e. Proposed exceedance report form.
      f. Proposed daily odor monitoring log form.
   2. Qualification Statements: Submit name and address of firm, and summary of relevant experience for air monitoring technician.
   3. Reports:
      a. Weekly Air Monitoring Reports: Submit in accordance with Article 1.05 of this Section.
      b. Exceedance Reports: Submit in accordance with Article 1.06 of this Section.
   4. Data Files: Submit in accordance with Article 1.08 of this Section.

1.05 WEEKLY AIR MONITORING REPORTS

A. Prepare weekly air monitoring reports throughout the Project. Include in each report, at a minimum, the following:
   1. Contractor's name.
   2. National Grid's name.
   3. Project name.
   4. Site name and location.
   5. The following for each day that community air monitoring is performed:
      a. Date and day of the week.
      b. General location and brief description of Work performed at the site.
      c. Graphs showing concentrations of TVOCs and PM_{10} vs. time for each air monitoring station.
      d. Daily maximum 15-minute time-weighted average (TWA) concentration of TVOCs and PM_{10} for each air monitoring station.
      e. Exceedances (if any) of the action levels specified in Paragraph 3.01.C of this Section. Provide the following:
         1) Time, location, and 15-minute TWA concentration of exceedance.
         2) Copy of exceedance report, prepared in accordance with Article 1.06 of this Section.

f. Site plan showing approximate locations of upwind, downwind, nearest downwind occupied building, and Fleet Building air monitoring stations at the site and prevailing wind direction for the day. Note if air monitoring stations were relocated during the day.
g. Copy of daily odor monitoring log, prepared in accordance with Article 1.07 of this Section.

B. Submit weekly air monitoring reports to Construction Manager and Engineer by 12:00 p.m. the Monday after the week covered in the associated report. Construction Manager will distribute weekly air monitoring reports to:
1. National Grid.
2. Engineer.
3. Contractor.
4. NYSDEC.
5. NYSDOH.
6. Others as appropriate.

1.06 EXCEEDANCE REPORTS

A. Prepare an exceedance report whenever the action levels specified in Paragraph 3.01.C of this Section are exceeded. Include in each report the following:
1. Contractor's name.
2. National Grid's name.
3. Project name.
4. Site name and location.
5. Date, day of the week, and time of exceedance.
6. General location and brief description of work being performed at time of exceedance.
7. Weather conditions at time of exceedance.
8. For each air monitoring station, 15-minute TWA concentration of TVOCs and PM_{10} at time of exceedance.
9. Source or cause of exceedance.
10. Corrective actions taken or to be taken in response to exceedance.
11. Date and time verbal or written notification was provided to NYSDEC.

B. Submit exceedance reports to Construction Manager and Engineer within 12 hours after an action level exceedance. Engineer will distribute exceedance reports within 24 hours after exceedance to:
1. National Grid.
2. Construction Manager.
3. Engineer.
4. Contractor.
5. NYSDEC.
6. NYSDOH.
7. Others as appropriate.

1.07 DAILY ODOR MONITORING LOG

A. Prepare daily odor monitoring logs throughout the Project. Include in each daily log, at a minimum, the following:
1. Contractor's name.
2. National Grid's name.
3. Project name.
4. Site name and location.
5. Date and day of the week.

6. Weather conditions.
7. Time and outcome of each perimeter check.
    a. Note the presence or absence of MGP-related odors at the perimeter of the work area.
    b. Identify the general location(s) along the work area perimeter where MGP-related odors are noticed.
8. Time and outcome of any odor complaints from the public.

B. Submit daily odor monitoring logs to Construction Manager and Engineer in weekly air monitoring report submittal in accordance with Article 1.05 of this Section.

1.08 DATA MANAGEMENT

A. Maintain a database of TVOC, PM_{10}, and meteorological data files at the site.
    1. Index TVOC and PM_{10} data files by date, station number, station location (upwind or downwind), and data type (TVOC or PM_{10}).
    2. Index meteorological data files by date.

B. Back up data files to disc or portable hard drive on a weekly or more frequent basis.

C. Submit TVOC, PM_{10}, and meteorological data files on a monthly basis throughout the Project. Provide data files on SharePoint in format acceptable to Engineer. Label each disc with the following information:
    1. Dates covered.
    2. National Grid's name.
    3. Project name.
    4. Site name and location.

PART 2 – PRODUCTS

2.01 PERIMETER AIR MONITORING SYSTEM

A. System Description:
    1. Provide complete, integrated perimeter air monitoring system consisting of the following:
        a. Four portable air monitoring stations, each capable of measuring real-time ambient air concentrations of TVOCs and PM_{10}, logging air monitoring data, and notifying site personnel if alert levels or action levels are exceeded.
        b. One portable meteorological monitoring system capable of measuring wind speed, wind direction, relative humidity, dry bulb temperature, and barometric pressure, and displaying and logging weather data.

B. Air Monitoring Stations:
    1. Photoionization Detectors: Direct-reading, data-logging photoionization detector with 10.6 eV lamp. Provide one of the following for each air monitoring station:
        a. MiniRAE 3000 by RAE Systems, Inc.
        b. Or equal.
    2. Aerosol Photometers: Direct-reading, data-logging aerosol monitor. Provide one of the following for each air monitoring station:
        a. DustTrak II Aerosol Monitor Model 8530 by TSI, Inc.
        b. Or equal.
    3. Spare Equipment: Provide and retain at the site the following:
        a. Spare photoionization detectors and aerosol photometers to allow for uninterrupted monitoring in the event of equipment damage or malfunction.

b. Spare batteries for each photoionization detector and aerosol photometer to allow for continuous real-time monitoring and data-logging for a period of not less than 12 hours.

4. Environmental Enclosures and Mounting Tripods: Provide portable, weather-tight enclosure and compatible mounting (survey) tripod for each air monitoring station. Environmental enclosures shall provide proper operating conditions for photoionization detectors and aerosol photometers.
5. Alarms and Wireless Telemetry System: Provide for each air monitoring station audible and visible alarms and wireless telemetry system capable of notifying air monitoring technician in real-time (via handheld radio or e-mail) if alert levels or action levels are exceeded.
6. Accessories: Provide equipment calibration kits, sampling inlets, data management software, and other accessories recommended by the equipment manufacturers for the intended application.

C. Meteorological Monitoring System:
   1. Product and Manufacturer: Provide one of the following:
      a. Wireless Vantage Pro2 by Davis Instruments Corporation, Inc.
      b. Or equal.
   2. Accessories: Provide the following:
      a. WeatherLink data logger and software suite by Davis Instruments Corporation, Inc.
      b. Mounting Pole Kit by Davis Instruments Corporation, Inc.
      c. Other accessories recommended by equipment manufacturer for the intended application.

PART 3 – EXECUTION

3.01 REAL-TIME AIR MONITORING FOR TVOCS AND PM10

A. Air Monitoring Stations:
   1. Installation:
      a. Deploy air monitoring stations at the start of each workday before any ground-intrusive Work or dust-generating Work is initiated.
         1) Position one air monitoring station at the upwind perimeter of the work area, two air monitoring stations at the downwind perimeter of the work area, and one air monitoring station adjacent to the Fleet Building between Garage Bays 6 and 7 (regardless of wind direction). If the wind direction is from the north or northeast, one of the downwind monitoring stations will be located approximately 20 feet off the northeast corner of Building 2 (within the area where parking/ driving is currently restricted).
         2) Determine and designate upwind and downwind air monitoring stations based on prevailing wind direction and nature and location of Work to be performed.
         3) Set alarm levels on real-time TVOC and PM_{10} monitoring equipment to respond to 15-minute TWA concentrations at or below the action levels specified in Paragraph 3.01.C of this Section.
         4) Ensure that community air monitoring is being performed before initiating ground-intrusive Work or dust-generating Work.
      b. Monitor wind direction throughout the day and adjust locations of air monitoring stations if wind direction shifts more than 60 degrees from original upwind direction. Document original upwind and downwind air monitoring stations and any changes made to monitoring locations during the day.

2. Protection:
    a. Protect air monitoring stations from damage due to construction operations, weather, and vandalism.
    b. Immediately remove from service, and replace at Contractor's expense, damaged equipment.
3. Removal:
    a. Remove air monitoring stations at the end of each workday, and only after all ground-intrusive Work or dust-generating Work has been completed for the day.
    b. Download TVOC and PM_{10} data from air monitoring stations at the end of each day.

B. Alert Levels and Response:
1. Alert Levels:
    a. TVOCs: 15-minute TWA concentration at downwind or dedicated Fleet Building air monitoring stations of 3 parts per million (ppm) and 0.5 ppm, respectively, above background (upwind) 15-minute TWA concentration.
    b. PM_{10}: 15-minute TWA concentration at downwind or dedicated Fleet Building air monitoring stations of 100 micrograms per cubic meter (ug/m^3) above background (upwind) 15-minute TWA concentration, or visible dust observed leaving the work area.
2. Response: Implement the following if alert levels are exceeded:
    a. Notify Construction Manager, Engineer, and appropriate Contractor personnel.
    b. Continue Work and employ additional odor, vapor, and dust controls to abate emissions in accordance with Section 01 57 05.
    c. Evaluate and, if necessary and appropriate, modify construction techniques.

C. Action Levels and Response:
1. Action Levels:
    a. TVOCs: 15-minute TWA concentration at downwind or dedicated Fleet Building air monitoring stations of 5 ppm and 1 ppm, respectively, above background (upwind) 15-minute TWA concentration.
    b. PM_{10}: 15-minute TWA concentration at downwind or dedicated Fleet Building air monitoring stations of 150 ug/m^3 above background (upwind) 15-minute TWA concentration.
2. Response: Implement the following if action levels are exceeded:
    a. Stop all Work and immediately notify Construction Manager, Engineer, and appropriate Contractor personnel. Engineer will notify the NYSDEC project managers by telephone or e-mail within two hours after the exceedance.
    b. Continue monitoring and employ additional odor, vapor, and dust controls to abate emissions in accordance with Section 01 57 05.
    c. Identify the source or cause of the exceedance.
    d. Evaluate and, if necessary and appropriate, modify construction techniques.
    e. Prepare exceedance report in accordance with Article 1.06 of this Section.
    f. Work shall not resume until 15-minute TWA concentrations are below action levels. If the 15-minute TWA concentration of TVOCs exceeds 25 ppm above the background (upwind) 15-minute TWA concentration, work shall not resume until authorized by National Grid.

3.02 PERIODIC MONITORING FOR MGP-RELATED ODORS

A. Perimeter Checks:
1. During work hours, perform hourly or more frequent walks around the entire perimeter of the work area to monitor for MGP-related odors.
2. Document the time and outcome of each perimeter check in daily odor monitoring log in accordance with Article 1.07 of this Section.

3. Implement the following if MGP-related odors are noticed at the perimeter of the work area:
    a. Notify Construction Manager, Engineer, and appropriate Contractor personnel.
    b. Continue Work and employ additional odor, vapor, and dust controls to abate emissions in accordance with Section 01 57 05.
    c. Evaluate and, if necessary and appropriate, modify construction techniques.
    d. Perform more frequent perimeter checks.
    e. If MGP-related odors persist at the perimeter of the work area, stop Work and notify Construction Manager, Engineer, and appropriate Contractor personnel.
    f. Identify the source or cause of MGP-related odors.
    g. Evaluate and, if necessary and appropriate, further modify construction techniques and employ additional odor, vapor, and dust controls (water-based, biodegradable vapor mitigation agents, including BioSolve® Pinkwater® and Rusmar AC-645 Long-Duration Foam) to abate emissions in accordance with Section 01 57 05.
    h. Work shall not resume until authorized by National Grid.

B. Odor Complaints:
1. Immediately notify Construction Manager and Engineer of any odor complaints from the public. Engineer will notify the NYSDEC project manager by telephone or e-mail within two hours after a complaint.
2. Implement the following in response to an odor complaint:
    a. As appropriate, verify with Construction Manager and Engineer the legitimacy of the complaint based on the Work being performed at the site, the prevailing wind direction, and other climatological factors.
    b. Continue monitoring and employ additional odor, vapor, and dust controls to abate emissions in accordance with Section 01 57 05.
    c. Evaluate and, if necessary and appropriate, modify construction techniques.
3. Document the time and outcome of any odor complaints in daily odor monitoring log in accordance with Article 1.07 of this Section.

3.03 FIELD QUALITY CONTROL

A. Site Inspections:
1. During the workday, perform hourly or more frequent field checks of monitoring equipment to verify proper function. Document the date, day of the week, time, and outcome of each field check in a dedicated log.
2. Immediately remove from service, and replace at Contractor's expense, damaged or malfunctioning equipment.
3. Prepare and retain at the site electronic or written records of all field checks. Submit to Engineer upon request.

END OF SECTION

SECTION 01 41 26

STORMWATER POLLUTION PREVENTION PLAN AND PERMIT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Comply with the substantive requirements of the most current version of NYSDEC's SPDES General Permit for Stormwater Discharges from Construction Activity (hereinafter, the "SPDES General Permit"). Contractor is responsible for providing necessary materials and taking appropriate measures to comply with requirements of the SPDES General Permit and minimize pollutants in stormwater run-off from the site.

B. Documents: The following are part of the Work included under this Section:
   1. Stormwater Inspection Reports: Prepared by Contractor's trained erosion and sediment control professional contractor using the form included with this Section. Stormwater inspection reports will be filed in a logbook kept at the site by Engineer. Copy of each report will be furnished to Engineer upon request.

C. Prevent discharge of sediment to and erosion from the site to surface waters, drainage routes, public streets and rights-of-way, and private property, including dewatering operations. Minimize or eliminate the potential for stormwater to run on to disturbed Interim Remedial Measure areas. Prevent trash and construction and demolition debris from leaving the site via stormwater run-off. Provide berms, dikes, and other acceptable methods of directing stormwater around work areas to drainage routes.

D. Do not cause or contribute to a violation of water quality standards, Laws, or Regulations. Provide and implement measures to control pollutants in stormwater run-off from the site to prevent:
   1. Turbidity increases that will cause a substantial visible contrast to natural conditions.
   2. Increase in suspended, colloidal, and settleable solids that would cause sediment deposition, or impair receiving water quality and use.
   3. Presence of residue from oil and floating substances, visible oil, and globules of grease.

E. Pay civil penalties and other costs incurred by National Grid, including additional engineering, construction management, and inspection services, associated with non-complying with the substantive requirements of the SPDES General Permit, erosion and sediment controls, and pollution prevention measures associated with the Work.

F. Contract Price includes all material, labor, and other permits and incidental costs related to:
   1. Installing, constructing, repairing, replacing, and maintaining structural and non-structural items used in complying with the Contract Documents.
   2. Clean-up, disposal, and repairs following wet weather events or spills caused by Contractor.
   3. Implementing and maintaining "best management practices", as defined in applicable permits and Laws or Regulations, to comply with requirements that govern stormwater discharges at the site.
   4. Inspecting erosion, sediment, and stormwater controls and pollution prevention measures as specified.

G. Coordinate requirements of this Section with requirements for earthwork, erosion and sediment control, pollution control, and landscaping in the Contract Documents, applicable permit requirements, and Laws and Regulations.

H. Implement stormwater pollution prevention controls and practices prior to starting other Work at the site.

1.02 QUALITY ASSURANCE

A. Qualifications:
   1. Trained Contractor:
      a. Employ and retain at the site a site supervisor or project manager with experience and knowledgeable in the principles and practices of erosion and sediment control (hereinafter, the “trained contractor”). Contractor’s trained contractor shall be present at the site at all times when ground-intrusive or other soil-disturbing Work is being performed and shall be responsible for the day-to-day implementation of the stormwater pollution prevention controls, including the performance of site inspections and assessments in accordance with this Section.
      b. Trained contractor shall have received four hours of NYSDEC-endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC-endorsed entity. Following the initial training, trained contractor shall have completed four hours of training every three years.

B. Regulatory Requirements:
   1. Comply with Laws and Regulations related to environmental protection and restoration, including:
      a. SPDES General Permit.
      b. New York State Standards and Specifications for Erosion and Sediment Control.
      c. Chapter 133, Article XIV of the City Code of the City of Albany, New York.

1.03 SUBMITTALS

A. Informational Submittals:
   1. Stormwater Permit Certification Statement: Submit in accordance with Paragraph 1.01.B.3 of this Section.
   2. Qualifications Statements: Submit name and qualifications of trained contractor, including summary of experience, training received, and copy of valid certifications applicable to the Project.
   3. Storm Water Inspection Reports: Submit in accordance with Article 1.05 of this Section.

1.04 STORMWATER POLLUTION PREVENTION CONTROLS REVISIONS

A. Engineer will prepare a revision to the Contract Documents in accordance with the SPDES General Permit:
   1. When the provisions of the stormwater pollution prevention controls prove to be ineffective in minimizing pollutants in stormwater discharges from the site.
   2. When there is a significant change in design, construction, operation, or maintenance of the Project that has or could have an effect on the discharge of pollutants from the site.
   3. To address issues or deficiencies identified during an inspection by Engineer, Contractor's trained contractor, NYSDEC, or other regulatory authority having jurisdiction.

1.05 STORM WATER INSPECTION REPORTS

A. Prepare a storm water inspection report for each site inspection and assessment required by the SPDES General Permit and this Section. Each report shall be prepared using the form included with this Section.

B. Include in each storm water inspection report, at a minimum, the following:
   1. Date and time of inspection.
   2. Name, title, and affiliation of Contractor's qualified inspector.
   3. Weather and soil conditions (e.g., dry, wet, saturated, etc.) at the time of the inspection.
   4. Description of and site plan showing areas that are disturbed at the time of the inspection and any areas that have been stabilized (either temporary or final) since the previous inspection.
   5. Repairs, maintenance, or corrective actions implemented since the previous inspection. Include digital photographs, with date stamp, that clearly show the areas or items installed, repaired, or replaced.
   6. Condition of storm water run-off at all points of discharge from the site.
   7. Identification of any erosion, sediment, turbidity, and storm water controls that require repair or maintenance.
   8. Identification of any erosion, sediment, turbidity, and storm water controls that were not installed properly or are not functioning as designed.
   9. Repairs, maintenance, or corrective actions required to correct any deficiencies observed during the inspection. Include digital photographs, with date stamp, that clearly show the deficient areas or items.

C. Submit storm water inspection reports to Engineer within three days after each inspection. Inspection reports shall be signed by Contractor's qualified inspector.

D. Retain copies of storm water inspection reports at the site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 INSPECTION AND MAINTENANCE

A. General:
   1. Perform site inspections and assessments as required by the SPDES General Permit and this Section to ensure the continued effectiveness and integrity of all stormwater pollution prevention controls and practices, including erosion and sediment controls and pollution prevention measures.
   2. Initiate repairs or maintenance to stormwater pollution prevention controls and practices within one day after each inspection.
   3. Complete repairs or maintenance to stormwater pollution prevention controls and practices in accordance with applicable requirements and to satisfaction of Engineer within two days after each inspection. If site conditions prevent repairs or maintenance from being completed, promptly notify Engineer and complete repairs or maintenance as soon as site conditions permit.
   4. Cooperate with representatives of authorities having jurisdiction during periodic visits to the site, and promptly provide information requested by authorities having jurisdiction.

B. Maintenance Inspections:
   1. Maintenance inspections (visual) shall be performed by Contractor's trained contractor on a daily basis during the Work until all disturbed areas have achieved final stabilization in accordance with the SPDES General Permit. For temporary Work stoppages and seasonal shut-downs greater than two weeks in duration, maintenance inspections may be suspended if temporary stabilization measures have been applied to all disturbed surfaces, and if approved by Engineer.
   2. Immediately notify Engineer of any deficiencies observed during maintenance inspections, and any maintenance activities or corrective actions required to address those deficiencies.

C. Periodic Inspections:
   1. Periodic inspections shall be performed by Contractor's trained contractor, together with Engineer:
      a. After installation of stormwater pollution prevention controls and practices, and temporary field offices and other temporary facilities, prior to starting other Work at the site.
      b. Every seven days during the Work, and within 24 hours after wet weather events, until all disturbed areas have achieved final stabilization in accordance with the SPDES General Permit. For temporary Work stoppages and seasonal shut-downs greater than two weeks in duration, inspection frequency may be reduced to once every 30 days if temporary stabilization measures have been applied to all disturbed surfaces.
   2. Engineer will prepare a stormwater inspection report for each periodic inspection.

3.02 ATTACHMENTS

A. The attachment listed below, which follow after the "End of Section" designation, are part of this Section:
   1. Attachment A: Storm water inspection report form (three pages).

END OF SECTION

STORM WATER INSPECTION REPORT

Client: _____

Project: _____

Site: _____

Date and Time of Inspection: _____

Qualified Inspector (Name, Title, and Affiliation): _____

Weather Conditions: _____

Soil Conditions: _____

Describe the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow: _____

Describe the condition (e.g., turbidity) of all natural surface waterbodies upstream and downstream of the site: _____

Describe disturbed areas at time of inspection: _____

Identify all erosion and sediment controls that are in need of installation, repair, or maintenance: _____

Describe areas stabilized (temporary or final) since previous inspection: _____

ATTACH SITE PLAN SHOWING APPROXIMATE LIMITS OF DISTURBED AND NEWLY-STABILIZED AREAS

Describe repairs, maintenance, or corrective actions required/implemented since previous inspection: _____

ATTACH PHOTOGRAPHS OF AREAS OR ITEMS INSTALLED, REPAIRED, OR REPLACED

Describe any repairs, maintenance, or corrective actions required to correct observed deficiencies: _____

_____

_____

_____

_____

_____

_____

ATTACH PHOTOGRAPHS OF DEFICIENT AREAS OR ITEMS OBSERVED DURING THE INSPECTION

Signature: _____

Date:_____

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SECTION 01 51 05

TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all temporary utilities required for the Project, including the following:
      a. Electricity.
      b. Lighting.
      c. Telephone and communications.
      d. Heating, cooling, ventilating, and temporary enclosures.
      e. Water.
      f. Fire protection.
      g. Sanitary facilities, in accordance with Section 01 52 19.
   2. Make all arrangements with utility service companies for temporary services and obtain required permits and approvals for temporary utilities.
   3. Pay all utility service costs, including cost of electricity, water, fuel, and other utility services required for the Work.
   4. Continuously maintain adequate temporary utilities for all purposes during the Project, until removal of temporary utilities and temporary facilities. At a minimum, provide and maintain temporary utilities through Substantial Completion and removal of temporary field offices and sheds.
   5. Maintain, including cleaning, temporary utilities and continuously provide consumables as required.
   6. Temporary utilities shall be adequate for personnel using the site and requirements of the Project.
   7. Provide temporary utilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

B. Related Sections:
   1. Section 01 52 13, Field Offices and Sheds.
   2. Section 01 52 19, Sanitary Facilities.

1.02 REFERENCE STANDARDS

A. The following standards are referenced in this Section:
   1. NFPA 10, Standard for Portable Fire Extinguishers.
   2. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.03 REQUIREMENTS FOR TEMPORARY UTILITIES

A. Electrical:
   1. Provide temporary electrical service required for the Work, including continuous power for temporary field offices and sheds. Provide temporary outlets with circuit breaker protection and ground fault protection.
   2. Entity and personnel performing temporary electrical Work shall be an electrician legally qualified to perform electrical construction and electrical work in the jurisdiction where the site is located.

B. Lighting:
   1. Minimum lighting shall be five foot-candles for open areas and 10 foot-candles for stairs and shops. Provide minimum of one, 300-watt lamp every 15 feet in indoor Work areas.
   2. Do not work in areas with insufficient lighting. Where lighting is insufficient for the work activities to be performed, provide additional temporary lighting.
   3. Provide temporary lighting sufficient for observation of the Work by Engineer and inspection by Contractor and authorities having jurisdiction. Where required by Engineer, provide additional temporary lighting.

C. Telephone and Communications:
   1. Provide temporary telephone and communications required for Contractor's operations at the site and for summoning emergency medical assistance.
   2. Provide temporary telephone and communications for field offices.

D. Heating, Cooling, Ventilating, and Enclosures:
   1. Provide sufficient temporary heating, cooling, ventilating, and enclosures to ensure safe working conditions and prevent damage to existing facilities and the Work.
   2. Except where otherwise specified, temporary heating shall maintain temperature of the area served between 50 degrees F and maximum design temperature of building or facility and its contents.
   3. Maintain temperature of areas occupied by National Grid's personnel or electronic equipment, including offices, lunch rooms, locker rooms, toilet rooms, and rooms containing computers, microprocessors, and control equipment, between 65 degrees F and 75 degrees F with relative humidity less than 75 percent.
   4. Required temperature range for storage areas and certain elements of the Work, including preparation of materials and surfaces, installation or application, and curing as applicable, shall be in accordance with the Contract Documents for the associated Work and the Supplier's recommended temperature range for storage, application, or installation, as appropriate.

E. Water:
   1. General:
      a. Provide temporary water facilities including piping, valves, meters if not provided by owner of existing waterline, backflow preventers, pressure regulators, and other appurtenances. Provide freeze-protection as required.
      b. Continuously maintain adequate water flow and pressure for all purposes during the Project, until removal of temporary water systems.
   2. Water for Construction Purposes:
      a. Provide water for site maintenance and cleaning and, water necessary for construction activities, and water for disinfecting and testing of systems.
   3. Water for Human Consumption and Sanitation: Comply with Section 01 52 13.

F. Fire Protection:
   1. Provide temporary fire protection, including portable fire extinguishers rated not less than 2A or 5B in accordance with NFPA 10, for each work zone, each temporary building, and every 3,000 square feet of floor area under construction.
   2. Provide Class A (ordinary combustibles), Class B (combustible liquids and gases), and Class C (electrical equipment) fire extinguishers as necessary.
   3. Comply with NFPA 241 and requirements of fire marshals and authorities having jurisdiction at the site.
   4. Provide temporary fire protection for field offices in accordance with Section 01 52 13.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary systems may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, wiring, controls, and appurtenances.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install temporary utilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Utilities:
   1. Locate temporary systems for proper function and service.
   2. Temporary systems shall not interfere with or provide hazards or nuisances to the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility companies.
   3. Do not install temporary utilities on the ground, with the exception of temporary extension cords, hoses, and similar systems in place for short durations.

C. Modify and extend temporary systems as required by progress of the Work.

3.02 USE

A. Maintain temporary systems to provide safe, continuous service as required.

B. Properly supervise operation of temporary systems:
   1. Enforce compliance with Laws and Regulations.
   2. Enforce safe practices.
   3. Prevent abuse of services.
   4. Prevent nuisances and hazards caused by temporary systems and their use.
   5. Prevent damage to finishes.
   6. Ensure that temporary systems and equipment do not interrupt continuous progress of construction.

C. At end of each work day, check temporary systems and verify that sufficient consumables are available to maintain operation until work is resumed at the site. Provide additional consumables if the supply on hand is insufficient.

3.03 REMOVAL

A. Completely remove temporary utilities, facilities, equipment, and materials when no longer required. Repair damage caused by temporary systems and their removal, and restore the site to condition required by the Contract Documents. If restoration of damaged areas is not specified, restore to pre-construction condition.

B. Where temporary utilities are disconnected from existing utility, provide suitable, water-tight or gas-tight (as applicable) cap or blind flange, as applicable, on service line, in accordance with requirements of utility owner.

END OF SECTION

SECTION 01 52 13

FIELD OFFICES AND SHEDS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide and maintain field offices at the site for National Grid, Construction Manager, Engineer, NYSDEC, and Contractor. Provide field offices at locations acceptable to National Grid and approved by Engineer.
   2. Provide required storage and work sheds.
   3. Field offices shall be complete, fully functional, and ready for occupancy within 14 days after Engineer's approval of the submittal required by this Section.
   4. Obtain required permits and pay all fees for field offices and sheds. Field offices and sheds shall comply with Laws and Regulations.

B. Related Sections:
   1. Section 01 51 05, Temporary Utilities.
   2. Section 01 52 16, First-Aid Facilities.

1.02 SUBMITTALS

A. Action Submittals:
   1. Field Office Submittal: Submit, as a single submittal, the following:
      a. Site plan indicating proposed location of field office trailers and sheds, parking for field offices, and facilities related to the field offices.
      b. Information on proposed field office trailer size, construction, exterior appearance, interior finishes, and security measures.
      c. Proposed layout of field office interior, showing location of offices, common areas, closets, with dimensions indicated for each.
      d. Listing of utility providers.
      e. Product data and technical information for multifunction printer and telephone system.

PART 2 – PRODUCTS

2.01 FIELD OFFICE TRAILERS

A. Provide two mobile office trailers (one for National Grid, Construction Manager, Engineer, and NYSDEC and the second for Contractor), each at least 10 feet wide with a minimum floor area of 430 square feet, and each partitioned to provide three separate office spaces (one which will serve as a common area).
   1. Trailers shall be completely weather-tight and insulated, with minimum R-19 insulation.
   2. Field Office Ingress and Egress:
      a. Two outside doors for ingress and egress for each field office trailer, each with landing, stairs, and railing conforming to building codes in effect at the site. A sign reading "All Site Visitors Must Sign-In Here" shall be affixed to the exterior of the Contractor's field office trailer.
      b. Landing and stairs shall be metal, pressure-treated wood, fiberglass, or concrete, and shall have slip-resistant walking surfaces.

c. Railing shall be metal, wood, or fiberglass.
d. Doors shall be secure and lockable, and each furnished with suitable, lockable security bar by MasterLock or equal.

3. Windows: Window area equal to at least 10 percent of floor area. Windows shall each have insect screen and operable sash. Provide each window with lock and exterior security bars approved by Engineer.
4. One lockable closet for storage.

B. Furnish to Engineer two identical sets of keys suitable for operating all keyed locks, including ingress/egress door locks, security bars for doors, window locks, closets, and office furnishings.

2.02 FIELD OFFICE UTILITIES

A. Comply with Section 01 51 05.

B. Provide the following for each field office trailer:
1. Electrical System and Lighting:
a. Electric service as required, including paying all costs.
b. Interior lighting of 50 foot-candles at desktop height.
c. Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
d. Exterior, wall-mounted, 250-watt lighting at each entrance.
2. Heating, Ventilating, and Air Conditioning:
a. Automatic heating to maintain indoor temperature of at least 65 degrees F in cold weather.
b. Automatic cooling to maintain indoor temperature no warmer than 75 degrees F in warm weather.
c. Furnish all fuel and pay all utility costs.
3. Internet Service:
a. Obtain and pay for Internet service, with unlimited (untimed) Internet access, until removal of field office trailers.
b. Provide fiber-optic or cable connection with appropriate modem and appurtenances, and dual-band Wireless-N router.
c. Minimum Speed: Up to 300 megabits per second download, up to 10 megabit per second upload.
d. Set up system and appurtenances required and verify functionality in each field office space.

C. Should actions of utility companies delay the complete set up of field offices, Contractor shall provide temporary electricity, heat, telephone, and internet service as required at no additional cost to National Grid.

2.03 FIELD OFFICE FURNISHINGS AND EQUIPMENT

A. Provide the following furnishings and equipment for each field office trailer:
1. Desks: Four five-drawer desks, each five feet long by 2.5 feet wide with at least one file drawer per desk suitable for storing 8.5-inch by 11-inch documents.
2. Desk Chairs: Four new or used (in good condition) five-point, high backed, cushioned swivel chairs.
3. Other Chairs: Ten metal folding chairs without arm rests.

4. Tables:
    a. Two new or used (in good condition) portable folding tables, each eight feet long by 2.5 feet wide.
    b. Two new or used (in good condition) portable folding tables, each six feet long by 2.5 feet wide.
5. Plan rack(s) to hold a minimum of eight sets of the Design Drawings.
6. Two four-drawer, legal size, fire-proof file cabinets with locks.
7. Four polyethylene waste baskets, each with minimum capacity of seven gallons.
8. Suitable doormat at each exterior ingress/egress door.
9. One tack board, approximately three feet long by 2.5 feet wide, with thumbtacks.
10. One white board for use with dry markers, approximately six feet long by four feet wide, with marker holding tray, installed by Contractor at location selected by Engineer in the field. Furnish supply of colored markers and eraser for the white board.
11. Fire extinguisher with associated signage, and smoke detector, in accordance with Laws and Regulations. At a minimum, provide two wall-mounted fire extinguishers and one battery-operated, ceiling-mounted smoke detector. Comply with fire protection requirements of Section 01 51 05.
12. One first-aid station. Comply with Section 01 52 16.
13. Two electric clocks.
14. One electric coffee maker with ten-cup capacity or larger.
15. One microwave oven with minimum capacity of 0.9 cubic foot.
16. Two refrigerators, each with minimum capacity of 2.5 cubic feet.
17. Bottled water with electric cooler dispenser for five-gallon bottles, with cup dispenser.
18. Multifunction Printer:
    a. Two new or used (in good condition) machines with the following functions:
        1) Photocopying.
        2) Network color printing.
        3) Scanning to produce PDF and JPG files.
        4) Fax via telephone line.
    b. Paper Size: 8.5-inch by 11-inch (A), 8.5-inch by 14-inch (legal), and 11-inch by 17-inch (B) capacity.
    c. Other: Enlarging and reducing capabilities, stream-feed capability, bypass feeder, and double-sided copying capability.
    d. Provide necessary cables and appurtenances to enable all functions specified in this Section, including printing from field office computers.

B. Provide two-way portable radios and charging units for Construction Manager, Engineer, and key Contractor personnel (e.g., superintendent, foreman, etc.).

2.04 STORAGE AND WORK SHEDS

A. Provide storage and work sheds sized, furnished, and equipped to accommodate personnel, materials, and equipment involved in the Work, including temporary utility services and facilities required for environmental controls sufficient for personnel, materials, and equipment.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install field offices, sheds, and related facilities in accordance with Laws and Regulations.

B. Install materials and equipment, including pre-fabricated structures, in accordance with manufacturer's instructions.

3.02 CLEANING, MAINTENANCE, AND SUPPLIES

A. Provide the following maintenance services:
   1. Immediately repair malfunctioning, damaged, leaking, or defective field office trailers, sheds, site improvements, systems, and equipment.
   2. Provide all supplies and pay for maintenance on multifunction printers.
   3. Promptly provide snow removal for field offices, including parking areas, walkways, and stairs and landings.
   4. Provide continuous maintenance and janitorial service of field offices and sanitary facilities. Clean field offices, including wiping horizontal surfaces and mopping floors, at least once per week.
   5. Properly dispose of trash as needed, at least twice per week. Dispose of other waste, if any, as required, to avoid creation of nuisances.

B. Provide the following consumables as needed:
   1. Light bulbs for interior and exterior lights.
   2. Toner or ink cartridges for multifunction printers, as required.
   3. Paper supplies for multifunction printers.
   4. Dry markers in six colors and white board eraser set.
   5. Bottled water suitable for water dispensers and disposable cups.
   6. Coffee supplies, including disposable cups, filters, coffee, sugar, creamer, and stir-sticks.
   7. Soap, paper towels, cleansers, sanitary supplies, and janitorial implements, including broom.
   8. Cleaning products (e.g., wipes, disinfectant spray, paper towels, etc.) for daily wipe-down of surfaces within the Engineer's and Contractor's field office trailers.
   9. Batteries for smoke detector and other battery-powered items furnished by Contractor.
   10. Replace fire extinguishers upon expiration.
   11. Replenish contents of first-aid kits as required.

3.03 REMOVAL

A. Do not remove field offices and sheds until after Substantial Completion. Restore areas upon removal and prior to final inspection.

B. Remove field offices and sheds and restore areas upon removal and prior to final inspection.

END OF SECTION

SECTION 01 52 16

FIRST-AID FACILITIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide first-aid facilities during the Project.
      a. Pay all costs for first-aid facilities, including installation, maintenance, and removal.
      b. Maintain, including cleaning, first-aid facilities. Keep first-aid facilities continuously supplied with consumables.
      c. Facilities shall be adequate for personnel using the site and requirements of the Project.
      d. Provide facilities in compliance with Laws and Regulations.

B. Related Sections:
   1. Section 01 35 29, Contractor's Health and Safety Plan

1.02 REFERENCE STANDARDS

A. The following standards are referenced in this Section:
   1. ANSI Z308.1, Minimum Requirements for Workplace First Aid Kits and Supplies.
   2. ANSI Z358.1, Emergency Eye Wash and Shower Equipment.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 29 CFR 1926.50, Medical Services and First-Aid.

1.04 REQUIREMENTS FOR FIRST-AID FACILITIES

A. Provide temporary first-aid stations at or immediately adjacent to the site's major work areas, and inside each temporary field office. Locations of first-aid stations shall be determined by Contractor's safety representative. At a minimum, first-aid stations provided shall include:
   1. One first-aid kit complying with ANSI Z308.1.
   2. Suitable washing facilities for Contractor's employees, including one eyewash station complying with ANSI Z358.1.
   3. Potable drinking water supply and cups.

B. Provide list of emergency telephone numbers in each field office trailer at the site. List shall be in accordance with the list of emergency contact information required in Section 01 35 29.

C. When Work is in progress, provide at the site at least one person trained in first-aid and cardiopulmonary resuscitation (CPR). First-aid- and CPR-trained personnel shall possess valid certificate indicating that they have successfully completed a first-aid and CPR training course by the American Red Cross or similar entity.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 INSTALLATION

A. Location of potable drinking water supply shall be as required by Contractor and convenient for access by personnel.

B. Location of temporary first-aid facilities shall be as specified in Article 1.03 of this Section.

3.02 USE

A. Properly supervise temporary first-aid facilities.

B. Properly dispose of wastes.

C. Check temporary first-aid stations not less than weekly and verify that sufficient consumables are available. Provide additional consumables if the supply on hand is insufficient.

3.03 REMOVAL

A. Completely remove temporary first-aid facilities and materials when no longer required. Repair damage caused by temporary first-aid facilities and their removal, and restore the site to condition required by the Contract Documents. If restoration of damaged areas is not specified, restore to pre-construction condition.

END OF SECTION

SECTION 01 52 19

SANITARY FACILITIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all temporary sanitary facilities required for the Project.
      a. Make all arrangements with temporary sanitary facility companies for temporary sanitary services and obtain required permits and approvals for temporary sanitary services.
      b. Pay all temporary sanitary facility service costs, including cost of electricity, water, fuel, and other utility services required for the Work.
      c. Continuously maintain adequate temporary sanitary facilities for all purposes during the Project, until removal of temporary sanitary facilities. At a minimum, provide and maintain temporary sanitary facilities through Substantial Completion and removal of temporary field offices and sheds.
      d. Maintain, including clean, temporary sanitary facilities and continuously provide consumables as required.
      e. Temporary sanitary facilities shall be adequate for personnel using the site, site visitors, and requirements of the Project.
      f. Provide temporary sanitary facilities in compliance with Laws and Regulations.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 29 CFR 1926.51, Sanitation.

1.03 REQUIREMENTS FOR TEMPORARY SANITARY FACILITIES

A. Provide separate facilities for Contractor and Owner/Engineer/Agency personnel.

B. Provide and maintain two suitably-enclosed chemical or self-contained toilets and suitable temporary washing facilities.

C. Location of temporary toilets and temporary washing facilities must be acceptable to National Grid.

D. Provide a supply of potable drinking water and related facilities and consumables.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary sanitary facilities may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, wiring, and controls.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install temporary sanitary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Sanitary Facilities:
   1. Locate temporary sanitary facilities for proper function and service.
   2. Temporary sanitary facilities shall not interfere with or provide hazards or nuisances to:
      a. The Work under this contract.
      b. Movement of personnel.
      c. Traffic areas, materials handling, hoisting systems, storage areas, and finishes.
      d. Work of utility companies.

C. Modify and extend temporary sanitary facilities as required by progress of the Work.

3.02 USE

A. Maintain temporary sanitary facilities to provide safe, continuous service as required.

B. Properly supervise operation of temporary sanitary facilities:
   1. Enforce compliance with Laws and Regulations.
   2. Enforce safe practices.
   3. Prevent abuse of services.
   4. Prevent nuisances and hazards caused by temporary sanitary facilities and their use.
   5. Prevent damage to finishes.
   6. Ensure that temporary sanitary facilities do not interrupt continuous progress of construction.

C. At the end of each work day, check temporary sanitary facilities and verify that sufficient consumables are available to maintain operation until work is resumed at the site. Provide additional consumables if the supply on hand is insufficient.

3.03 REMOVAL

A. Completely remove temporary sanitary facilities and materials when no longer required. Repair damage caused by temporary sanitary facilities and their removal, and restore the site to condition required by the Contract Documents. If restoration of damaged areas is not specified, restore to pre-construction condition.

END OF SECTION

SECTION 01 55 26

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Keep all public and private roads, driveways, and parking areas open for passage of traffic and pedestrians during the Work, unless otherwise approved by the owner of the street, traffic way, right-of-way, or National Grid, as applicable.
   2. Construction traffic will access the site only via entrance(s) indicated on the Design Drawings.
   3. Maintain two lanes of traffic open for passage of traffic adjacent to Building #2 and the fuel island during the work, unless otherwise approved by National Grid.
   4. Maintain vehicle and pedestrian traffic to the Fleet Garage bays outside the construction limits during the work, unless otherwise approved by National Grid.
   5. Unless otherwise shown or specified in the Contract Documents, maintenance and protection of traffic shall be in accordance with the New York State Department of Transportation Manual of Uniform Traffic Control Devices.

B. Coordination:
   1. Coordinate with National Grid, as applicable, for maintenance and protection of traffic requirements.
   2. Provide a minimum of 3 weeks' notice to National Grid of the closure/detour for the Fleet Building garage bays and fuel island.
   3. Submit Traffic Control Plan to National Grid for approval following review and approval of the Traffic Control Plan by the Engineer.
   4. Give required advance notice to fire departments, police departments, and other emergency services as applicable of proposed construction operations, modifications to existing traffic patterns, and access to onsite structures (e.g., sprinkler hookups, valves, shut-offs, fuel island pumps).
   5. Give reasonable notice to National Grid of private properties that may be affected by construction operations. Give such notice not less than seven days prior to when such buildings will or may be affected by construction operations.

1.02 SUBMITTALS

A. Information Submittals:
   1. Traffic Control Plan: Submit detailed plan, procedures, and sequencing for maintaining and protecting traffic in accordance with the Contract Documents and requirements of authorities having jurisdiction for review and approval by the Engineer. Include the following:
      a. Traffic staging plan, and construction sequencing as applicable to maintenance and protection of traffic.
      b. Map or drawing depicting proposed haul routes and authorized commercial or industrial location to be used for temporary truck staging/queueing locations.
      c. Product data, including manufacturer's catalog information and specifications, for temporary signage, temporary signals, temporary illumination devices, and other products to be used in maintaining and protecting traffic.
      d. Number and types of personnel dedicated to maintaining and protecting traffic during construction.

e. Location of traffic controls to be installed.

PART 2– PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment used for the maintenance and protection of traffic shall comply with the reference specification indicated in Paragraph 1.01.A.3 of this Section.

PART 3 – EXECUTION

3.01 GENERAL PROVISIONS

A. Temporary road crossings or obstructions shall be for shortest duration practical, and passage shall be restored immediately after completion of Work.

B. Provide signs, signals, barricades, flares, lights and other equipment, service, and personnel required to regulate and protect all traffic and warn of hazards. Such Work shall comply with the requirements of National Grid and authorities having jurisdiction. Remove temporary equipment and facilities when no longer required, and restore grounds to original or to specified conditions, as applicable.

C. Switchgear, transformers, hydrants, valves, fire alarm boxes, postal boxes and delivery service boxes, and other facilities that may require access during construction shall be kept accessible for use.

3.02 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in areas under Contractor's control, and areas affected by construction operations.

B. Provide traffic control and directional signs, mounted on temporary barriers or standard posts, at the following locations:
   1. Detours and areas of hazard.
   2. Parking areas.
   3. Traffic entrance to and exit from each construction area.
   4. Other locations required by the reference specification indicated in Paragraph 1.01.A.3 of this Section and authorities having jurisdiction.

3.03 TRAFFIC CONTROL PERSONNEL

A. General:
   1. When construction operations encroach on traffic lanes, furnish qualified and suitably-equipped traffic control personnel with current NYSDOT-approved flagger certification as required for regulating traffic and in accordance with requirements of authorities having jurisdiction.
   2. Traffic control personnel shall use appropriate flags or mobile signs.
   3. Equip traffic control personnel with appropriate personal protection equipment and suitable attire.
   4. Attire and conduct of traffic control personnel must be appropriate and must not create nuisances or distraction for traffic.

3.04 FLARES AND LIGHTS

A. During periods of low visibility provide flares and lights for the following:
   1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazard areas.
   2. For use by traffic control personnel directing traffic.

B. Provide adequate illumination of critical traffic and parking areas.

3.05 PARKING CONTROL

A. Control all Contractor-related vehicular parking at the site to preclude interfering with traffic and parking, access by emergency vehicles, National Grid's operations, and construction operations.

B. Control parking of construction vehicles at the site as follows:
   1. Maintain free vehicular access to and through Building #2, the fuel island, Fleet Building, and the parking areas.
   2. Prohibit employee parking or vehicle staging on or adjacent to public streets, access roads, and in non-designated areas.
   3. Construction vehicles shall possess current vehicle registration.

3.06 HAUL ROUTES

A. Submit proposed haul routes to National Grid and Engineer and obtain approval of authorities having jurisdiction.

B. Confine construction traffic to approved haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

3.07 REMOVAL

A. Maintain and protect traffic throughout the Project. Provide maintenance and protection of traffic measures at the site until no longer required due to the progress of the Work. When no longer required, completely remove maintenance and protection of traffic measures and restore the site to pre-construction condition or to condition required by the Contract Documents, as applicable.

END OF SECTION

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SECTION 01 57 05

TEMPORARY CONTROLS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide and maintain methods, equipment, materials, and temporary construction as required to control environmental conditions at the site and adjacent areas during the Project.
   2. Maintain temporary controls until no longer required.
   3. Temporary controls include, but are not limited to, the following:
      a. Erosion and sediment controls.
      b. Control of surface water, including storm water run-off.
      c. Odor, vapor, and dust controls.
      d. Pollution controls.
      e. Noise controls.

B. Related Sections:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 01 35 49, Community Air Monitoring Plan.
   3. Section 01 41 26, Storm Water Pollution Prevention Plan.
   4. Section 01 74 05, Cleaning.
   5. Section 02 55 00, In-Situ Solidification
   6. Section 31 00 00, Earthwork.
   7. Section 31 11 00, Clearing and Grubbing.
   8. Section 31 23 19, Dewatering.

1.02 REFERENCE STANDARDS

A. The following standards are referenced in this Section:
   1. AASHTO M 288, Standard Specification for Geotextile Specification for Highway Applications.
   2. FHWA FP-03, Standard Specifications for the Construction of Roads and Bridges on Federal Highway Projects.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with applicable provisions and recommendations of the following:
      a. NYSDEC New York State Standards and Specifications for Erosion and Sediment Control.
      b. NYSDEC Spill Guidance Manual.
      c. NYSDOT Standard Specifications and Standard Sheets.
      d. City of Albany Codes.

1.04 SUBMITTALS

A. Action Submittals:
   1. Submit the following plans (separate or as part of the Contractor's Project Operations Plan):

a. Erosion and Sediment Control Plan.
b. Noise Control Plan.
c. Dust Control Plan.
d. Pollution Control Plan.

2. Product Data: Submit manufacturer's data and specifications for the following:
   a. Compost filter sock.
   b. Silt fencing.
   c. Erosion control blankets, and staples or anchoring stakes.
   d. Vapor mitigation agents and proposed application and storage equipment for each.

PART 2– PRODUCTS

2.01 EROSION AND SEDIMENT CONTROLS

A. General:
   1. Materials used for erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.03 of this Section, unless otherwise shown or indicated in the Contract Documents.

B. Silt Fencing:
   1. Filter Fabric:
      a. Material: Geotextile shall comply with AASHTO M 288 specifications for temporary silt fence.
      b. Height: Two feet, minimum.
   2. Fence Support Posts:
      a. Material: Hardwood or steel posts may be used.
         1) Hardwood posts shall be at least 2 inches by 2 inches in cross section.
         2) Steel posts shall be "T" or "U" shape in cross section with a minimum weight of 1.0 pound per linear foot.
      b. Length: Four feet, minimum.
   3. Fabric fasteners shall be heavy-duty staples, wire ties, or other fastener compatible with support post material.

C. Compost Filter Sock:
   1. Compost filter sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up slope at 45 degrees to main sock alignment.
   2. Compost filter socks shall be sized and designed in accordance with the tables provided in the New York Standards and Specifications for Erosion and Sediment Control.

2.02 ODOR, VAPOR, AND DUST CONTROLS

A. Vapor Mitigation Agents: Provide the following:
   1. BioSolve Pinkwater, by The BioSolve Company.
   2. AC-645 Long-Duration Foam, by Rusmar, Inc.

B. Water: Clean, potable.

C. Provide pressure washers, pneumatic foam unit, portable tanks, hoses, and other equipment required for the storage and application of vapor mitigation agents and water. Furnish and retain at the site spare equipment to allow for uninterrupted odor, vapor, and dust control in the event of equipment damage or malfunction.

PART 3– EXECUTION

3.01 EROSION AND SEDIMENT CONTROLS

A. Installation and Maintenance – General:
   1. General:
      a. Provide temporary erosion and sediment controls as shown and indicated on the Design Drawings and elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously undisturbed areas.
      b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.03 of this Section, unless otherwise shown or indicated in the Contract Documents.
      c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices in accordance with Laws and Regulations, and regulatory requirements indicated in Article 1.03 of this Section, to control erosion and sedimentation during the Project.
      d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
      e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provide measures for regulating drainage and controlling erosion and sedimentation, subject to Engineer's approval.
      f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.
   2. Coordination:
      a. Coordinate erosion and sediment controls with this Section's requirements on water control and with Section 01 41 26.
      b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment controls.
   3. Before commencing activities that will disturb soil or soil cover at the site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
   4. In general, implement construction procedures associated with, or that may affect, erosion and sediment control to ensure minimum damage to the environment during construction. Contractor shall implement any and all additional measures required to comply with Laws and Regulations, and Section 01 41 26.
   5. Access Roads and Parking Areas: When possible, access roads, temporary roads, and parking areas shall be located and constructed to avoid adverse effects on the environment. Provide measures to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
   6. Earthwork, ISS, and Temporary Controls:
      a. Perform excavation, fill, and related operations in accordance with Section 31 00 00.
      b. Perform ISS related operations in accordance with Section 02 55 00.
      c. Control erosion to minimize transport of silt from the site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, gravel or crushed stone, temporary plantings, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.
      d. Hold to a minimum the areas of bare soil exposed at one time.

e. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
f. In performing earthwork, eliminate depressions that could serve as mosquito breeding pools.
g. Provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.

7. Inspection and Maintenance:
   a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation. Promptly implement corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized.
   b. Inspect and report not less often than the frequency specified in Section 01 41 26.
   c. Repair or replace damaged erosion and sediment controls within two days of Contractor becoming aware of such damage.
   d. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
8. Duration of Erosion and Sediment Controls:
   a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.
   b. Maintain erosion and sediment controls until the site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.
9. Work Stoppage: If the Work is temporarily stopped or suspended for any reason, Contractor shall provide additional temporary controls necessary to prevent environmental damage to the site and adjacent areas while the Work is stopped or suspended.
10. Failure to Provide Adequate Controls: In the event Contractor repeatedly fails to satisfactorily control erosion and sedimentation, National Grid reserves the right to employ outside assistance or to use National Grid's own forces for erosion and sediment control. Cost of such work by National Grid, plus engineering and inspection costs, will be deducted from amounts due to Contractor.

B. Silt Fencing:
1. Install and maintain silt fencing in a vertical plane, at the location(s) shown or indicated in the Contract Documents and where required.
2. Locations of Silt Fencing:
   a. Where possible, install silt fencing along contour lines so that each given run of silt fencing is at the same elevation.
   b. On slopes, install silt fencing at intervals that do not exceed the maximum lengths indicated in Table 01 57 05-A.

TABLE 01 57 05-A
MAXIMUM LENGTH OF SLOPE BETWEEN RUNS

Slope (V:H)	Slope Length (feet)
1:2 (50%)	25
1:3 (33%)	50
1:4 (25%)	75
1:5 (20%) and Less	100

   c. Provide silt fencing around the perimeter of each stockpile of topsoil, general fill material, and excavated material. Install silt fencing before expected precipitation and maintain until stockpile is removed.
   d. Do not install silt fencing at the following types of locations:
      1) Area of concentrated storm water flows such as ditches, swales, or channels.

2) Where rock or rocky soils prevent full and uniform anchoring of silt fencing.
3) Across upstream or discharge ends of storm water piping or culverts.

3. Installation:
   a. Securely fasten filter fabric to each support post in no less than four locations. Spacing between support posts shall not exceed 10 feet (center to center).
   b. When two sections of filter fabric abut each other, fold over edges and overlap by not less than six inches and securely fasten to wire mesh.
   c. Embed posts in the ground to the depth necessary for proper controls, but not less than 16 inches below ground surface.
   d. Filter fabric shall extend not less than eight inches below ground and not less than 16 inches above ground.
   e. Filter fabric at bottom of silt fence shall be buried in a trench, in a "J" configuration, to a depth of six inches.
   f. Remove sediment accumulated at silt fencing as required. Repair and reinstall silt fencing as required.
4. Maintenance:
   a. Do not allow formation of concentrated storm water flows on slopes above silt fencing unless so shown or indicated in the Contract Documents. If unauthorized concentrated storm water flows occur, stabilize the slope via earthmoving and other stabilization measures as required to prevent flow of concentrated storm water flows toward silt fencing.

3.02 SURFACE WATER CONTROL

A. General:
   1. Provide methods to control surface water to prevent damage to the Work, the site, and adjoining properties.
   2. Control fill, grading, and ditching to direct surface water away from disturbed areas, excavations, pits, tunnels, and other construction areas, and to direct drainage to proper run-off courses to prevent erosion, damage, or nuisance.

B. Equipment and Facilities for Surface Water Control:
   1. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.
   2. Equipment and facilities used to control surface water shall not be located in environmentally sensitive areas such as wetlands.

C. Dewatering, Discharge, and Disposal:
   1. Comply with dewatering requirements of Sections 31 00 00 and 31 23 19.
   2. Dispose of surface water in a manner to prevent flooding, erosion, and other damage to any and all parts of the site, adjoining areas, and wetlands, and that complies with Laws and Regulations.

3.03 ODOR, VAPOR, AND DUST CONTROL

A. General:
   1. Provide means, methods, and facilities required to control MGP-related odors, vapors, and dust generated during the Work.
   2. Proactively employ odor, vapor, and dust controls during the Work, and evaluate and modify construction techniques and site management practices, as necessary and appropriate, to:
      a. Mitigate MGP-related odor emissions to the extent practicable, and to the satisfaction of National Grid, Construction Manager, Engineer, and NYSDEC.

b. Prevent exceedances of the community air monitoring action levels specified in Section 01 35 49.

3. If Contractor's means, methods, and facilities are unsuccessful in controlling MGP-related odors, vapors, and dust as specified in this Section, based on visual observations or the results of community air monitoring, Work shall be suspended until appropriate corrective actions are taken by Contractor to remedy the situation to Construction Manager's or Engineer's satisfaction. National Grid will not be liable for any expense or delay resulting from Contractor's failure to control MGP-related odors, vapors, and dust in accordance with this Section.

B. Vapor Mitigation Agents:
1. Mobilize vapor mitigation agents and means of storage and dispersion at the site before initiating any ground-intrusive Work or dust-generating Work.
2. Application of vapor mitigation agents shall be as follows:
a. BioSolve Pinkwater:
1) Prepare three-percent solution of BioSolve Pinkwater concentrate and water. Apply to exposed soils and excavation faces using backpack sprayers, power washers, or misters.
2) Apply when actively excavating, performing ISS, when actively handling excavated materials, and as required by National Grid, Construction Manager, or Engineer.
b. AC-645 Long-Duration Foam:
1) Prepare 13-percent solution of AC-645 Long-Duration Foam concentrate and water. Apply to excavation faces and uncovered stockpiles of excavated materials using pneumatic foam unit. Completely and uniformly cover exposed soil surfaces with minimum three inches of foam.
2) Apply before each work break, at the end of each work day, and as required by National Grid, Construction Manager, or Engineer.

C. Construction Techniques and Site Management Practices:
1. Excavate and backfill, and load, handle, and unload excavated materials and clean fill materials, in manner that minimizes the generation of airborne dust.
2. Haul excavated materials and clean fill materials in properly covered vehicles.
3. Restrict vehicle speeds on temporary access roads and active haul routes.
4. Cover shallow excavations and stockpiles of clean fill materials with polyethylene liners before extended work breaks and at the end of each workday. Anchor liners to resist wind forces; slope to prevent accumulation of water.
5. Hold to a minimum the areas of bare soil exposed at one time.
6. Comply with cleaning and dust control requirements of Section 01 55 13 and progress cleaning requirements of Section 01 74 05.

3.04 POLLUTION CONTROL

A. General:
1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.
2. Equipment used during construction shall comply with Laws and Regulations.
3. Comply with Sections 01 35 43.13 and 01 41 26.

B. Spills and Contamination:
1. Provide equipment, materials, and personnel to perform emergency measures required to contain and clean up spills, and to remove soils and liquids contaminated by spills.

2. Provide spill kits, including oil-absorbent pads, socks, and booms, at or immediately adjacent to the site's major work areas and equipment storage and fueling areas.
3. Immediately notify National Grid, Construction Manager, and Engineer of all spills, regardless of material, volume, or circumstances involved.
4. Excavate contaminated material and properly dispose of offsite, and replace with suitable compacted fill and topsoil.

C. Protection of Surface Waters and Wetlands:
1. Implement special measures to prevent harmful substances from entering surface waters and wetlands. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters, wetlands, and open drainage routes, in sanitary sewers, or in storm sewers.

D. Atmospheric Pollutants:
1. Provide systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:
1. Provide systems for controlling and managing solid waste related to the Work.
2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
3. Properly handle and dispose of solid waste.

3.05 NOISE CONTROL

A. Contractor's vehicles, equipment, and operations shall minimize noise emissions to the greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary, or as directed by National Grid or Engineer.

B. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.

C. Noise emissions shall not interfere with the Work of City, nearby property owners, or others.

3.06 PROHIBITED CONSTRUCTION PROCEDURES

A. Prohibited construction procedures include, but are not limited to, the following:
1. Dumping or disposing of spoil material, cleared vegetation, debris, or other waste material in any surface waters, drainage ways, wetlands, or other unauthorized locations.
2. Indiscriminate, arbitrary, or capricious operation of equipment in any surface waters, drainage ways, wetlands, or other unauthorized locations.
3. Pumping of silt-laden water from trenches or other excavations to any surface waters, drainage ways, sewers, wetlands, or other unauthorized locations.
4. Damaging vegetation beyond the extent necessary for construction.

3.07 REMOVAL OF TEMPORARY CONTROLS

A. Remove temporary controls only when directed by National Grid or Engineer.

END OF SECTION

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SECTION 01 57 33

SECURITY

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Safely guard all Work, the Project, products, materials, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion, or as otherwise directed by National Grid. Contractor's duty includes safely guarding National Grid's property in the vicinity of the Work and Project, the site, and other private property in the vicinity of the Project from injury and loss in connection with the performance of the Project.
   2. Make no claim against National Grid for damage resulting from trespass.
   3. Pay full compensation for, or repair and replace, damage to property of National Grid and others arising from failure to furnish adequate security.
   4. Provide temporary fencing, temporary gates, and privacy screens in accordance with the Contract Documents and this Section.

B. Related Sections:
   1. Section 01 32 26, Construction Progress Reporting.

1.02 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Submit drawings showing proposed locations and extent of temporary fencing and gates at the site.
   2. Product Data: Submit manufacturer's data, specifications, and installation instructions for temporary fencing, temporary gates, and privacy screens.

B. Informational Submittals:
   1. Daily Security Logs: Submit in accordance with Paragraph 1.03.C of this Section.

1.03 CONTRACTOR'S SITE ACCESS AND SECURITY PROCEDURES

A. Comply with National Grid's security procedures and access restrictions at the site throughout the Project.

B. Maintain a daily security log of all site workers and visitors throughout the Project. Include the date, name, affiliation, purpose of visit, time in, and time out for each site worker and visitor. Submit copy of daily security log to Construction Manager and Engineer with daily construction report in accordance with Section 01 32 26.

PART 2 – PRODUCTS

2.01 TEMPORARY FENCING AND GATES

A. Temporary Fencing:
   1. Provide portable chain-link fence panels or chain-link fencing mounted atop concrete security barrier (jersey barrier) with minimum height of 6 feet. Fence fabric and framework shall be galvanized steel.

B. Temporary Gates:
   1. Provide chain-link vehicle swing gates with minimum height of 6 feet and minimum width of 12 feet. Gate fabric and framework shall be galvanized steel.
   2. Provide chain-link personnel access gates with minimum height of 6 feet and minimum width of 4 feet.
   3. Provide suitable locking mechanism for each temporary gate.

2.02 RELATED MATERIALS

A. Privacy Screens: Provide privacy screens (hedge slats or geotextile meeting the specifications of US Fabric Inc. Fence Screen 130 Series Privacy Air or Equivalent) for all temporary fencing and gates used for site security.
   1. Size: Match to height of fence fabric.
   2. Color: Green or black.
   3. Opacity: 85 percent, minimum.

PART 3– EXECUTION

3.01 TEMPORARY FENCING AND GATES

A. Installation:
   1. Install temporary fencing and gates used for site security in accordance with the Contract Documents and manufacturer's instructions.
   2. Install privacy screens and slats in accordance with manufacturer's instructions on all temporary fencing and gates used for site security.

B. Maintenance:
   1. Maintain temporary fencing and gates throughout the Project. Repair damage to temporary fencing and gates, and replace fencing and gates when required to maintain site security.
   2. Adjust or relocate temporary fencing and gates at the site as needed to accommodate the Work and construction sequencing.
   3. Maintain privacy screens/slats throughout the Project. Promptly repair or replace damaged privacy screens/slats.

C. Removal:
   1. Remove temporary fencing and gates upon Substantial Completion, or when otherwise directed by National Grid.
   2. Repair damage caused by temporary fencing and gates and their removal, and restore the site to condition required by the Contract Documents. If restoration of damaged areas is not specified, restore to pre-construction condition.

END OF SECTION

SECTION 01 58 13

TEMPORARY PROJECT SIGNAGE

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Furnish and install temporary signage as specified in this Section for Project identification and construction site information.
   2. Temporary signs include:
      a. Project hotline signs.
      b. Danger signs.
      c. Security signs.
   3. Do not display any other temporary signs, other than those specified, without prior approval of National Grid.
   4. Maintain temporary signs until Substantial Completion, or as otherwise directed by National Grid.

1.02 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Submit drawings showing layout, text, font, character size, colors, graphics or logos (if any), materials of construction, and dimensions of each temporary sign, and the proposed locations and orientations of temporary signs at the site.

PART 2 – PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. Project Hotline Signs:
   1. Location: At the vehicle entrance for the project work area.
   2. Text: Text shall be centered vertically and horizontally on sign board, and shall read as follows:

      "SITE HOTLINE: [*Insert telephone number assigned to Construction Manager's field office*]"

   3. Background Color: White.
   4. Text Color: Black.
   5. Text Height: 1.5 inches, minimum.
   6. Printing: Digital or screen printing with ultraviolet-resistant inks.
   7. Sign Board:
      a. Material: Aluminum composite, minimum thickness of three millimeters.
      b. Minimum Dimensions: 48 inches wide by 24 inches high.
   8. Supports and Bracing: Provide supports and bracing as required to adequately support and brace signs for the duration of the Project.
   9. Obtain Engineer approval before releasing for manufacture.

B. Danger Signs:
   1. Location: Mounted on temporary security fencing and gates at intervals of 100 lineaL feet.
   2. Text: “DANGER” in upper panel and “CONSTRUCTION AREA-AUTHORIZED PERSONNEL ONLY” in lower panel.
   3. Background Color: Red upper panel, black outline along border, and white lower panel.
   4. Text Color: White in upper panel and black in lower panel.
   5. Printing: Digital or screen printing with ultraviolet-resistant inks.
   6. Sign Board:
      a. Material: Treated polyethylene, thickness of 0.055 inch.
      b. Minimum Dimensions: 14 inches wide by 10 inches high.
   7. Supports and Bracing: Provide supports and bracing as required to adequately support and brace signs for the duration of the Project.

C. Security Signs:
   1. Location: Mounted on temporary security gates and at entrances of each field office trailer (one sign per trailer entrance).
   2. Text: “SECURITY NOTICE” in upper panel and “ALL VISITORS MUST SIGN-IN AT THE FIELD OFFICE” in lower panel.
   3. Background Color: Yellow upper panel, black outline along border, and white lower panel.
   4. Text Color: Black for upper and lower panels.
   5. Printing: Digital or screen printing with ultraviolet-resistant inks.
   6. Sign Board:
      a. Material: Treated polyethylene, thickness of 0.055 inch.
      b. Minimum Dimensions: 20 inches wide by 14 inches high.
   7. Supports and Bracing: Provide supports and bracing as required to adequately support and brace signs for the duration of the Project.

PART 3 – EXECUTION

3.01 INSTALLATION, MAINTENANCE, AND REMOVAL

A. Installation:
   1. Install temporary signs within 14 days of Engineer’s approval of the submittal required by this Section.
   2. Obtain National Grid and Engineer approval of installation locations before installing temporary signs.

B. Maintenance:
   1. Maintain temporary signage so that signs are clean, legible, and upright. Cut grass, weeds, and other plants so that temporary signs are not covered or obscured.
   2. Repair or replace damaged temporary signs. Relocate signs as required by progress of the Project.

C. Remove temporary signs upon Substantial Completion, or as otherwise directed by the Engineer.

END OF SECTION

SECTION 01 62 00

PRODUCT OPTIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. Contractor's options for selecting products.
      b. Requirements for consideration of "or-equal" products.

1.02 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Products" includes materials, equipment, machinery, components, fixtures, systems, and other goods incorporated in the Work. Products do not include machinery and equipment used for preparing, fabricating, conveying, erecting, or installing the Work. Products include National Grid-furnished goods incorporated in the Work where use of such goods is specifically required in the Contract Documents.

1.03 PRODUCT OPTIONS

A. For products specified only by reference standard or description, without reference to Supplier, provide products meeting that standard, by a Supplier or from a source that complies with the Contract Documents.

B. For products specified by naming one or more products or Suppliers, provide the named products that comply with the Contract Documents, unless an "or-equal" or substitute product is approved by Engineer.

C. For products specified by naming one or more products or Suppliers and the term, "or equal", when Contractor proposes a product or Supplier as an "or equal", submit to Engineer a request for approval of an "or-equal" product or Supplier.

D. For products specified by naming only one product or manufacturer and followed by words indicating that no substitution is allowed, there is no option and no substitution will be allowed.

1.04 "OR-EQUAL" PRODUCTS

A. For proposed products not named in the Contract Documents and considered as an "or equal", Contractor shall request in writing Engineer's approval of the "or equal". Request for approval of an "or-equal" product shall accompany the Shop Drawing or product data submittal for the proposed product and shall include:
   1. Contractor's request that the proposed product be considered as an "or equal", accompanied by Contractor's certifications.

2. Documentation adequate to show that proposed product:
   a. Does not require extensive revisions to the Contract Documents.
   b. Is consistent with the Contract Documents.
   c. Will produce results and performance required in the Contract Documents.
   d. Is compatible with other portions of the Work.
3. Detailed comparison of significant qualities of proposed product with the products and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements shown or indicated.
4. Evidence that proposed product manufacturer will furnish warranty equal to or better than specified, if any.
5. List of similar installations for completed projects with project names and addresses, and names and address of design professionals and owners, if requested.
6. Samples, if requested.
7. Other information requested by Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23

FIELD ENGINEERING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide field engineering services and professional services of the types indicated for the Project, including:
      a. Developing and making all detail surveys and measurements required for construction, including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.
      b. Providing materials required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
      c. Keeping a transit, theodolite, or total station (theodolite with electronic distance measurement device), leveling instrument, and related implements such as survey rods and other measurement devices, at the site at all times, and having a skilled instrument person available when necessary for laying out the Work.
      d. Being solely responsible for all locations, dimensions, and levels. No data other than Change Order, Work Change Directive, or Field Order shall justify departure from dimensions and levels required by the Contract Documents.
      e. Rectifying all Work improperly installed because of not maintaining, not protecting, or removing without authorization established reference points, stakes, marks, and monuments.
      f. Providing such facilities and assistance necessary for Engineer to check lines and grade points placed by Contractor. Do not perform excavation or backfilling Work until all cross-sectioning necessary for determining payment quantities for Unit Price Work have been completed and accepted by Engineer.

B. Related Sections:
   1. Section 01 78 39, Project Record Documents.
   2. Section 31 09 13, Geotechnical Instrumentation and Monitoring.

1.02 QUALITY ASSURANCE

A. Qualifications:
   1. Surveyor:
      a. Employ or retain the services, as needed, at the site a surveyor with experience and capability of performing surveying and layout tasks required in the Contract Documents and as required for the Work. Surveyor shall be a professional land surveyor licensed and registered in the State of New York.
      b. Responsibilities include, but are not necessarily limited to, the following:
         1) Providing required surveying equipment, including transit or theodolite, level, stakes, and surveying accessories.
         2) Establishing required lines and grades for performing all excavating, filling, compacting, and grading, and for constructing all facilities, structures, pipelines, and site improvements.
         3) Preparing and maintaining professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the Work.

4) Performing such surveys and computations necessary to determine quantities of Work performed, placed, or installed.
5) Performing such surveys necessary to record actual construction, including excavation, in-situ soil solidification (ISS), backfilling, and restoration operations.
6) Prior to backfilling operations, surveying, locating, and recording on a copy of the Contract Documents accurate representation of buried Work and Underground Facilities encountered.
7) Preparing certified survey drawings in accordance with Section 01 78 39.
8) Complying with requirements of the Contract Documents relative to surveying and related Work.

1.03 SUBMITTALS

A. Informational Submittals:
   1. Procedure Submittals: Submit acceptable plan for conducting all survey Work not less than 10 days prior to starting survey Work.
   2. Survey Field Books: Submit original field books within two days after completing survey Work.
   3. Qualifications Statements: Submit name and address of firm and resumes of each professional land surveyor and crew chief conducting the survey Work. Submit at least 10 days prior to beginning survey Work. During the Project, submit resume for each new registered land surveyor and crew chief employed or retained by Contractor at least 10 days prior to starting on the survey Work.
   4. Certificates: When requested by Engineer, submit certificate signed by professional surveyor certifying that elevations and locations of the Work comply with the Contract Documents. Explain all deviations, if any.

1.04 RECORDS

A. Maintain at the site a complete and accurate log of control and survey Work as it progresses.
   1. Survey data shall be in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the locality where the site is located. Original field notes, computations, and other surveying data shall be recorded by Contractor's surveyor in Contractor-furnished hard-bound field books and shall be signed and sealed by Contractor's surveyor. Completeness and accuracy of survey Work, and completeness and accuracy of survey records, including field books, shall be responsibility of Contractor. Failure to organize and maintain survey records in an appropriate manner that allows reasonable and independent verification of calculations, and to allow identification of elevations, dimensions, and grades of the Work, shall be cause for rejecting the survey records, including field books.
   2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SURVEYING

A. Verification of Conditions: Verify site conditions before starting Work. Promptly notify Engineer of any discrepancies with the potential to affect the Work.

B. Reference Points:
   1. Refer to the General Conditions, as may be modified by the Supplementary Conditions, regarding reference points.
   2. National Grid's established reference points damaged or destroyed by Contractor will be re-established by National Grid at Contractor's expense.
   3. From National Grid-established reference points, establish lines, grades, and elevations necessary to control the Work. Obtain measurements required for executing the Work to tolerances specified in the Contract Documents.
   4. Establish, place, and replace as required, such additional stakes, markers, and other reference points necessary for control, intermediate checks, and guidance of construction operations.

C. Reference Datums and Coordinate System: Comply with the following:
   1. Reference Datums:
      a. Horizontal: North American Datum of 1983.
      b. Vertical: North American Vertical Datum of 1988.
   2. Coordinate System: State Plane Coordinate System of 1983, New York State, East Zone.

D. Surveys to Determine Quantities for Payment:
   1. For each Application for Payment, perform such surveys and computations necessary to determine quantities of Work performed, placed, or installed. Perform surveys necessary for Engineer to determine final quantities of Work performed or in place.
   2. Notify Engineer at least 24 hours before performing survey services for determining quantities. Unless waived in writing by Engineer, perform quantity surveys in presence of Engineer.

E. Surveys to Record Actual Construction: Perform such surveys necessary to record actual construction including, but not limited to, the following:
   1. Horizontal and vertical limits of excavation.
   2. Horizontal and vertical location of existing Underground Facilities and surface structures demolished, realigned, or abandoned in-place.
   3. Horizontal and vertical location of new Underground Facilities, including connections to existing Underground Facilities.
   4. Horizontal and vertical location of existing archeological features.
   5. Horizontal and vertical limits of ISS.
   6. Horizontal and vertical limits of fill for each material classification.
   7. Subgrade and final grade topography.
   8. Horizontal and vertical location of buildings, foundations, and walls.
   9. Horizontal location and elevation of exposed piping and utilities, poles, overhead wires, posts, signs, markers, curbs, fencing, gates, valves, hydrants, and other facilities visible at or above ground surface.
   10. Horizontal limits of lawns, pavements, roads, walks, drives, and other surface improvements.
   11. Horizontal and vertical location of wells, including ground surface elevation, outer casing elevation, and inner casing elevation.

F. Construction Surveying: Comply with the following:

1. Alignment Staking: Provide alignment stakes at 20-foot intervals on tangent, and at 10-foot intervals on curves.
2. Structures: Stake out structures, including elevations, and check prior to and during construction with this Section's requirements and with Section 31 09 13.
3. Pipelines: Stake out pipelines including elevations, and check prior to and during construction with this Section's requirements and with Section 31 09 13.
4. Roads: Stake out roadway elevations at 20-foot intervals on tangent, and at 10-foot intervals on curves with this Section's requirements and with Section 31 09 13.
5. Cross-Sections: Provide original, intermediate, and final staking as required for site work, and other locations as necessary for quantity surveys.
6. Easement Staking: Provide easement staking at 20-foot intervals on tangent, and at 10-foot intervals on curves. Also provide wooden laths with flagging at 40-foot maximum intervals.
7. Record Staking: Provide permanent stake at each blind flange and each utility cap provided for future connections. Stakes for record staking shall be material acceptable to Engineer.

G. Accuracy:
1. Establish Contractor's temporary survey reference points for Contractor's use to at least second-order accuracy (i.e., 1:10,000). Construction staking used as a guide for the Work shall be set at least third-order accuracy (i.e., 1:5,000). Basis on which such orders are established shall provide the absolute margin for error specified below.
2. Horizontal accuracy of easement staking shall be plus or minus 0.1 foot. Accuracy of other staking shall be plus or minus 0.04 foot horizontally and plus or minus 0.02 foot vertically.
3. Survey calculations shall include an error analysis sufficient to demonstrate required accuracy.

END OF SECTION

SECTION 01 71 33

PROTECTION OF WORK AND PROPERTY

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage as specified in the General Conditions, Supplementary Conditions, and this Section.
   2. To prevent damage, injury, or loss, Contractor's actions shall include the following:
      a. Storing materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with the progress of the Work or other contractors.
      b. Providing suitable storage facilities for materials and equipment subject to damage or degradation by exposure to weather, theft, breakage, or other cause.
      c. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.
      d. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by Contractor's operations so that, at all times, the site is safe, orderly, and workmanlike in appearance.
      e. Providing temporary barricades and guard rails around openings, scaffolding, temporary stairs and ramps, excavations, elevated walkways, and other hazardous areas.
   3. Do not, except after written consent from proper parties, enter or occupy privately-owned land with personnel, tools, materials, or equipment, except on lands and easements provided by National Grid. Contractor shall not seek out such written consent unless specifically authorized by National Grid to do so.
   4. Contractor has full responsibility for preserving public and private property and facilities on and adjacent to the site. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by Contractor in executing the Work, shall be restored by Contractor, at its expense, to condition equal to that existing before damage was done.

B. Related Sections:
   1. Sections 01 55 26, Maintenance and Protection of Traffic.
   2. Section 01 57 33, Security.
   3. Section 31 00 00, Earthwork.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 BARRICADES AND WARNING SIGNALS

A. General:
   1. Where the Work is performed on or adjacent to roadway, driveway, parking area, right-of-way, or public place:

a. Provide barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work in accordance with Laws and Regulations.
b. Paint barricades and provide reflective markings to be visible at night.
c. From sunset to sunrise, furnish and maintain at least one light at each barricade.
d. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
e. Furnish watchmen in sufficient numbers to protect the Work.

2. Provide temporary barricades to protect personnel and property for Work not in or adjacent to vehicular travel areas, including indoor work, in accordance with Laws and Regulations.
3. Contractor's responsibility for maintaining temporary barricades, signs, lights, and for providing watchmen shall continue until the Work is accepted in accordance with the Contract Documents.

B. Temporary Fencing: Comply with Section 01 57 33.

C. Coordinate Work in this Article with Sections 01 55 26 and 01 57 33.

3.02 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:
1. Underground Facilities known to National Grid and Engineer, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown on the Design Drawings. Information shown for Underground Facilities is the best available to National Grid and Engineer but is not guaranteed to be correct or complete.
2. Utility Mark-Out:
a. Clearly delineate areas of trenching, excavation, in-situ soil solidification (ISS), or other subsurface Work at the site.
b. Provide required notification to local one-call notification system (UDig NY) at least two working days, but not more than 10 working days, before planned start of trenching, excavation, ISS, or other subsurface Work.
c. Subcontract with a private utility locator to conduct utility markout.
d. Confirm the locations of all subsurface utilities, including suspected abandoned utilities, using geophysical and/or other methods.
e. Walk the site and review utility markings before proceeding with trenching, excavation, ISS, or other subsurface Work.
f. Protect and preserve staking, markings, or other designations until no longer required for proper and safe Work at or near Underground Facilities.
3. Contractor shall explore ahead of trenching, excavation, ISS, or other subsurface Work, and shall uncover obstructing Underground Facilities sufficiently (e.g., via soft digging) to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to building or parcels served by Underground Facilities. Following uncovering of a natural gas main(s), Contractor shall notify National Grid so that an inspection and/or leak survey of the gas main(s) can be performed by National Grid (if necessary). If Contractor damages an Underground Facility, or the material surrounding or supporting the same, Contractor shall immediately notify National Grid, Construction Manager, Engineer, and the owner of the damaged facility and restore it to original condition, in accordance with requirements of the owner of the damaged facility and the General Conditions. Such repair or restoration Work shall be performed at no additional cost to National Grid.
a. Undertake such emergency response actions as may be required.
b. Collect, containerize, characterize, and properly dispose of any oils or pollutants released from the damaged facility.

c. Provide provisions for alternate or temporary service until damaged facility is repaired.
d. Provide assistance to the owner of the damaged facility during repairs unless authorized by the facility's owner to undertake such repairs directly.

4. Necessary changes in the location of the Work may be directed by Engineer to avoid Underground Facilities not shown or indicated on the Contract Documents.
5. If permanent relocation of an existing Underground Facility is required and is not otherwise shown or indicated in the Contract Documents, Contractor will be directed in writing to perform the Work. When the relocation Work results in a change in the Contract Price or Contract Times, contract modification procedures and payment for such Work shall be in accordance with the Contract Documents.

B. Surface Structures:
1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations or any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.
2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are damaged or temporarily removed to facilitate the Work shall be replaced and restored to their original condition at Contractor's expense.

C. Protection of Underground Facilities and Surface Structures:
1. Sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such facility or structure. Before proceeding with the Work of sustaining and supporting such facility or structure, Contractor shall satisfy Engineer that methods and procedures to be used have been approved by party owning same.
2. Bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to the limits of the Work, in accordance with the Contract Documents. Contractor shall be responsible for damage and expense for direct or indirect injury caused by its Work to facilities and structures. Contractor shall repair immediately and completely damage caused by its Work, to the satisfaction of the owner of damaged facility or structure.
3. Comply with 16 NYCRR 753 (Protection of Underground Facilities) and other Laws and Regulations regarding the protection of Underground Facilities.

D. Coordinate Work in this Article with Section 31 00 00.

3.03 PROTECTION OF INSTALLED MATERIALS, EQUIPMENT, AND LANDSCAPING

A. Protect installed materials and equipment to prevent damage from subsequent operations. Remove protection facilities when no longer needed prior to completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Provide coverings to protect materials and equipment from damage.

END OF SECTION

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SECTION 01 74 05

CLEANING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Executing cleaning during the Project, at completion of the Work, and as required by this Section.
   2. Maintaining in a clean manner the site, the Work, and areas adjacent to or affected by the Work.

B. Related Sections
   1. Section 01 57 05, Temporary Controls.

1.02 REFERENCE STANDARDS

A. The following standards are referenced in this Section:
   1. NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.

1.03 PROGRESS CLEANING

A. General: Clean the site, work areas, and other areas occupied by Contractor at least weekly. Dispose of materials in accordance with the following:
   1. Comply with NFPA 241 for removing combustible waste materials and debris.
   2. Do not hold non-combustible materials at the site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.
   3. Provide suitable containers for storage of waste materials and debris.
   4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Site:
   1. Keep outdoor, dust-generating areas wetted down or otherwise control dust emissions in accordance with Section 01 57 05.
   2. Brush-sweep roadways and paved areas at the site daily when work is ongoing where construction vehicles are entering or exiting the remediation area and surfaces are affected by construction activities.

C. Work Areas:
   1. Clean areas where the Work is in progress to level of cleanliness necessary for proper execution of the Work.
   2. Remove liquid spills promptly and immediately report spills to National Grid and Engineer, and authorities having jurisdiction.
   3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.
   4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

D. Installed Work: Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment

manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

F. Waste Disposal:
   1. Properly dispose of waste materials, surplus materials, debris, and rubbish off the site.
   2. Do not burn or bury rubbish and waste materials at the site.
   3. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.
   4. Do not discharge wastes into surface waters or drainage routes.
   5. Contractor shall be solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste.

G. During handling and installation of materials and equipment, clean and protect construction in progress and adjoining materials and equipment already in place. Apply protective covering where required for protection from damage or deterioration, until Substantial Completion.

H. Clean completed construction as frequently as necessary throughout the construction period.

1.04 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:
   1. Clean and remove from the site rubbish, waste material, debris, and other foreign substances.
   2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.
   3. Hose-clean sidewalks and loading areas.
   4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   5. Leave surface waterways, drainage routes, storm sewers, and gutters open and clean.
   6. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition. If condition is not specified, restore to pre-construction condition.
   7. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.
   8. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
   9. Remove non-permanent tags and labels.
   10. Leave the site clean, and in neat, orderly condition, satisfactory to National Grid and Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. This Section includes administrative and procedural requirements for:
      a. Recycling non-hazardous, uncontaminated demolition and construction waste.
      b. Disposing of non-hazardous, uncontaminated demolition and construction waste.

B. Coordination:
   1. Coordinate recycling and disposing of waste as specified under this and other Sections.

C. Related Sections:
   1. Section 01 31 13, Project Coordination.

D. Performance Requirements:
   1. Practice efficient waste management in using materials in the Work.
   2. Employ reasonable means to divert demolition and construction waste from landfills and incinerators. Facilitate recycling of materials, including the following:
      a. Demolition Waste:
         1) Concrete
         2) Concrete reinforcing steel.
         3) Brick.
         4) Concrete masonry units.
         5) Miscellaneous steel and metal.
      b. Construction Waste:
         1) Site-clearing waste.
         2) Packaging:
            a) Paper.
            b) Cardboard and boxes.
            c) Pallets and wood crates.
   3. Dispose of demolition and construction waste only at National Grid-approved facilities.

1.02 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. “Construction waste” is building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
   2. “Demolition waste” is building and site improvement materials resulting from demolition or selective demolition operations.
   3. “Disposal” is removal to an offsite location of demolition and construction waste and subsequent sale, recycling, reuse, or placement in a National Grid-approved landfill or incinerator facility conforming to Laws and Regulations and acceptable to authorities having jurisdiction.
   4. “Recycle” is recovery of demolition waste or construction waste for subsequent processing in preparation for reuse.

5. “Recycle and reuse” is recovery of demolition waste or construction waste and subsequent processing and reuse in the Work.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 6 NYCRR 217, Motor Vehicle Emissions.
      b. 6 NYCRR 360, Solid Waste Management Facilities.
      c. Chapter 359 (Vehicles and Traffic) of City of Albany code, Albany County, New York.
   2. Obtain required permits and approvals for transportation and disposal Work.
   3. Comply with hauling and disposal Laws and Regulations of authorities having jurisdiction.

1.04 SUBMITTALS

A. Informational Submittals:
   1. Waste Management Plan: Submit acceptable plan for managing demolition and construction waste within 14 days of the date the Contract Times commence running, and before removing any waste from the site. Include the following:
      a. Procedures for separating each type of recyclable waste, including sizes of containers, container labeling, and designated location at the site where materials will be separated and stored.
      b. List of local, National Grid-approved disposal facilities that will be used for demolition and construction waste. Include name, address, and telephone number of each recycling or processing facility, landfill, and incinerator facility. Identify type of waste to be disposed of at each facility.
   2. Waste Profiles:
      a. Preliminary Waste Profiles: Submit waste profile, listing National Grid’s name and address of the site as generator of waste, for each landfill and incinerator facility. National Grid will sign and return each acceptable waste profile to Contractor.
      b. Final Waste Profiles: Submit counter-signed waste profile and proof of acceptance of waste for each landfill and incinerator facility.
   3. Disposal Records:
      a. Recycling and Processing Facility Records: Submit counter-signed manifests, weight tickets, receipts, and invoices on a monthly-basis throughout the Project, and concurrent with each Application for Payment.
      b. Landfill and Incinerator Facility Records: Submit counter-signed manifests, weight tickets, receipts, and invoices on a monthly-basis throughout the Project, and concurrent with each Application for Payment.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Recyclable Waste: On a daily basis, remove all recyclable materials from the work area in acceptable containers.

B. Provide separate collection containers as required by recycling haulers and to prevent contamination of materials, including protection from the elements as applicable.

C. Replace loaded containers with empty containers as demand requires.

D. Handling: Deposit recyclable materials in containers in clean (no mud, adhesives, solvents, or petroleum or coal tar contamination), debris-free condition.

E. If contamination chemically combines with materials so that materials cannot be cleaned, do not deposit into recycle containers.

F. Environmental Requirements: Transport recyclable waste materials from the work area to recycling containers, and carefully deposit in containers in manner to minimize noise and dust. Close the covers of container immediately after materials are deposited. Do not place recyclable waste materials on the ground adjacent to container.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 WASTE MANAGEMENT

A. Provide handling, containers, storage, signage, transportation, and other items required to manage wastes during the Project.

B. Site Access and Temporary Controls:
   1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent facilities.
      a. Designate and label specific areas of the site necessary for separating materials to be recycled.
      b. Provide temporary controls in accordance with the Contract Documents.

C. Shipping Documents: Prepare a non-hazardous waste manifest for each shipment of demolition and construction waste. National Grid or an authorized agent will review and sign each manifest as generator of waste.

3.02 RECYCLING WASTE

A. General:
   1. Recycle paper and beverage containers used by Contractor's personnel, Subcontractors, and Suppliers.
   2. Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at the site to the maximum extent practical.
      a. Provide appropriately marked containers or bins for controlling recyclable waste until recyclable materials are removed from the site. Post list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
      b. Before removing from the site, prepare and process recyclable waste as required by recycling or processing facility.
      c. Stockpile processed materials at the site without intermixing with other materials. Place, grade, and shape stockpiles to drain water. Cover to prevent dust and blowing debris.
      d. Stockpile materials away from the construction area. Do not store within drip line of trees.
      e. Remove recyclable waste from the site and from National Grid's property and transport to National Grid-approved recycling or processing facility.

B. Recycling and Reuse of Demolition Waste:
   1. Concrete
      a. Remove reinforcement and other metals from concrete and sort with other metals.

b. All concrete must be removed, transported, and disposed of away from the site, unless otherwise approved by Engineer.

2. Masonry
   a. Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
   b. All masonry must be removed, transported, and disposed of away from the site, unless otherwise approved by Engineer.
3. Metals:
   a. Separate metals by type.
   b. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Recycling Construction Waste:
   1. Packaging:
      a. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store at dry location.
      b. Pallets: Require that goods delivered on pallets have the pallets removed from site, to the extent possible. For pallets that remain at the site, break down pallets into component wood pieces. Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, and treated wood materials.
      c. Crates: Break down crates into component wood pieces. Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, and treated wood materials.

3.03 DISPOSAL OF WASTE

A. General: Except for items or materials to be recycled, remove from the site and properly dispose of waste at National Grid-approved facility such as permitted landfill or incinerator, or other method acceptable to National Grid and authorities having jurisdiction.
   1. Except as otherwise specified, remove from the site all waste and debris from the Work as it accumulates. Upon completion of the Work, remove materials, equipment, waste, and debris and leave the site clean, neat, and orderly. Comply with the Contract Documents regarding cleaning and removal of trash, debris, and waste.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials at the site.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Maintain and submit to Engineer record documents in accordance with the General Conditions, Supplementary Conditions, and this Section.

B. Related Sections:
   1. Section 01 33 00, Submittal Procedures.

1.02 SUBMITTALS

A. Closeout Submittals:
   1. Record Documents: Submit in accordance with Article 1.04 of this Section.

1.03 MAINTENANCE OF RECORD DOCUMENTS

A. Maintain in Contractor's field office, in clean, dry, legible condition, complete sets of the following record documents:
   1. Design Report, Drawings, Specifications, and Addenda.
   2. Shop Drawings, Samples, and other Contractor submittals, including records of test results, reviewed or accepted, as applicable, by Engineer.
   3. Change Orders, Work Change Directives, Field Orders, photographic documentation, survey data, permits, and all other documents pertinent to the Work.
   4. Contractor's updated work schedule.
   5. As-built survey drawings.
   6. Permits.
   7. Shipping papers (e.g., waste manifests and bills of lading).
   8. Contractor's HASP, including appropriate training/medical monitoring certifications, site and emergency contact information, and emergency route(s) to hospital.

B. Provide files and racks for proper storage and easy access to record documents. File record documents in accordance with the edition of the Construction Specifications Institute's "MasterFormat" used for organizing the Project Manual, unless otherwise accepted by Engineer.

C. Make record documents available for inspection upon request of National Grid, Construction Manager, or Engineer.

D. Do not use record documents for purpose other than serving as Project record. Do not remove record documents from Contractor's field office without Engineer's approval.

1.04 SUBMITTAL OF RECORD DOCUMENTS

A. Prior to readiness for final payment, submit to Engineer one copy of the following record documents:
   1. Drawings.
   2. Specifications and Addenda.

B. Submit record documents with transmittal letter on Contractor letterhead complying with letter of transmittal requirements in Section 01 33 00.

C. Record documents submittal shall include certification, with original signature of an official authorized to execute legal agreements on behalf of Contractor, reading as follows: "[*Insert Contractor's corporate name*] has maintained and submitted record documentation in accordance with the General Conditions, Supplementary Conditions, Specification Section 01 78 39, and other elements of Contract Documents, for the National Grid, Fleet Building Addition Interim Remedial Measure Design, North Albany Former MGP Site, City of Albany, Albany County, New York. We certify that each record document submitted is complete, accurate, and legible relative to the Work performed under our Contract, and that the record documents comply with the requirements of the Contract Documents.

[*Provide signature, print name, print signing party's corporate title, and date*]"

1.05 RECORDING CHANGES

A. General:
   1. At the start of the Project, label each record document to be submitted as "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.
   2. Keep record documents current. Make entries on record documents within two working days of receipt of information required to record the change.
   3. Do not permanently conceal the Work until required information has been recorded.
   4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from Engineer-accepted record documents.
   5. Marking of Entries:
      a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.
      b. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files.
      c. Date all entries on record documents.
      d. Call attention to changes by drawing a "cloud" around the change(s) indicated.
      e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:
   1. Record changes on a copy of the Drawings. Submittal of Contractor-originated or -produced drawings as a substitute for recording changes on the Drawings is unacceptable.
   2. Record changes on plans, sections, schematics, and details as required for clarity, making reference to dimensions and elevations (to Project datum) for complete record documentation.
   3. Record actual construction, including:
      a. Horizontal and vertical location of existing Underground Facilities and surface structures demolished, realigned, or abandoned in-place, referenced to permanent surface improvements. For each Underground Facility or surface structure, provide dimensions to at least two permanent, visible surface improvements.
      b. Horizontal and vertical limits of excavation and in-situ soil solidification (ISS).
      c. Horizontal and vertical location of new Underground Facilities referenced to permanent surface improvements. For each Underground Facility, including pipe fittings, provide dimensions to at least two permanent, visible surface improvements.

d. Location of exposed utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
e. Changes in structural and architectural elements of the Work, including changes in reinforcing.
f. Field changes of dimensions, arrangements, and details.
g. Changes made in accordance with Change Orders, Work Change Directives, and Field Orders.
h. Changes in details on the Contract Drawings. Submit additional details prepared by Contractor when required to document changes.

4. Supplemental Drawings:
   a. In some cases, drawings produced during construction by Engineer or Contractor supplement the Drawings and shall be included with record documents submitted by Contractor. Supplemental record drawings shall include the following:
      1) Drawings provided with Change Orders, Work Change Directives, and Field Orders.
      2) Drawings that cannot be incorporated into the Drawings due to space limitations.
      3) Certified survey drawings, in accordance with Article 1.06 of this Section.
   b. Supplemental drawings provided with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.
   c. When supplemental drawings developed by Contractor using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in "DWG" format compatible with AutoDesk AutoCAD 2018 (or newer) as part of record drawing submittal. Submit electronic files on compact disc labeled, "Supplemental Record Drawings", together with Contractor name, Project name, and Contract name and number.

C. Specifications and Addenda:
   1. Mark each Section to record:
      a. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually provided.
      b. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

1.06 CERTIFIED SURVEY DRAWINGS

A. Prepare the following survey drawings:
   1. Excavation plan, depicting the final horizontal and vertical limits of excavation for each excavation area, including subgrade spot elevations and topographic contours.
   2. ISS plans, depicting the final horizontal and vertical limits of ISS for each ISS area, including bottom of ISS spot elevations and top of ISS topographic contours.
   3. Final site plan, depicting final (post-construction) site topography and conditions.

B. Drawing Requirements:
   1. General Content:
      a. Property lines, easements, and rights-of-way.
      b. Topographic contours at minimum 0.5-foot intervals.
      c. Horizontal and vertical location of buildings, foundations, and walls.
      d. Horizontal location of exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, fencing, gates, guard rails, guard cables, valves, hydrants, manholes, catch basins, vaults, and other facilities visible at or above ground surface.
      e. Horizontal limits of lawns, pavements, roads, walks, drives, and other surface improvements.

f. Horizontal and vertical location of wells, including ground surface elevation, outer casing elevation, and inner casing elevation.
g. Horizontal location, size (diameter), and species of trees and other plantings.
h. Horizontal and vertical location of archeological features.

2. Scale: One inch equals 15 feet.
3. Sheet Size: 34 inches wide by 22 inches high.
4. CADD Files: Contractor shall also submit survey drawings to Engineer in "DWG" format compatible with AutoDesk AutoCAD 2014 as part of record drawing submittal.

C. Certification:
1. Each survey drawing shall be signed and sealed by a professional land surveyor licensed and registered in the State of New York.

1.07 ELECTRONIC FILES

A. CADD files will be furnished by Engineer upon the following conditions:
1. Contractor shall submit to Engineer a letter on Contractor letterhead requesting CADD files and providing specific definition(s) or description(s) of how files will be used, and specific description of benefits to National Grid if the request is granted.
2. Contractor shall execute Engineer's standard agreement for release of electronic files and shall abide by all provisions of the agreement for release of electronic files.
3. Layering system incorporated in CADD files shall be maintained as transmitted by Engineer. CADD files transmitted by Engineer containing cross-referenced files shall not be bound by Contractor. Drawing cross-references and paths shall be maintained. If Contractor alters layers or cross-reference files, Contractor shall restore all layers and cross-references prior to submitting record documents to Engineer.
4. Contractor shall submit record drawings to Engineer in same CADD format that files were furnished to Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02 21 19

STRUCTURAL SURVEYS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, professional services, and incidentals as specified and required to perform structural surveys.
   2. The Work includes, but is not limited to, performing pre-construction and post-construction structural surveys of the following:
      a. Fuel Island
      b. Fleet Garage

B. Related Sections:
   1. Section 01 71 23, Field Engineering.
   2. Section 31 09 13, Geotechnical Instrumentation and Monitoring.

1.02 QUALITY ASSURANCE

A. Qualifications:
   1. Professional Engineer:
      a. Contractor shall retain the services of a professional engineer licensed and registered in the State of New York and experienced in providing engineering services of the kind indicated.
      b. Responsibilities include, but are not necessarily limited to, performing structural surveys, and preparing and certifying structural survey reports.

1.03 SUBMITTALS

A. Informational Submittals:
   1. Qualifications Statements: Submit name, address of firm, and qualifications of professional engineer.
   2. Notification of Intended Survey Start: Submit in accordance with Paragraph 3.01.A of this Section.
   3. Survey Reports: Submit in accordance with Article 1.04 of this Section.

1.04 SURVEY REPORTS

A. Contractor's professional engineer shall prepare one survey report for a pre-construction survey of the fuel island and fleet garage and a separate report for a post-construction survey of these structures. The reports shall document the results of the surveys and the conditions of visible surface structures. Include field notes, measurements, and photographs taken during the surveys. Number each photograph and label with description and orientation.

B. Submit report within 14 days after the surveys. The report shall be certified by the professional engineer.

1.05 SCHEDULING AND SEQUENCING

A. Pre-Construction Surveys: Perform pre-construction surveys before initiating removal activities. Deflection or vibration causing construction operations may not begin until the pre-construction reports for each of the identified structures are reviewed by the National Grid and Engineer.

B. Post-Construction Surveys: Perform post-construction surveys after completion of all removal and backfilling operations and before Substantial Completion.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PREPARATION

A. Notification: Notify National Grid and Engineer in writing not less than 14 days before performing each survey. Do not enter the property without permission of National Grid.

3.02 STRUCTURAL SURVEYS

A. Structural surveys shall be performed in accordance with this specification and Sections 01 71 23 and 31 09 13.

B. The professional engineer shall review any available drawings to gain understanding of the structure framework and support system.

C. Perform structural surveys to assess and document the pre-construction and post-construction structural and cosmetic conditions of visible surface structures located within and adjacent to the work area. Surveys shall be performed by the Contractor's retained professional engineer. The Engineer will accompany Contractor's professional engineer for each survey.

D. For each survey, take comprehensive notes, measurements, and photographs of each structure as a whole and of potential areas of damage or deterioration including, but not limited to, the following:
   1. Photographic documentation should provide an overview of the entire structure, in addition to close-up pictures to record problematic areas (e.g. cracks, corrosion, etc.). Each photograph will be labeled with a picture number, description, and orientation.
   2. Notes and measurements should be taken on potential items of concern, including, but not limited to, the following:
      a. Spalling concrete.
      b. Cracks.
      c. Active leaking.
      d. Construction joints. Note if joint is opening (cracking) or tight.
      e. Cracking associated with transitions in geometry. Note changes in plan or section dimensions and any settlement or shrinkage cracking.
      f. Foundation settlement.
      g. Bearing seats of beam/column connections. Carefully examine for potential separation, spalling, and cracking that may be associated with thermodynamic changes or joint rotation.
      h. Bolts and connections.

i. Areas of corrosion in structural members associated with cracking.
j. Areas of delaminating concrete or voids in concrete in walls and slabs. Note method of observation (e.g., hammer sounding, chain drag, ultrasonic testing, etc.).

E. Prepare survey reports for the structures in accordance with Article 1.04 of this Section.

END OF SECTION

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SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required for the selective demolition, removal, and disposal of abandoned underground structures within the excavation and in-situ soil solidification (ISS) limits that may be present, including but not limited to a former 3,000,000 cubic foot gas holder base (slab), holder subgrade walls, and piles supporting the former holder, other Underground Facilities (e.g., old sanitary sewer line from the east side of the Fleet Building), and similar facilities.
   2. Perform selective demolition Work within areas shown or indicated.
   3. Pay all fees associated with transporting and disposing of materials and equipment resulting from selective demolition.

B. Coordination:
   1. Review procedures under this and other Sections and coordinate Work that must be performed with or before selective demolition Work.

C. Related Sections:
   1. Section 01 74 05, Cleaning.
   2. Section 01 74 19, Construction Waste Management and Disposal.
   3. Section 02 60 05, Contaminated Waste Management and Disposal.
   4. Section 31 23 00, Excavation and Fill.

1.02 REFERENCES:

A. Terminology:
   1. The following words or terms are not defined but, when used in this Section, have the following meaning:
      a. "Remove" means to detach items from existing construction and legally dispose of them offsite unless indicated to be removed and reinstalled.
      b. "Remove and reinstall" means to detach items from existing construction, prepare for reuse, and reinstall where indicated.
      c. "Existing to remain" means existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed or removed and reinstalled.

B. Reference Standards:
   1. The following standards are referenced in this Section:
      a. NFPA 51, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.

b. 29 CFR 1910.251 through 29 CFR 1910.255, Subpart Q – Welding, Cutting, and Brazing.
c. 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response.
d. 29 CFR 1926.350 through 29 CFR 1926.354, Subpart J – Welding and Cutting.
e. 29 CFR 1926.850 through 29 CFR 1926.860, Subpart T – Demolition.
f. 12 NYCRR 23-1.25, Welding and Flame Cutting Operations.
g. 12 NYCRR 23-3.1 through 12 NYCRR 23-3.3, Subpart 23-3 – Demolition Operations.
h. 16 NYCRR 753, Protection of Underground Utilities.

2. Obtain required permits and approvals for selective demolition, removal, and disposal Work.
3. Comply with requirements of authorities having jurisdiction.

1.04 SUBMITTALS

A. Informational Submittals:
1. Selective Demolition Plan: Submit acceptable plan for selective demolition Work (this may be part of the Project Operations Plan) not less than 14 days prior to starting selective demolition Work. Include the following:
a. Plan for coordinating shut-offs, locating, capping, temporary services, and continuing utility services.
b. List of proposed equipment for selective demolition Work.
c. Proposed selective demolition procedures. Where different procedures or equipment will be used for different types of material or at different locations at the site, indicate where each procedure and equipment item will be used.
d. Planned sequence of selective demolition operations, including coordination with excavation, backfilling, and pile removal Work.
e. Detailed schedule of selective demolition Work in accordance with the accepted Progress Schedule.
2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.03.A of this Section.

B. Action Submittals:
1. Lifting and Rigging Plan: Submit acceptable plan for pulling pile foundations from beneath the former 3,000,000 cubic foot holder slab (assumed to be timber, steel, or concrete encased in steel) not less than 7 days prior to starting the pile removal. The plan shall be certified (stamped and signed) by a professional engineer licensed and registered in the State of New York and possessing not less than five years of relevant experience. Include the following:
a. Pile characteristics, including dimensions and weight.
b. Type, make, model, and rated capacity of equipment to be used and verification that selected equipment and rigging are appropriate for the type of lift.
c. Rigging sketches and descriptions that include (as appropriate):
1) identification and rated capacity of slings, lifting bars, rigging accessories, and below-the-hook lifting devices. Calculated and provide the rated capacity of equipment in the configuration in which it will be used.
2) Load-indicating devices.
3) Load vectors.
4) Lifting points.
5) Sling angles.
6) Required lifting equipment movement (e.g., boom and swing angles, etc.).
7) Method(s) of attachment.
8) Excavator/crane location(s) and orientation(s) relative to the load and relative to surrounding obstructions.
9) Height of the lift to be accomplished.

10) Load radius from center pin of crane to center of the hook at pick-up point.
11) Boom length and angle for entire range of the lift.
12) Other factors affecting equipment capacity (e.g., soil bearing capacity, etc.).

d. Operating procedures and special instructions to operators including rigging precautions and safety measures to be followed as applicable.
e. Type and number of personnel required, their specific roles and competencies, and how they will be briefed.
f. Pick up and set down points and constraints such as space and stacking.
g. Step-by-step instructions.
h. Communication protocols.
i. Emergency and rescue plans.
j. Restrictions on the lift such as weather, light, or sea state.
k. Simultaneous, conflicting, or nearby operations or work.
l. Pre-lift inspection requirements.
m. Load integrity check.
n. Load charts for generic lift plans and for heavy or complex lifts.
o. Assessment of whether tag lines should be used, their hazards and limitations.
p. Compliance with Owner's safety programs.
q. Other information, as required.

1.05 WARRANTY

A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 INSPECTION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Inventory and record the condition of items to be removed and reinstalled.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain:
1. Maintain services/systems indicated to remain and protect them against damage during selective demolition Work.

B. Existing Services/Systems to be Removed, Relocated, or Abandoned:
1. Shutdown of utility services shall be coordinated and paid for by Contractor, and will be assisted by National Grid as required relative to contacting utility owners.
2. Before proceeding with selective demolition, locate; identify; drain, purge, or de-energize; and make safe for removal and capping all Underground Facilities to be removed, relocated, or abandoned. Collect, containerize, and properly dispose of chemicals, gases, coal tar, or other dangerous materials recovered from Underground Facilities.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems.
4. All modifications, shut-downs, and removals shall be in accordance with utility owner's policies and procedures.

C. Should uncharted or incorrectly charted Underground Facilities be encountered, Contractor's responsibilities shall be in accordance with the General Conditions, as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.

3.03 PREPARATION

A. Notification:
1. At least 48 hours prior to commencing selective demolition or removal Work, notify Construction Manager and Engineer in writing of planned start of selective demolition Work. Do not start selective demolition without permission of Construction Manager.

B. Protection of Surrounding Areas and Facilities:
1. Perform selective demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.
2. Closing or obstructing roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
3. Provide temporary barriers, lighting, sidewalks, sheds, and other necessary protection.
4. Protect construction and facilities indicated to remain against damage and soiling during selective demolition operations. Repair damage at Contractor's expense. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
5. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
    a. Strengthen or add new supports when required during progress of selective demolition.
    b. Cease operations and immediately notify Engineer if safety of structure or facility appears to be endangered.
    c. Do not resume selective demolition operations until safety is restored.

C. Pollution Control:
1. Provide and maintain special measures to prevent debris, waste, rubbish, and material resulting from selective demolition operations from entering surface waters, open drainage routes, sanitary sewers, or storm sewers. Comply with pollution control requirements of Section 01 57 05.
2. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05 and Laws and Regulations.
3. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.

3.04 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Unless otherwise approved by Engineer, proceed with selective demolition systematically, from higher to lower level.
   2. Cutting and Patching:
      a. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
      b. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   3. Hot Work: Comply with NFPA 51, Laws and Regulations, and the following:
      a. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
      b. Maintain adequate ventilation when using cutting torches.
   4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of offsite.
   5. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain and at regular intervals using power-driven saw or hand tools, then remove concrete or masonry between saw cuts. Do not use power-driven impact tools, unless the work can be performed without causing vibrations above allowable limits or damaging nearby structures and Underground Facilities. Where reinforcement is present, dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition.
   6. Break up and remove foundations and below-grade slabs unless otherwise shown or indicated as remaining in place.
   7. Remove subsurface piles (e.g., timber, steel, concrete encased in steel) encountered beneath the 3,000,000 cubic foot former gas holder within the remedial limits.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on adjacent surfaces, structures, and Underground Facilities.
   9. Dispose of demolished items and materials promptly. Comply with requirements of Sections 01 74 19 and 02 60 05.

B. Selective Demolition of Structures:
   1. Remove structures to lines and grades shown or indicated, unless otherwise directed by Engineer. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at Contractor's expense and such excess removals shall be reconstructed to satisfaction of Engineer without additional cost to National Grid.
   2. After removing subgrade concrete slab and subgrade masonry subgrade walls or portions thereof, and similar construction that ties into the Work or existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.
   3. Where parts of existing structures are to remain following demolition, remove the portions shown or indicated for removal, repair damage, and leave the structure in proper condition for the intended use.

a. Remove concrete and masonry to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will be satisfactory for the purpose intended.
b. Do not damage reinforcing bars beyond the area of concrete and masonry removal. Do not saw-cut beyond the area to be removed.

C. Selective Demolition of Site Improvements:
1. Pavement, Sidewalks, Curbs, and Gutters: Selective demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at saw-cut edges. Edges shall be linear and have a vertical cut face.
2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.

D. Existing Items to Remain:
1. Protect construction indicated to remain against damage and soiling during selective demolition.

3.05 REUSE OF DEMOLISHED MATERIALS

A. Concrete and Masonry:
1. Separate concrete and masonry resulting from selective demolition operations from other demolished materials and process at the site for use as fill. Comply with Sections 01 74 19 and 31 23 00.
2. Concrete or masonry that does not comply with requirements for general fill material, or is in excess of the quantity required for general fill material, shall be removed, transported, and disposed of away from the site, unless otherwise approved by Engineer.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items or materials indicated to be reinstalled, remove from the site all debris, waste, rubbish, and material resulting from selective demolition operations and equipment used in selective demolition Work. Comply with the General Conditions, Supplementary Conditions, and Sections 01 74 05, 01 74 19, and 02 60 05.

B. Transportation and Disposal:
1. Steel: Property transport steel (e.g., piles) offsite for recycling at an appropriate, National Grid-approved facility in accordance with Laws and Regulations.
2. Non-Hazardous Material: Properly transport and dispose of non-hazardous demolition debris at an appropriate, National Grid-approved facility in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.
3. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with Laws and Regulations and the Contract Documents.

3.07 CLEANING

A. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by selective demolition operations in accordance with the General Conditions and Section 01 74 05.

END OF SECTION

SECTION 02 55 00

IN-SITU SOIL SOLIDIFICATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Furnish all labor, materials, tools, and equipment and perform all operations necessary for the in-situ solidification (ISS) of soil as described in this Section and as shown and described on the Design Drawings.
   2. Furnish all labor, materials, tools, and equipment to maintain the stability and integrity of adjacent fuel island, existing buildings, parking lots, and underground utilities during ISS.

B. Related Sections:
   1. Section 01 57 05, Temporary Controls
   2. Section 01 71 23, Field Engineering
   3. Section 01 71 33, Protection of Work and Property
   4. Section 31 00 00, Earthwork
   5. Section 31 09 13, Geotechnical Instrumentation and Monitoring

1.02 REFERENCES

A. Reference Standards:
   1. The most recent version of the following ASTM International (ASTM) Standards shall be employed in concert with this Section:
      a. D 1633 – Standard Test Method for Unconfined Compressive Strength of Molded Soil – Cement Cylinders.
      b. D 5084 – Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter.
      c. D 4832 – Preparations and Testing of Controlled Low Strength Material Test Cylinders.
      d. C 150 – Standard Specification for Portland Cement.
      e. C 989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.
   2. American Petroleum Institute (API). 2004. Specification 13A: Specification for Drilling Fluids – Specifications and Testing. 16th Edition. 22 pp. August.

1.03 QUALIFICATIONS

A. Demonstrate that the Contractor has successfully completed a minimum of three (3) ISS projects of similar scope and size.

B. Project Manager/Superintendent must demonstrate a minimum of 5 years of relevant experience with ISS work and must have a minimum of 2 years of experience as a Project Manager/Superintendent.

C. Other key personnel must demonstrate a minimum of 2 years of experience with ISS projects of similar scope and size. Other key personnel include technical staff and equipment and mixing plant operators involved with the ISS activities.

1.04 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer's product data for proposed soil admixtures.

B. Informational Submittals:
   1. An ISS Implementation Plan, to be provided at least 10 working days prior to mobilization of ISS equipment, that presents the following:
      a. Detailed description of ISS process, equipment, and specifications, including the grout mixture with proposed reagent percentages and water to cement ratio, to be used for ISS operations.
      b. Layout drawing depicting the limits of the ISS area and proposed ISS test cell, as well as proposed ISS layout/pattern to illustrate continuous ISS coverage within the limits specified on the Design Drawings.
      c. Procedures for the tracking/labeling of ISS progression, determining/verifying location coordinates and depths including global positioning system (GPS) or physical measurement equipment/methods.
      d. Air and noise control procedures including equipment emission control, air quality monitoring and response procedures, and noise monitoring and control procedures. Install appropriate engineering controls such that sound levels as measured at a distance of 100 feet in any direction from the ISS mixing plant or ISS area are less than 85 decibels (dB). Address identified or reported odor issues and employ engineering controls to mitigate the presence of perceived odors at the site perimeter.
      e. Detailed description of ISS equipment and layout, power requirements, backup equipment, equipment failure replacement/repair procedures and estimated related downtimes.
      f. Detailed description and procedures for preparing ISS mixtures and specific application methods to ensure proper in-situ proportions and sequencing.
      g. Estimated production rate expressed as volume of ISS per day and estimated schedule for completing ISS efforts.
      h. Procedures for the removal of subsurface obstructions (if encountered).
      i. Procedures to minimize surface water flow into the work areas.
      j. Equipment cleaning/decontamination procedures and waste material handling procedures.
      k. Equipment and procedures used to protect and maintain existing utilities as identified in the Design Drawings during ISS.
      l. Equipment and procedures used to maintain the stability and integrity of existing site features during ISS.
   2. Resumes for key project personnel including Project Manager/Superintendent, engineering and technical staff, and equipment and mixing plant operators.
   3. A daily submittal that contains the following:
      a. Grout batch calculations (mix proportions, volumes and weights of reagents per batch, start/finish times per batch, number of batches).
      b. ISS equipment used.
      c. Total volume of ISS completed, volume of ISS completed for the day, an updated map identifying and depicting completed ISS areas and associated IDs, and the following information for each mixing cell:
         1) Start and finish times for ISS mixing in each cell.
         2) Mixing cell elevations (top and bottom).
         3) Treated soil volume and mass.
         4) Weights of reagents (Portland cement, ground granulated blast furnace slag, water).
         5) Approximate grout flow rate.

6) Corresponding sample locations and depths.
d. Documentation of any unforeseen site conditions.
e. Documentation of equipment failures and/or maintenance/repairs.
f. Documentation of modifications or deviations from the approved ISS Implementation Plan, or this Section.

4. A weekly submittal that contains the following:
a. Total quantity of material solidified for the week in terms of total cubic yards and the number and depth of installed ISS locations.
b. Total quantities of materials (water and reagents) used for the week and waste quantities (if any).
c. Summary of material deliveries for the week, including, but not limited to, backup in the form of bills of lading, weight tickets, and flow meter records.
d. ISS progress schedule and percent complete and modifications to the progress schedule based on ISS production rates.
e. Documentation of material swell and a description of collection/handling methods and quantities of excess materials.
f. Equipment cleaning methods and quantities of cleaning fluids/materials generated.

1.05 GROUT MIX DESIGN

A. Provide grout mix materials (i.e., specified reagents and water) in sufficient quantities to allow for uninterrupted ISS activities and the production rate as determined by the Contractor, after an initial pause while waiting to verify that performance criteria are or will be met following ISS test cell mixing, as identified in Section 1.06.

B. Calculate and provide, in an acceptable format, the following ISS grout mix parameters:
1. The volume of soil being treated in each ISS area, including the volume of treated soil as a result of overlap from adjacent areas.
2. Based on an approximate average wet density of 124.6 pounds per cubic foot (pcf), show the calculation that indicates the wet weight of soil being treated in each ISS area.
3. If the Contractor proposes to use mix designs other than those provided in this Section, conduct bench-scale treatability study testing to document the proposed mix designs' hydraulic conductivity and unconfined compressive strength (UCS) using site soil and potable water. Bench-scale testing for Contractor-proposed mix designs shall be conducted at no additional cost to the Engineer. Additionally, if the Contractor conducts ISS activities using a mix design other than those provided in this Section and does not meet the performance criteria provided in this Section, the site soils shall be re-solidified, removed, or otherwise addressed by the Contractor at the Contractor's expense with Engineer and NYSDEC approval.
4. Show the calculation that indicates the quantity of grout materials required for each ISS area by a percentage of the total weight of treated soil. The following mix design shall be used for ISS bidding purposes, based on performance testing results:
a. The following percentages of solidified mixture components are relative to the total calculated wet weight of the soil treated:
1) Portland cement (PC) at 3.0 percent.
2) Ground granular blast furnace slag (BFS) cement at 7.0 percent.
5. Show calculations of estimated volume expansion of treated soils (swelling) based on amounts of water within grout mixture and estimated groundwater contained within each ISS area. The volume expansion must be kept below 25 percent.
6. Final grout mix must have a flowing viscosity less than 10 centipoise.

7. The water to cement ratio shall be a minimum of 0.8:1 w/c. Based on in-situ field conditions, other water to binder ratios may be necessary based on field conditions encountered and are acceptable as long as the ratio used allows grout to be effectively pumped, allows equipment to achieve design depth, provides enough water to be effectively mixed, and meet all other requirements of the specification. If the Contractor proposes water to binder ratios other than proposed under the Contractor's ISS implementation plan, the Contractor must submit a request to the Engineer for approval to alter the grout mixture water quantities.

1.06 PERFORMANCE CRITERIA

A. Conduct an in-field ISS test cell (minimum 10 feet by 10 feet) to demonstrate that the Contractor's proposed ISS mix design) achieves the performance criteria. Collect one set of verification samples in accordance with Part 1.06(I) for compressive strength testing (by daily field pocket penetrometer and geotechnical laboratory analysis after at least 3 days of sample curing) from the test cell at depths acceptable to the Remediation Engineer. Drill a soil boring within the treated ISS matrix of the test cell, as described in Part 1.06(L), after at least 3 days of matrix curing. Completion of additional ISS test cells at other locations may be required, at the discretion of National Grid and/or the Engineer, until the proposed ISS mix design successfully achieves the performance criteria. Full-scale ISS treatment shall not be conducted until it has been demonstrated that the compressive strength performance criteria has been or will be achieved and approval to proceed is provided National Grid and/or the Engineer.

B. Ensure that the performance of the remediated ISS area meets the requirements set forth in the Design Drawings and Specifications. Meet performance requirements by any means necessary and any replacement or repairs shall be incurred at the Contractor's expense.

C. Verify that the treated ISS matrix meets the performance standards specified, including, but not limited to, the following:
   1. The average hydraulic conductivity (permeability) of the treated soil matrix must be less than or equal to 1.0×10^{-6} centimeters per second (cm/sec), with no more than 20 percent of the performance samples shall be greater than 1.0×10^{-6} cm/sec, and no samples shall be greater than 1.0×10^{-5} cm/sec.
   2. Unconfined compressive strength (UCS) of the treated soil matrix must be greater than or equal to 50 pounds per square inch (psi) with no more than 20 percent of the performance samples shall be less than 50 psi, and no samples shall be less than 30 psi.

D. The ISS mixing shall cover the entire ISS area and meet all target depths as depicted on the Design Drawings. Provide sufficient overlap between mixed areas such that no soil within the established ISS area limits goes untreated.

E. ISS areas shall be installed from the top of the excavation depth as indicated in the Design Drawings to remove targeted material and account for swelling of the solidified material and management of that material.

F. In the event that refusal is encountered prior to achieving the target anticipated depths, the Engineer shall be notified immediately. Upon notification, the Engineer may request the Contractor to remove the obstruction. If the obstruction cannot be removed, the Contractor may terminate ISS in that column or solidify beneath the object (e.g., jet grouting) with approval from the Engineer and NYSDEC.

G. Evenly distribute the grout throughout the ISS area to result in a homogeneous mixture.

H. Thoroughly mix the ISS area as required to achieve a homogeneous mixture.

I. Collect verification ISS samples, using an in-situ wet sampler, at a frequency of one set for every 500 cubic yards (cy) of treated material or at least one per per day if less than 500 cy are mixed, and test the samples for permeability and compressive strength (ASTM D5084 and D1633, respectively). Each set of samples shall consist of at least six (6) 3-inch by 6-inch sample specimens (cylinders) of homogenized solidified/stabilized soils obtained from the ISS monolith surface, mid-point, and other depths to be determined with the Engineer. Samples shall be prepared and cured in accordance with ASTM D4832.

J. Notify the Engineer a minimum of 10 working days prior to the start of ISS activities. The Engineer will be onsite during all ISS operations to observe and document the overall ISS operation.

K. ISS activities shall be performed in a manner which minimizes swell and minimizes the quantity of flowable material at ground surface.

L. Drill soil borings within the treated ISS matrix, at a frequency of one soil boring for every 5,000 square feet of ISS treatment area, but not less than two boreholes total, to a depth of at least 3 feet deeper than the bottom of the ISS monolith in the underlying bedrock unit in accordance with the NYSDEC ISS Quality Assurance/Quality Control Guidance Document (included as Attachment B of the Draft Fleet Building Addition Interim Remedial Measure Design). Each coring sample shall not be longer than 5 feet. The first boring shall be installed when the ISS treatment area is no more than 25% complete (e.g., after the test cell is completed). The monolith will also be visually inspected by inserting a video camera in the open boring and viewing the sidewalls via closed circuit television, if sample recovery from the boring is <60%. At a minimum, borings shall be completed at the locations identified below.
   1. ISS test cell.
   2. Areas where previous soil borings identified the greatest thickness of NAPL.
   3. Overlap of individual treatment areas or where difficulties in the ISS process (if any) were encountered.

PART 2 – PRODUCTS

2.01 ISS EQUIPMENT

A. It is assumed that ISS shall be performed via bucket mixing with excavators or Engineer approved equal.

2.02 GROUT MIXTURE MATERIALS

A. Provide all required reagent materials in sufficient quantities to complete the ISS activities as specified, without delay.

B. PC shall be Type I/II (or Type IL if Tupe I/II is not regionally available) per ASTM C150.

C. BFS cement shall be Grade 100 per ASTM C989, manufactured by LaFarge North America (or approved equal).

D. Provide a means for accurate measurement and documentation verifying the required grout material quantities are maintained, as specified.

E. Have on the site at all times reagent material capable of maintaining a maximum production rate for a minimum of 3 days. Coordinate an appropriate material delivery schedule to accommodate this indicated stock requirement.

2.03 GROUT MIXTURE WATER

A. Provide onsite potable water for grout mixing. Arrange for and obtain appropriate permits for the use of hydrant water, onsite water hookup or temporary hookup of site potable water. The Contractor shall provide a backflow preventer and meter and comply with all City requirements for hydrant use. The Contractor shall be responsible for all fees associated with water usage. If an offsite source of water is used other than City-provided water, submit documentation of the source of water for Engineer review.

B. Provide a means for accurate measurement and documentation of water quantities used for grout batch mixtures. The water measurement devices must be capable of measuring totalized and instantaneous flows. Measuring devices must be calibrated to within +/-2 percent to accurately measure the required quantity of water necessary for each grout batch mixture. Provide documentation for equipment calibration and calibrating a schedule.

C. If water for ISS-related activities is stored onsite, the water storage containers/tanks must be clean and free of any waste residuals or debris.

PART 3 – EXECUTION

3.01 GROUT MIXTURE PREPARATION

A. Complete and submit a form calculating the required quantities of water and grout materials for the batch mix design. The following grout mixture information must be documented.
   1. Quantity of reagents added.
   2. ISS area ID.
   3. Identification of ISS overlap and reduction in grout volume due to overlap (where applicable).

B. Add the calculated quantities of grout mixture ingredients (water and specified reagent quantities) to the mixing plant and thoroughly mix the grout mixture to achieve a homogeneous mixture.

C. Perform consistency testing in the field, including slump test (ASTM International [ASTM] C143) and grout density, pH, temperature and viscosity (API-RP-13B), on daily basis or per batch and include the results in the Contractor's daily submittal.

D. The equipment must provide adequate pressure and flow rate and a means of measuring pressure and flow such that grout is delivered at a constant rate throughout the ISS area.

E. Grout mixture must not be allowed to stand for a period of greater than 90 minutes.

F. Processed grout that reaches a temperature of 90 degrees Fahrenheit (˚F) or greater should be discarded.

G. Provide spare parts/pumps/mixing equipment to be available onsite during full-scale operations to minimize potential downtime.

3.02 SOLIDIFICATION

A. Remove, replace, relocate, bulkhead, protect, and maintain existing utilities as identified in the Design Drawings.

B. Mix grout with the soil until a homogeneous mixture of soil and grout is achieved from the top of the ISS area to the target depths.

C. Information relative to each installed ISS area must be documented throughout the ISS efforts. Documentation for each ISS area must, at a minimum, include the following:
   1. ISS area ID.
   2. ISS area coordinates.
   3. Surface elevation at top of ISS.
   4. Total installed depth of ISS (elevation).
   5. Location/depth of post-mix representative sample.
   6. Start time and finish time.
   7. Quantity of grout installed.
   8. Soil mixing technique and duration.
   9. Diagram of ISS area depicting location and overlap configuration.

D. Excess debris may only be added to an ISS column after the column is thoroughly mixed (approved by Engineer).

E. Backfilling/covering of the ISS area will not be permitted following the completion of ISS activities until receipt of approved UCS minimum performance results from field quality assurance/quality control (QA/QC) testing program, in accordance with this Section, indicating ISS has achieved the required design strength. During the “cure” period, the ISS area shall be secured by placing orange plastic construction fencing around the entire area.

3.03 SOLIDIFICATION PERFORMANCE MONITORING

A. The Engineer must be onsite during all ISS operations. The Engineer shall observe the installation of each ISS area to document the soil mixing process.

B. The Engineer shall visually inspect each batch of mixed grout prior to its use in an ISS area. The grout batch shall be visually observed to verify that the material has been mixed creating a homogeneous grout mixture.

C. Collect samples, at the specified frequency, from complete ISS areas as directed by the Engineer. Samples shall be collected from discrete depths within the soil/grout mixture. These materials shall be placed into molds and sent out for testing as designated in this Section at the Contractor’s expense.

D. Samples shall be prepared and cured in accordance with ASTM D4832.
   1. Samples from the ISS areas shall be collected and submitted to a qualified QA/QC laboratory for testing as described below.
   2. UCS shall be determined by ASTM D1633. UCS tests shall be performed after a 3-day cure time for the test cell and a 7-day cure time for the test cell (as needed) and all other cells. As determined by the Engineer, additional samples may be tested at a longer cure time (i.e., 28 days) if 7-day samples do not meet the project performance standard of at least 50 psi. Test samples submitted (if any) shall be determined by the Engineer based upon observations of ISS performance.
   3. Hydraulic conductivity (permeability) of the treated soil matrix shall be determined by ASTM D5084. Hydraulic conductivity testing shall be performed after a 28-day cure time.

E. Cores should be taken as required by the engineer to confirm tie in to confining layer.

F. If QA/QC testing results do not meet established project objectives a more exhaustive sampling/testing program may be required, and deficient areas shall be repaired and re-solidified at the Contractors' expense.

END OF SECTION

SECTION 02 60 05

CONTAMINATED WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment, and incidentals as specified and required to manage, remove from the site, and dispose of contaminated waste generated during the Project.
   2. The Work includes, but is not limited to, characterizing, handling, segregating, dewatering, containerizing, temporary storage as necessary, loading, transporting, and disposing of contaminated waste at appropriate, National Grid-approved facilities in accordance with Laws and Regulations.
   3. Pay all fees associated with transporting and disposing of contaminated waste.

B. Coordination:
   1. Coordinate disposing of waste as specified under this and other Sections.

C. Related Sections:
   1. Section 01 55 26, Maintenance and Protection of Traffic.
   2. Section 01 74 05, Cleaning.
   3. Section 02 41 19, Selective Demolition.
   4. Section 02 55 00, In-Situ Soil Solidification.
   5. Section 31 00 00, Earthwork.
   6. Section 31 23 19, Dewatering.
   7. Section 31 23 23, Fill Materials.

1.02 REFERENCES

A. Terminology:
   1. The following words or terms are not defined but, when used in this Section, have the following meaning:
      a. “Construction wastewater” is water used for working or processing, or resulting from excavation dewatering or decontamination operations.
      b. “Contaminated waste” is waste material containing manufactured gas plant waste or site-related Contaminants. Examples of potential contaminated wastes include, but are not limited to, the following:
         1) Construction wastewater.
         2) Demolition waste.
         3) Excavation waste.
         4) Free-phase coal tar.
      c. “Demolition waste” is building and site improvement materials resulting from demolition or selective demolition operations.
      d. “Disposal” is removal to an offsite location of contaminated waste and subsequent recycling, reuse, or disposal in a National Grid-approved treatment facility, landfill, or incinerator facility conforming to Laws and Regulations and acceptable to authorities having jurisdiction.

e. “Excavation waste” is earth; sand; clay; gravel; hardpan; soft, weathered, or decomposed rock; debris; bulked in-situ soil solidification (ISS) material; and other materials removed from excavations that does not comply with the requirements for general fill material, or is in excess of the quantity required for general fill material.

B. Reference Standards:
   1. The following standards are referenced in this Section:
      a. ASTM D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
      b. ASTM D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
      c. GRI GM17, Standard Specification for Test Methods, Test Properties and Testing Frequency for Linear Low-Density Polyethylene (LLDPE) Smooth and Textured Geomembranes.
      d. GRI GT12, Standard Specification for Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials.
      e. USEPA SW-846 Method 9095, Paint Filter Liquids Test.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Laws and Regulations applying to the Work under this Section include, but are not limited to, the following:
      a. 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.
      b. 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response.
      c. 40 CFR 261.3, 264, and 265, Resource Conservation and Recovery Act (RCRA).
      d. 49 CFR 171.8, Transportation, Definitions and Abbreviations.
      e. 6 NYCRR 217, Motor Vehicle Emissions.
      f. 6 NYCRR 360, Solid Waste Management Facilities.
      g. 6 NYCRR 364, Waste Transporter Permits.
      h. 6 NYCRR 370, Hazardous Waste Management System – General.
      i. 6 NYCRR 371, Identification and Listing of Hazardous Wastes.
      j. 6 NYCRR 372, Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities.
      k. 6 NYCRR 373, Hazardous Waste Management Facilities.
      l. 6 NYCRR 375, Environmental Remediation Programs.
   2. Comply with applicable provisions and recommendations of the following:
      a. NYSDEC Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants (MGPs) (DER-4).
      b. NYSDOT Standard Specifications and Standard Sheets.
   3. Obtain required permits and approvals for contaminated waste transportation and disposal operations.
   4. Comply with hauling and disposal Laws and Regulations of authorities having jurisdiction.

1.04 SUBMITTALS

A. Action Submittals:
   1. Product Data: Submit manufacturer’s product data for proposed soil drying agent.

B. Informational Submittals:
   1. Contaminated Waste Management Plan: Submit acceptable plan for managing contaminated waste within 14 days of the date the Contract Times commence running, and before removing any contaminated waste from the site. Include the following:

a. Procedures for separating each type of contaminated waste, including sizes of containers, container labeling, and designated location at the site where contaminated wastes will be separated and stored.
b. List of local, National Grid-approved disposal facilities that will be used for contaminated wastes. Include name, address, and telephone number of each treatment facility, landfill, and incinerator facility. Identify type of contaminated waste to be disposed of at each facility.

2. Waste Profiles:
   a. Preliminary Waste Profiles: Submit waste profile, listing National Grid's name and address of the site as generator of waste, for each treatment facility, landfill, and incinerator facility. National Grid will sign and return each acceptable waste profile to Contractor.
   b. Final Waste Profiles: Submit counter-signed waste profile and proof of acceptance of waste for each treatment facility, landfill, and incinerator facility.
3. Permits: Submit copy of valid NYSDEC waste transporter permit for each waste transporter hauling contaminated waste.
4. Waste Characterization Results: Submit laboratory test reports for waste characterization samples collected by Contractor.
5. Disposal Records: Submit counter-signed manifests, weight tickets, receipts, and invoices for each treatment facility, landfill, and incinerator facility on a monthly basis throughout the Project, and concurrent with each Application for Payment.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store soil drying agent in closed, water-proof containers not exceeding one ton in weight. Bulk deliveries and onsite storage of soil drying agent are prohibited.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Soil Drying Agent:
   1. Soil drying agent shall be non-biodegradable sorbent complying with 40 CFR 264.314(d)(1). Inorganic minerals, if used, shall contain no more than 50 percent reactive (free) calcium oxide and magnesium oxide by weight.

B. Temporary Containment Areas:
   1. Crushed Gravel shall meet Material Designation 703-0202 and Size Designation 2MS requirements described in Section 703.02 and Table 703-5 of the NYSDOT Standard Specifications for Construction and Materials, or shall be functionally equivalent as reviewed and approved by the Engineer.
   2. Sand material shall meet NYSDOT requirements for Sand Backfill as described in Section 733-15 and Table 733-15A of the NYSDOT Standard Specifications for Construction and Materials, or shall be functionally equivalent as reviewed and approved by the Engineer.
   3. Geomembrane shall be chemically-resistant, free of and resistant to fungal or bacterial attack, and free of cuts, abrasions, holes, blisters, contaminants, and other imperfections. Nominal thickness of geomembrane shall be not less than 40 mils when tested in accordance with ASTM D5199. HDPE or LLDPE geomembrane may be used.
      a. HDPE Geomembrane: Comply with GRI GM13.
      b. LLDPE Geomembrane: Comply with GRI GM17.

4. Geotextile shall be a non-woven cushioning fabric composed of 100 percent polyester filaments. Fabric shall be inert to biological degradation and naturally encountered chemicals, alkalizes, and acids. Unit weight of fabric shall be not less than 12 ounces per square yard when tested in accordance with ASTM D5261. Comply with GRI GT12.

PART 3 – EXECUTION

3.01 CONTAMINATED WASTE MANAGEMENT

A. General:
   1. Provide handling, containers, storage, signage, transportation, and other items required to manage contaminated wastes during the Project. Containers shall be new or in like-new condition, water-tight, and compatible with wastes to be stored.
   2. Segregate contaminated waste streams as required by waste transporters and disposal facilities. Crush excavated rock and debris, as necessary, to render material suitable for disposal.

B. Site Access and Temporary Controls: Conduct contaminated waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent facilities.
   1. Designate and label specific areas of the site necessary for separating and storing contaminated wastes.
   2. Provide temporary controls in accordance with the Contract Documents.

C. Waste Characterization:
   1. Determine disposal facility characterization requirements for each waste stream.
   2. Collect waste characterization samples, and coordinate and pay for laboratory testing.

3.02 DEWATERING EXCAVATION WASTE

A. Dewater excavation waste as necessary to pass Paint Filter testing procedures (USEPA SW-846 Method 9095) before leaving the site.

B. Dewatering may include one or more of the following:
   1. Active dewatering of soils before or during excavation in accordance with Sections 31 00 00 and 31 23 19.
   2. Blending of dry soils excavated from above the water table with wet soils excavated from below the water table.
   3. Stockpiling soils on a temporary basis to allow for gravity dewatering.
   4. Use of approved soil drying agent to amend soils excavated from below the water table. Unless otherwise directed by National Grid, excavation waste shall be amended with not more than four percent soil drying agent by weight.

C. Storage of Liquids Resulting from Dewatering Operations: Comply with temporary storage requirements for construction wastewater.

3.03 TEMPORARY CONTAINMENT AREAS

A. General:
   1. Provide temporary containment areas for the temporary storage of contaminated waste.
   2. Temporary containment areas shall be constructed as shown or indicated in the Contract Documents.

B. Installation:
   1. Prepare reasonably level well-drained existing paved surface free of sharp stones, roots, debris, and other deleterious matter.
   2. Provide sand material a minimum of 4 inches thick above prepared subgrade or unpaved surfaces. Grade sand to a level, dense surface.
   3. Install geomembrane, with layer of cushioning non-woven geotextile fabric above and below liner, upon prepared surface/asphalt. Comply with manufacturer's installation instructions. Geomembrane shall be sloped to a sump to allow for the collection and removal of leachate.
   4. Provide sand material a minimum of 9 inches thick above geosynthetics. Sand material placed above the geosynthetics shall be installed in accordance with manufacturer's installation instructions.
   5. Install non-woven geotextile fabric above the sand material as a separation layer. Comply with manufacturer's installation instructions.
   6. Provide Type 2 crushed gravel material a minimum of 12 inches thick above non-woven geotextile separation layer. Gravel material placed above the geosynthetics shall be installed in accordance with manufacturer's installation instructions.
   7. Provide compacted berm at the entrance of temporary containment area not less than 18 inches in height.
   8. Provide Jersey barriers around remaining perimeter of temporary containment area. Place a 6 inch (min.) layer of sand over the Jersey barrier to provide a smooth continuous surface and decrease the potential for puncture of overlying geosynthetics.

C. Maintenance:
   1. Maintain not less than the minimum required thickness of crushed gravel above geosynthetics. Add crushed gravel as necessary to maintain required thickness.
   2. Remove leachate from temporary containment areas on a regular basis so as to not exceed storage capacity of temporary containment area.

D. Removal:
   1. Completely remove temporary containment areas when no longer required. Repair damage caused by temporary containment areas and their removal, and restore the site to condition required by the Contract Documents. If restoration of damaged areas is not specified, restore to pre-construction condition.

E. Material Disposal:
   1. The gravel, sand, liner, and geotextile materials used to construct the temporary containment area shall be transported for offsite disposal in accordance with Paragraph 3.06 of this Section.

3.04 TEMPORARY STORAGE OF CONTAMINATED WASTE

A. Excavation Waste:
   1. Excavation waste shall be direct loaded (based on pre-excavation waste characterization sampling and profiling), to the extent possible, stockpiled over impacted material remaining within the excavation area, or stockpiled in a temporary containment area.
      a. Place, grade, and shape stockpiles for proper drainage.
      b. Stockpiles shall be securely covered at all times, during both working and non-working hours, with minimum 10-mil polyethylene liners or other covering impervious to water when not in use. Covers shall be properly anchored to prevent uplift due to wind conditions and shall be sloped to prevent accumulation of water.
      c. Inspect stockpiles not less than daily and immediately correct any deficiencies observed.

2. Based on site conditions, National Grid may elect to limit the maximum size of stockpiles. Limitations to stockpile size shall not result in any additional cost to National Grid.
3. Remove stockpiles from the site within 24 hours of placement unless a longer duration is approved by National Grid or Engineer.

B. Construction Wastewater:
1. Construction wastewater shall be stored in closed-top steel tanks. Provide not less than one tank, with minimum storage capacity of 18,000 gallons.
2. Storage tanks shall be water-tight and shall be located in a pop-up temporary containment area.

C. Coal Tar:
1. Free-phase coal tar, if encountered, shall be stored in 55-gallon steel drums.
2. Drums shall be water-tight and shall be located in a temporary containment area.

3.05 LOADING AND TRANSPORTATION

A. Prepare a waste manifest for each shipment of contaminated waste. National Grid or an authorized representative will review and sign each manifest as generator of waste.

B. Waste transporters hauling contaminated waste shall possess valid permit issued by NYSDEC pursuant to 6 NYCRR 364.

C. Place 10-mil (minimum thickness) polyethylene sheeting on the ground surface in the waste loading area to protect the area from incidental spillage during loading.

D. Vehicles transporting contaminated waste shall be fully-lined with minimum six-mil polyethylene liners, an equivalent material, or otherwise water-tight, and shall be equipped with functioning tailgate locks and non-mesh (solid), water-proof tarpaulins.

E. Exercise care when loading contaminated waste to prevent contamination of transport vehicles and adjacent surfaces.

F. The Contractor's staff (not the truck driver) shall reposition tarp bars over the loads. The drivers shall not be permitted to walk over the waste material.

G. Vehicles transported contaminated waste shall be covered with a tarp upon loading and before departing the site. The tarps shall extend over the entire load and shall be secured to resist wind forces at highway speeds. The use of mesh covers is prohibited.

H. All transport waste containers shall have a watertight tailgate secured via turnbuckles.

I. Inspect vehicles before leaving the site. Clean vehicles of visible soil or debris within a temporary decontamination area.

J. Keep all streets, sidewalks, and pavements clean and free from dirt, mud, stone, and other hauled materials. Comply with Section 01 74 05.

K. Vehicles transporting contaminated waste from the site shall follow approved haul routes in accordance with Section 01 55 26.

3.06 DISPOSAL

A. Remove from the site and properly dispose of contaminated waste at National Grid-approved treatment facility, landfill, or incinerator facility permitted to accept each type of contaminated waste.
   1. Direct-load contaminated waste to the extent practicable. Except as otherwise specified, remove contaminated waste from the site as fast as it accumulates.
   2. Remove and transport contaminated waste in a manner that will prevent spillage on adjacent surfaces and areas.

END OF SECTION

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SECTION 02 81 00

TRANSPORTATION AND DISPOSAL OF WASTE MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. This Section provides for all labor, materials, tools, equipment, accessories, and appurtenances necessary to transport, treat, and dispose of all construction waste materials.

B. Related Sections:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 02 60 05, Contaminated Waste Management and Disposal.

1.02 SUBMITTALS:

A. Submit proposed disposal facilities from National Grid's list of approved disposal facilities and associated truck routes for offsite transport and disposal of all construction waste materials.

B. Submit copy of valid NYSDEC waste transporter permit for each waste transporter hauling contaminated waste, in accordance with Section 02 60 05.

C. Provide waste manifests to the Engineer for review and approval prior to the transport of waste offsite.

D. Prepare and submit Daily Reports, which will provide a daily summary of waste materials transported offsite.

E. Provide waste disposal certifications within 25 working days after the date of disposal.

1.03 DEFINITIONS:

A. Hazardous Waste (Haz): A waste material that is either a listed hazardous waste or a characteristic hazardous waste, as determined by the Engineer.

B. Non-Hazardous Waste (Non-Haz): A waste material that is either a non-hazardous waste by definition and/or analysis. Determination of a waste as non-hazardous will be completed by the Engineer.

PART 2 – PRODUCTS

2.01 CONTAINERS

A. Supply and transport all containers for staging and disposal of Haz and Non-Haz waste materials.

B. Ensure that all containers are in good condition upon arrival (i.e., clean, no damage).

C. The containers shall conform to the specifications listed below:
   1. The containers shall be watertight and sift-proof, suitable for truck service, and meet U.S. Department of Transportation (USDOT) and American Association of Railroads requirements.
   2. The containers shall be loaded to comply with contract filling requirements and will not exceed USDOT permit standards.

2.02 COVERS AND LINERS

A. The containers shall be lined with 6 mil polyethylene and covered with a soft tarp cover consisting of 18-ounce rip-stop vinyl with double-stitched web reinforcement (the use of mesh covers is prohibited).

PART 3 – EXECUTION

3.01 GENERAL

A. Handle, transport, unload, treat, and dispose of waste materials in a manner that is protective of the environment and in accordance with the Contract Documents and all State and Federal transportation and disposal requirements.

B. Manage and track trucking and movement of containers from staging to loading area, loading, trucking to the destination, and disposal. Manage containers, trucks, and other required equipment to accommodate Project needs.

C. Complete, manage, and track all transportation and disposal documentation, including bills of lading, waste manifests, container inventory and location information, and certificates of disposal.

D. The Contractor shall be responsible for the offsite logistics and shall have direct accountability to the Engineer.

E. The Contractor shall not transport Haz or Non-Haz wastes offsite until the waste manifests and transport have been approved and signed by the Engineer.

3.02 DISPOSAL

A. Hazardous Material: Disposal shall be at an Engineer-approved hazardous waste disposal facility from National Grid's list of approved disposal facilities.

B. Non-Hazardous Material: Disposal shall be at an Engineer-approved waste disposal facility from National Grid's list of approved disposal facilities.

C. Remove and transport construction waste materials in a manner that prevents spillage of waste materials onto adjacent areas and surfaces.

3.03 HAULING MATERIAL

A. When hauling material over the streets or pavement, provide suitably tight-sealing vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, clean up the same as often as required to keep the crosswalks, streets, and pavements clean and free from dirt, mud, stone, and other hauled material.

B. When hauling hazardous materials, abide by all applicable federal, state, and local codes, including, but not limited to, manifesting and placarding (if necessary).

3.04 CONTAINER CLEANING

A. Proper use and performance of the container liners shall provide separation between the waste and the containers.

B. A visual inspection of each container shall be performed by the disposal facility to verify that liners have performed properly. If the liners have performed properly, container cleaning shall not be required.

C. If liner failure has occurred, investigation into the cause shall be required. Container cleaning shall be required in this case.

3.05 MONITORING AND TRACKING

A. Monitoring and tracking of the transport, treatment, and disposal of waste materials shall be conducted by the Contractor.

END OF SECTION

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SECTION 31 00 00

EARTHWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, tools, equipment, accessories, and appurtenances necessary to complete earthwork activities as described in the Contract Documents, Design Drawings, and/or as directed by National Grid/Engineer.
   2. Earthwork is defined to include, but is not limited to, pavement removal, rough grading, excavation for subgrades, trenching, handling of surplus materials, maintenance of excavations, removal of water, backfilling operations, embankments and fills, and compaction.

B. Related Sections:
   1. Section 01 35 49, Community Air Monitoring Plan
   2. Section 01 57 05, Temporary Controls
   3. Section 02 81 00, Transportation and Disposal of Waste Materials
   4. Section 31 05 19.13, Geotextiles for Earthwork
   5. Section 31 23 23, Fill Materials

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 [2,700 kN-m/m3])
   2. D6938 Standard Test Method for In-Place Density and Water Content of Soils and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.03 SUBMITTALS

A. Earthwork Plan: Submit a plan for all earthwork activities no less than 10 working days prior to initiating trenching, excavation, grading, and/or backfilling activities. The plan shall include the following information:
   1. Name of Contractor's "competent person" in charge of earthwork activities.
   2. Plan for coordinating shut-offs, locating, capping, abandoning, temporary services, and continuing utility services.
   3. Plan for protecting existing structures and underground utilities from damage while performing the Work.
   4. Design calculations and assumptions for construction surcharges, including magnitude and location relative to excavations, prepared by Contractor's professional engineer. Engineer's review and acceptance of submittal does not imply approval by Engineer of the associated Work. Contractor shall be solely responsible for designing, installing, operating, and maintaining the system(s) required to satisfactorily perform all necessary shoring, bracing, and protection.
   5. Copies of "manufacturer's data" or other tabulated data if protective system(s) are designed on the basis of such data.

6. Proposed trenching, excavating, dewatering, backfilling, grading, and compaction procedures (equipment and compaction methods must be provided prior to all earthwork activities). Where different procedures or equipment will be used for different types of material or at different locations at the site, indicate where each procedure and equipment item will be used.
7. List of equipment required to complete all trenching, excavation, dewatering, backfilling, and compaction activities.
8. Planned sequence of all earthwork activities, including coordination with demolition and piping installation Work.
9. Detailed schedule of all earthwork activities.

B. Geotechnical Test Results:
   1. Results of moisture/density tests performed on fill materials (determined by ASTM D1557), in accordance with Part 3.09.C.4 of this Section.
   2. Results of in-place density tests performed on fill materials (determined by ASTM D6938), in accordance with Part 3.09.C.5 of this Section.

1.04 EXISTING SITE CONDITIONS

A. General
   1. The Contract Documents show or indicate the presence of existing structures and underground utilities adjacent to or within the limits of the Work. Such information was obtained from existing records and is not guaranteed to be correct or complete. The Contractor shall explore ahead of demolition, trenching, excavation, grading, or other subsurface Work to determine the exact location of all existing structures and underground utilities. Existing structures and underground utilities, not identified for removal, shall be supported and protected from damage by Contractor.
   2. Notify UDig NY at least two working days, and not more than 10 working days, prior to initiating any construction activities (not counting the day the notification is made).
   3. Movement or operation of construction equipment over any existing structure or subsurface utility shall be at Contractor's sole risk and only after the Contractor has prepared and submitted to Engineer and utility owner(s) (as applicable), and received acceptance therefrom, a plan describing Contractor's analysis of the loads to be imparted and Contractor's proposed measures to protect structures and underground utilities while performing the Work.
   4. Damage to any existing structure and/or underground utilities, not identified for removal, shall be immediately repaired or replaced in kind by the Contractor at no additional cost to National Grid.
   5. Coordinate shut off services with utility owners, where specified in the Contract Documents or as required, to complete the Work.
   6. Do not interrupt existing utilities serving facilities occupied and used by National Grid or others, except when such interruption is indicated in the Contract Documents or when allowed in writing by Engineer after acceptable temporary utility services are provided by Contractor for the affected structure or property.

1.05 QUALITY ASSURANCE

A. Use materials, procedures, operations, and methods in strict conformance with the Contract Documents. Materials will be subjected to strict quality control monitoring as detailed herein.
B. Comprehend and anticipate the CQA requirements and account for these activities in the construction schedule.

PART 2 – PRODUCTS

2.01 TEMPORARY BARRIERS

A. Temporary barriers shall meet the following minimum requirements:
   1. Snow fence-type fencing (or equivalent) with a minimum height of four feet.
   2. Fence shall be constructed of vertical hardwood slats measuring no less than 1.5 inches by ¼ inch, interwoven with strands of horizontal wire, or shall be of equivalent plastic construction.
   3. Posts:
      a. Shall be steel, either “U”-, “Y”-, or “T”-shaped, or channel section.
      b. Shall have a nominal weight of no less than 1/3 pound per linear foot, exclusive of the anchor.
      c. Shall have tapered anchors weighing no less than 0.67 pound, each firmly attached by means of welding, riveting, or clamping.
      d. Shall have corrugations, knobs, notches, or studs placed and constructed to engage a substantial number of fence line wire in the proper position.
   4. Provide each post with sufficient quantity of galvanized wire fasteners or clamps, of not less than 0.120 inch in diameter, for attaching fence wire to post.

2.02 BACKFILL MATERIAL

A. Backfill materials shall meet the requirements provided in Specification Section 31 23 23.

B. Unless otherwise specified on the Design Drawings or directed by National Grid/Engineer, existing onsite material, designated as “native fill” or “existing soil” material, shall not be used as backfill.

PART 3 – EXECUTION

3.01 NOTIFICATION

A. Handle, transport, unload, treat, and dispose of waste materials in a manner that is protective of the environment and in accordance with the Contract Documents and all State and Federal transportation and disposal requirements.

3.02 PREPARATION

A. Prior to initiating earthwork activities, install erosion and sediment control measures in accordance with Specification Section 01 57 05.

B. Perform air monitoring activities in accordance with Specification Section 01 35 49.

C. Provide temporary barriers surrounding excavations and excavation work areas to provide temporary protection to persons and property. The barriers shall meet the requirements of Part 2.01 of this Section.

3.03 EXCAVATION

A. General:

1. Perform all excavation required to complete the Work as shown, specified, and required. Excavation shall include removing and handling of earth, sand, clay, gravel, hardpan, soft, weathered, or decomposed rock, pavements, rubbish, and other materials within the work area.
2. Excavation protection: Provide excavation protection systems in accordance with Federal and State Laws and Regulations to prevent injury to persons and property, including surface structures and underground utilities.
    a. Excavation less than five feet deep: Excavations in stable rock or in soil conditions where there is no potential for a cave-in may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched.
    b. Excavations greater than five feet deep: Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be sloped and benched, shielded, or shored and braced. The design, construction, safety of any shielding, shoring and/or bracing, and all related costs shall be the responsibility of the Contractor.
    c. Provide and maintain excavation support and protection systems in accordance with and the submittal accepted by Engineer and required under this Section.
    d. Maintain excavations in dry condition in accordance with Part 3.05 of this Section.
    e. Extend excavations sufficiently on each side of structures, footings, and similar construction to allow setting of forms, installation of shoring and bracing, and the safe sloping of banks, as necessary.
    f. Pavement cuts (if required) shall be saw cut deep enough to cause edges to separate in straight, clean lines.
    g. Bridging across open excavation areas shall be constructed and maintained where required (i.e., at driveways), or where requested by the Engineer. Bridging shall be designed to safely handle the maximum anticipated loading, in accordance with all applicable standards and regulations. The design and cost of any required bridging will be the responsibility of the Contractor.
3. Pipe Trench Excavation
    a. Trench excavations shall be constructed at the locations shown on the Design Drawings, in accordance with Specification and/or as required to complete the Work. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and/or soil conditions necessitate, sheeting and/or bracing may be required.
    b. Trenches shall not be opened for more than 150 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress. Open trenches shall be protected and barricaded in accordance with all applicable safety standards and regulations. There will be no trenches left open at the close of each working day unless properly protected.
    c. Trench width shall be minimized to the greatest extent practical, and shall comply with the following:
        1) Trench width shall be sufficient to provide space for installing, jointing, and inspecting piping. Refer to the Design Drawings for trench requirements. In no case shall trench be wider at top of pipe than pipe barrel OD plus two feet, unless otherwise shown or indicated on the Design Drawings.
        2) Enlargement of trench width at pipe joints may be made when required and approved by Engineer.
        3) Trench width shall be sufficient for shoring and bracing or shielding and dewatering.
        4) Trench width shall be sufficient to allow thorough compaction of fill adjacent to bottom half of pipe.
        5) Do not use excavating equipment that requires the trench to be excavated to excessive width.

d. Depth of trench shall be as shown or indicated on the Design Drawings. If required and approved by Engineer in writing, depths may be revised.
e. Where bedrock or other unyielding material is encountered at the bottom of the trench, remove such material to a minimum depth of six inches below the bottom of the pipe and replace with pipe bedding material.
f. Where the Engineer considers existing material beneath bedding material unsuitable, the Contractor shall remove and replace such unsuitable material with pipe bedding material.

3.04 UNAUTHORIZED EXCAVATIONS

A. The Contractor shall not be entitled to any compensation for excavations carried beyond or below the lines and subgrades prescribed on the Design Drawings. The Contractor shall backfill and compact such unauthorized excavations at its own expense and in conformance with the provisions of this Section.

B. Should the Contractor, through negligence or for reasons of its own, carry its excavation below the designated subgrade, appropriate materials (as specified in Specification Section 31 23 23) shall be furnished and placed as backfill in sufficient quantities to reestablish the required subgrade surface. Materials used for backfilling shall be spread and compacted in conformance with the requirements of this Section and to the percentage compaction outlined in Table 31 00 00 – A of this Section. The cost of any testing required as a result of this refilling operation shall be borne by the Contractor.

C. All material that slides, falls, or caved into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid to the Contractor for any materials ordered for refilling the void areas left by the slide, fall, or cave-in.

3.05 REMOVAL OF WATER AND DRAINAGE

A. Provide and maintain proper and satisfactory means and devices for the removal of all surface water and groundwater entering excavations, or other work areas.

B. Keep work areas dry during excavation and continually thereafter until backfilling operations are completed and acceptable to the Engineer.

C. Remove all such water as fast as it may collect, in such a manner that avoids interference with the performance of the Work.

D. Water resulting from dewatering or decontamination operations shall be collected, containerized, removed, treated onsite and/or transported offsite for disposal, unless otherwise approved by the Engineer.

3.06 EXCAVATED MATERIALS

A. Disposal of Excavated Materials:
1. Excavated material shall be removed, transported, and disposed of in accordance with Specification Section 02 81 00.

3.07 SUBGRADE PREPARATION

A. General

1. Subgrades shall be firm and intact, dense, and thoroughly compacted and consolidated; shall be free of standing water and mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades that are otherwise solid but become soft or mucky on top due to construction operations shall be reinforced with general fill material. Finished elevation of stabilized subgrades shall not be above subgrade elevations shown or indicated.
2. If, in the Engineer's opinion, subgrade becomes softened or mucky because of construction delays, failure to dewater properly, or other cause within Contractor's control, the subgrade shall be excavated to firm material, trimmed, and backfilled with compacted general fill material at Contractor's expense.
3. Proof-rolling:
    a. Prior to placing backfill or constructing pavements or slabs, proof-roll the subgrade surface with sufficient proof-rolling apparatus. Before starting proof-rolling, submit to and obtain acceptance from Engineer of proof-rolling apparatus and procedure to be used.
    b. Proof-rolling operations shall be made in the presence of Engineer. Notify Engineer at least 24 hours in advance of start of proof-rolling operations.
    c. Subgrades displaying pronounced elasticity or deformation, deflection, cracking, or rutting shall be stabilized as directed by Engineer. Unsuitable materials shall be undercut to the depth directed by Engineer and replaced with compacted general fill material. Other suitable stabilization methods may be directed by Engineer.

B. Subgrade Preparation for Pipe Bedding Materials
1. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench.
2. Where pipe is to be laid on the undisturbed bottom of an excavated trench, excavation shall not extend lower than the finished subgrade elevation at any location.
3. Where pipe is to be laid on granular material, the excavation below subgrade shall be to the minimum depth required to install the pipe bedding material. The pipe bedding material shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to pipe installation.

C. Subgrade Preparation for Crushed Gravel Surfacing
1. Place subbase material in layers not to exceed 6 inches over ground surface to support crushed gravel surfacing.
2. Grade and compact subgrade to an even, firm foundation in accordance with this Section. Remove unsuitable subgrade materials, including soft materials, boulders, vegetation, and loose stones, and replace with compacted fill material as directed by Engineer.

3.08 GENERAL BACKFILL REQUIREMENTS

A. General
1. Areas to be backfilled shall be inspected and approved by National Grid/Engineer prior to backfilling operations. All unsuitable materials and debris shall be removed.
2. Backfill materials shall meet the requirements provided in Part 2.02 of this Section.
3. Moisture/density testing (using ASTM D1557) shall be performed by a certified geotechnical testing laboratory on at least one sample of each backfill material type delivered to the site or support area (prior to placement). Testing shall be performed at the Contractor's expense and additional tests shall be performed if requested by the Engineer.
4. Place backfill materials in excavations as promptly as progress of the Work allows, but not until completing the following:
    a. Surveying and recording of horizontal and vertical limits of excavation.

b. Inspection, testing, approval and recording of horizontal and vertical locations of all installed underground utilities.
c. Removal of trash and debris.
d. Backfill shall be started at the lowest elevation of the area to be backfilled.

5. Backfill material shall not be placed on frozen ground nor shall the materials itself be frozen or contain frozen soil fragments when placed.
6. No calcium chloride or other chemicals shall be added to the backfill materials to prevent freezing.
7. Material incorporated in the backfilling operation that is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense.
8. Place backfill materials to the lines and grades shown on the Design Drawings and at the moisture content and density specified in Part 3.09(C) and Table 31 00 00-A of this Section.
   a. If the backfill materials are too dry, furnish and use equipment capable of adding measured amounts of water to the fill materials to bring backfill materials to a condition within required moisture content range.
   b. If the backfill materials are too wet, dry the backfill material by aeration and/or stockpile the material for drying.
   c. When subgrade or lift of backfill materials requires moisture-conditioning before compaction, backfill material shall be sufficiently mixed or worked on the subgrade to ensure uniform moisture content throughout the lift of material to be compacted.
9. Unless otherwise specified, place backfill materials in horizontal, loose lifts not exceeding the uncompacted thicknesses listed in Table 31 00 00-A of this Section.
10. Use appropriately sized equipment and methods when placing and compacting backfill over geosynthetics so as not to damage underlying geosynthetic materials. Areas of the geosynthetics that may have been damaged during backfill installation as determined by the Contractor and/or Engineer, shall be inspected and repaired, if necessary, in accordance with the Specifications at the Contractor's expense.
11. For backfill placed directly over geosynthetics (i.e., in areas where engineered barriers are installed), the minimum installed first lift thickness above the geosynthetics is 12 inches.
12. Drainage of the areas being backfilled shall be maintained at all times.

B. Pipe Embedment
   1. Refer to the Design Drawings and Specification Section 31 23 23, for pipe embedment material and additional installation requirements.
   2. Where shown or indicated on the Design Drawings, geotextile separation fabric shall be installed between pipe embedment and native material in accordance with Specification Section 31 05 19.13.
   3. Unless otherwise shown, placement and compaction of pipe bedding material shall comply with the requirements of this Section and the following:
      a. Pipe bedding material shall be spread and the surface graded to provide a uniform and continuous support beneath piping at all points between bell holes or pipe joints. Slight disturbance of installed pipe bedding material surface during withdrawal of pipe slings or other lifting tackle is acceptable.
      b. Pipe bedding materials shall be placed in horizontal layers not exceeding 6 inches in thickness, and compacted to at least 92 percent maximum density (Modified Proctor), unless otherwise recommended by the pipe manufacturer and accepted by the Engineer, using appropriate compaction equipment that will not damage or cause displacement of the pipe or surrounding soils.
      c. Pipe bedding material shall be placed above the centerline of the pipe, or above the concrete cradle (if present), to a depth of 12 inches above the top of the pipe barrel. Bedding materials shall be deposited in such manner as to not damage the pipe.

4. Placing and Compacting Pipe Trench Backfill: Unless otherwise shown, placement and compaction of pipe trench backfill material shall comply with the following:
    a. After each pipe's bedding material has been graded, and the piping has been aligned, joined in accordance with the Contract Documents, and placed in final position on bedding material, provide and compact sufficient pipe trench backfill material under and around each side of the pipe and back of the bell or end thereof to hold piping in proper position and maintain alignment during subsequent pipe jointing and embedment operations. Deposit and compact pipe trench backfill material uniformly and simultaneously on each side of piping to prevent lateral displacement of piping. Place and compact pipe trench backfill material to an elevation 12 inches above top of pipe, unless otherwise shown on the Design Drawings or specified in the Contract Documents.
    b. Each layer of pipe trench backfill material shall be compacted by at least two complete coverages, each lift using appropriate compaction equipment.
    c. Method of compaction and compaction equipment used shall be appropriate for material to be compacted and shall not transmit damaging shocks to the piping.
5. All pipes shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact, or unbalanced loading during backfilling operations by adequately embedding within suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side of the pipe, and back of the bell, as it is laid.
6. If specified on the Design Drawings or requested by the Engineer, concrete cradling and encasement of the class specified shall be installed. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or floatation during concrete placement. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise allowed by the Engineer. Where concrete is to be placed in a sheeted trench, it shall be poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Crushed Gravel Surfacing
1. Subbase Course Placement:
    a. Place subbase course material on prepared subgrade in layers of uniform thickness, in accordance with the Design Drawings. Maintain optimum moisture content for compacting subbase material during placing operations.
    b. A geotextile shall be installed between prepared subgrade and subbase course in accordance with the Design Drawings and Specification Section 31 05 19.13.
    c. Unless otherwise shown, placement and compaction of subbase course material shall comply with the requirements of this Section and the following:
        1) Compaction with roller shall begin at the sides of the area to receive crushed stone surfacing, and shall continue towards the center of the area. Compaction shall continue until there is no movement of the course ahead of the roller.
        2) After rolling, check for grade with a line not less than 40 feet in length. Depressions over ½ inch deep shall be filled and regraded to the satisfaction of the Engineer.
    d. Do not install subbase in excess of 500 feet in length without compacting to prevent softening of the subgrade.
    e. If subgrade material becomes churned up into or mixed with the subbase material, remove the mixed material and replace with clean, compacted subbase material.

3.09 METHOD OF COMPACTION

A. General

1. Adopt compaction methods that produce the degree of compaction specified herein, prevent subsequent settlement, and provide adequate support.
2. Compaction methods used shall avoid disturbance to underlying fine-graded soils, subsurface utilities, and the geosynthetics used in engineered barriers.
3. Hydraulic compaction by ponding or jetting shall not be permitted.
4. Backfill materials shall not be compacted when standing water is present on the materials to be compacted.
5. Backfill materials shall not be left in an uncompacted state at the close of the day's construction, unless otherwise approved by the Engineer.
6. Prior to terminating work, ridges of soil left on the final layer of compacted fill, by tractors, trucks, or other equipment used for compaction, shall be eliminated using low-pressure equipment. However, soil surfaces may be left in a "tracked" condition (i.e., with parallel indentations from the tracks of tracked equipment running horizontally along the slope for purposes of erosion and sediment control.
7. As backfill progresses, the surface shall be graded such that no ponding of water shall occur on the surface of the fill material.

B. Equipment
   1. Unless otherwise specified on the Design Drawings, equipment for compaction shall be consistent with space limitations of the work areas and the need to protect adjacent facilities.
   2. Select and use compaction equipment suitable for the type of fill material placed and capable of providing the minimum density required in the Contract Documents. Equipment used shall be capable of compacting in restricted areas next to structures and around piping and underground utilities. Compaction of fill material in confined areas shall be accomplished by means of a drum-type, power-driven, hand-guided vibratory compactor, or by hand-guided vibratory plate tampers. Effectiveness of the equipment selected by Contractor shall be tested prior to initiating compaction activities by constructing a small section of backfill within or adjacent to the area where backfill will be placed. Record total number of coverages with selected compaction equipment and perform field moisture content and density tests to ensure that specified compaction of fill has been obtained. If tests on the test section of fill indicate that required compaction has not been obtained, do one or more of the following:
      a. Increase the amount of coverage.
      b. Decrease the lift thickness.
      c. Use different compaction equipment/method.
      d. Adjust moisture content of backfill or fill material.

C. Minimum Compaction Requirements
   1. The minimum allowable compaction requirements provided in Table 31 00 00-A of this Section are expressed as a percentage of the maximum dry unit weight of the material compacted using ASTM D1557.
   2. Unless otherwise specified on the Design Drawings or in the Contract Documents, backfill materials shall be placed and compacted in accordance with Table 31 00 00-A of this Section.
   3. When proof-rolling existing (or native) soils, the layer shall be acceptable when deformations caused by substantial site equipment (e.g., roller, fully loaded dump truck) are no deeper than 1 inch. All soft or wet materials that continue to deform more than 1 inch shall be removed and replaced with suitable material and retested at the expense of the Contractor.

Table 31 00 00 - A

MINIMUM COMPACTION REQUIREMENTS

Type of Backfill Material	Maximum Uncompacted Lift Thickness (inches)	Percent Compaction (ASTM D1557)
Crushed Gravel Existing Soil Below Pavements, Structures and Sidewalks	Not Applicable	95
General Fill Material		
More Than Five Feet Below Final Grade	12	95
Less Than Five Feet Below Final Grade	12	95
Above Geosynthetics (all locations)	12	Compact by Placing/Grading Only
Pipe Bedding Material		
Below Piping, Structures, and Pavements	6	92
All Other Locations	8	90

D. Unacceptable Excavated Materials:
   1. In cases where over-excavation to replace unacceptable soil materials is required, backfill the over-excavated area to the required subgrade with general fill material and thoroughly compact the backfill in accordance with Table 31 00 00-A of this Section.

3.10 FIELD QUALITY CONTROL

A. In-Place Field Density Testing
   1. The Contractor shall provide free access to all backfill areas for in-place density testing.
   2. In-place density testing shall be performed in accordance with ASTM D6938 to verify that the specified compaction requirements provided in Table 31 00 00-A of this Section have been met.
   3. In-place density tests (using ASTM D6938) shall be performed by a certified geotechnical testing laboratory at the Contractor's expense. Tests will be required at a minimum frequency of one passing test per each lift of backfill placed, one passing test per 2,500 square feet of subgrade or one passing test per 100 cubic yards of soil fill placed, whichever results in the greatest frequency. In-place density test results, certified by the testing laboratory, shall be submitted to the Engineer within 24 hours of test completion.
   4. If the required densities are not obtained, the following activities shall be performed, at no additional cost to National Grid:
      a. Remove unacceptable materials as necessary and replace with specified materials.
      b. Compact backfill materials as required to achieve acceptable results.
      c. In-place compaction testing shall be performed on the backfilled materials by the testing laboratory and the results provided to the Engineer within 24 hours of test completion.

5. National Grid/Engineer may order additional in-place density tests to ascertain conformance with the compaction requirements shown in Table 31 00 00-A of this Section.
6. Dig test holes, at no additional cost to National Grid, when requested for the purpose of performing in-place density testing below the current fill level (if needed).
7. Anticipate time needed to complete in-place density testing. The Contractor shall not have claims for extra compensation for down time due to testing.
8. Anticipate time needed due to testing procedures. The Contractor shall not have claims for extra compensation occasioned by such time.

3.11 EXISTING FACILITIES

A. General

1. Existing subsurface facilities may be encountered during construction of the work, or located in close proximity to the work.
2. These facilities may include, but are not necessarily limited to, sewers, drains, water mains, gas mains, communications/fiber optic lines, electrical conduits and their appurtenances. These facilities may or may not be shown on the Design Drawings. However, the sizes, locations, heights and depths, if indicated, are only approximate and the Contractor shall conduct its operations with caution and satisfy itself as to the accuracy of the information given. The Contractor shall not claim nor shall it be entitled to receive compensation for damages sustained by reason of the inaccuracy of the information given or by reason of its failure to properly maintain and support such structures.
3. There may be other subsurface facilities, the existence and/or location of which are not known, such as individual water and gas services, electrical conduits, sanitary and storm sewer drains, communications/fiber optic lines, etc. The Contractor shall consult with National Grid/Engineer of such facilities and, if possible, shall determine, prior to construction, the location and depth of any such facilities that may exist in the area to be excavated.
4. If underground facilities are known to exist in an area but their location is uncertain, the Contractor shall exercise reasonable care in its excavation technique to avoid damage to them.
5. The Contractor shall notify UDig NY at least two working days, and not more than 10 working days, prior to initiating any construction activities (not counting the day the notification is made).

B. Notification and Protection Procedures

1. Except where superseded by state or local regulations, or in the absence of any applicable regulations, the Contractor shall, at a minimum, include the following procedures in its operations:
   a. Prior to Excavating:
      1) Determine correct field location of all nearby underground facilities or arrange for Representatives of the utilities to locate them.
      2) Notify owners of nearby underground facilities when excavation is to take place, allowing them reasonable time to institute precautionary procedures or preventive measures which they deem necessary for protection of their facilities.
      3) In cooperation with owners of nearby facilities, provide temporary support and protection of those underground facilities that may be especially vulnerable to damage by virtue of their physical condition or location, or those that could create hazardous conditions if damaged.

b. Immediately notify any utility owner of any damage to its underground facilities resulting from the Contractor's operations, and arrange for repairs to be made as soon as possible.
c. In case of any emergency the Contractor shall follow the approved Contingency and Emergency Procedures Plan.

3.12 OTHER REQUIREMENTS

A. Unfinished Work
1. When, for any reason, the Work is to be left unfinished, all trenches and excavations shall be filled and all roadways and watercourses left unobstructed with their surfaces in a safe and satisfactory condition.
2. Temporary barriers shall be installed around all excavations and excavation work areas in accordance with Part 3.02(c) of this Section.

B. Hauling Material on Street

1. When hauling material over the streets or pavement, the Contractor shall provide suitably tight-sealing vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets, and pavements clean and free from dirt, mud, stone, and other hauled material.
2. When hauling materials that contain PCBs or other hazardous constituents, the Contractor shall abide by all applicable federal, state, and local codes, including, but not limited to, manifesting and placarding (if necessary).

C. Dust Control
1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of its operations to such a degree that it will not endanger the safety and welfare of the general public.
2. In addition, if dust from the work is visibly airborne, the Contractor will immediately discontinue operations and implement measures to mitigate windborne migration of particulate matter until there is no further visible airborne dust, either due to the implementation of such measures or a change in conditions.

END OF SECTION

SECTION 31 05 19.13

GEOTEXTILES FOR EARTHWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Includes providing equipment, materials, labor, and services required to furnish and install woven and non-woven geotextile as described in this Section and in the Contract Documents.
   2. The Installer shall be responsible for performing all Quality Assurance/Quality Control (QA/QC) activities.

B. Related Sections:
   1. Section 31 05 19 16, Geomembranes for Earthwork.

1.02 REFERENCES:

A. American Society for Testing and Materials (ASTM)
   1. D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
   2. D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
   3. D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
   4. D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
   5. D4751 Standard Test Methods for Determining Apparent Opening Size of a Geotextile
   6. D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
   7. D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
   8. D6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
   9. D7238 Standard Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus

B. Geosynthetic Research Institute (GRI)
   1. GRI Test Method GT-12: Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials.

C. American Association of State Highway and Transportation Officials (AASHTO)
   1. AASHTO M288 Standard Specification for Geotextile Specification for Highway Applications.

1.03 QUALIFICATIONS:

A. Geotextile Manufacturer
   1. The Manufacturer shall be a specialist in the manufacture of geotextile separation and stabilization fabrics and will have sufficient production capacity and qualified personnel to meet the demands (e.g., quantity production and quality control) of this project.

B. Geotextile Installer
   1. The Installer shall be responsible for field handling, storing, deploying, seaming, temporarily restraining (against wind), and other site aspects of the geotextile material.

1.04 SUBMITTALS:

A. Prior to installation, submit the following information to the Engineer for review:
   1. Manufacturer's complete and detailed quality control manual, including written instructions for storage, handling, and installation procedures.
   2. Written certification from the Manufacturer that the Minimum Average Roll Values (MARVs) given in this Section are guaranteed by the Manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Each roll of geotextile delivered to the site shall be labeled by the manufacturer identifying the manufacturer's name, product identification, lot number, roll number, and roll dimensions.

B. All rolls and packages shall be inspected upon delivery to the site. Notify Engineer if any loss or damage exists to geotextile. Replace loss and repair damage to new condition, in accordance with Manufacturer's instructions.

C. Geotextile shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions. Geotextile rolls shall be shipped and stored in relatively opaque and watertight wrappings.

PART 2 – PRODUCTS

2.01 NON-WOVEN GEOTEXTILES

A. Material shall be needle-punched geotextile and consist of long-chain polymeric fibers or filaments composed of polypropylene, with elongation greater than 50 percent. The non-woven geotextile shall be chemically inert to naturally encountered chemicals, acids, and bases and resist biological degradation.

B. Non-woven geotextile shall be used as a cushion layer as shown on the Design Drawings. The non-woven geotextile material shall meet the following specification values listed below and as listed in GRI GT-12:

Property	Method	Minimum Average Roll Value (MARV)*
Mass per Unit Area	ASTM D5261	10 oz/sq yd
Grab Tensile Strength	ASTM D4632	230 lbs
Grab Tensile Elongation	ASTM D4632	50%
Trapezoidal Tear Strength	ASTM D4533	95 lbs
Puncture Strength	ASTM D4833	700 lbs
UV Resistance	ASTM D7238	70% (min.)

* *All values are minimum average roll values (MARV) except UV resistance; it is a minimum value.*

C. Non-woven geotextile placed above the ISS monolith and lining the trench for the new sanitary sewer pipe from the Fleet Building shall be bright orange color.

2.02 WOVEN GEOTEXTILE

A. Material shall be composed of high-tenacity polypropylene yarns woven into a stable network such that the yarns retain their relative position. The woven geotextile shall be chemically inert to naturally encountered chemicals, acids, and bases and resist biological degradation.

B. Woven geotextile shall be used as a stabilization layer as shown on the Design Drawings. The woven geotextile material shall meet the following specification values listed below and AASHTO M288 requirements for a Class 1 stabilization geotextile:

Property	Method	Minimum Average Roll Value (MARV)*
Grab Tensile Strength	ASTM D4632	315 lbs
Grab Elongation at Break	ASTM D4632	15%
Trapezoidal Tear Strength	ASTM D4533	113 lbs
Puncture Strength	ASTM D6241	900 lbs
Apparent Opening Size (AOS)	ASTM D4751	40 U.S. Sieve
Permittivity	ASTM D4491	0.05 sec^{-1} (max.)
UV Resistance (at 500 hours)	ASTM D4355	70%

* *All values are minimum average roll values (MARV) except AOS which is a maximum average roll value (MaxARV) and UV resistance which is a minimum value.*

2.03 ACCEPTABLE MANUFACTURER'S

A. TenCate Geosynthetics

B. US Fabrics, Inc.

C. An alternate manufacturer may be considered. Submit alternate Manufacturer and/or material to the Engineer for review.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the Work will be performed and notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected in a manner acceptable to Engineer.

3.02 PREPARATION

A. Excavate or fill subgrade, as required, to bring subgrade to elevations shown or indicated. Maintain all angles of repose. Confirm that subgrade is at proper elevations and that no further earthwork is required to bring the subgrade to proper elevations.

B. Remove all stones greater than two inches in any dimension, construction debris, trash, rubble, and all other extraneous materials from the subgrade.

C. Notify the Engineer that subgrade has been prepared and obtain Engineer's approval before installing geotextile.

3.03 INSTALLATION

A. Place (roll out) geotextiles in the direction of the most frequent vehicular traffic.

B. Overlap adjoining edges of geotextiles 18 inches.

C. Weight geotextiles with sandbags or equivalent when required. Install sandbags (or equivalent) during placement and maintain until replaced with cover materials.

D. During placement of geotextiles, take care not to entrap excessive dust, mud, or moisture in the geotextile stone, that could damage or cause clogging of the geotextile, or hamper subsequent seaming.

E. Use proper tools to cut and size geotextiles; exercise care while cutting geotextiles.

F. Do not expose geotextiles to precipitation prior to being installed, and do not expose geotextiles to direct sunlight for more than 15 days.

3.04 GEOTEXTILE REPAIR

A. Any holes or tears in the fabric shall be repaired as follows:
   1. On slopes: Sew a fabric patch into place using a double sewn lock stitch (1/4 inch to 3/4 inch apart and no closer than one inch from any edge). Should any tear exceed 10 percent of the width of the roll, that roll shall be removed from the slope and replaced.
   2. Non-slope areas: Spot-seam a fabric patch in place with a minimum of 18 inches of overlap in all directions.

3.05 PLACEMENT OF COVER MATERIALS

A. Place all granular materials located on top of the geotextile in such a manner as to ensure:
   1. No damage of the geotextile or underlying layers;
   2. Minimal slippage between the geotextile and the underlying layers; and
   3. No excess tensile stresses in the geotextile.

B. Do not drive equipment directly on the geotextile.

C. Utilize equipment exerting the lowest ground pressure practicable to place the granular materials to minimize the potential for damage to the geotextile. Under no circumstances shall the placement equipment exert more than 5 psi ground pressure.

END OF SECTION

SECTION 31 05 19.16

GEOMEMBRANES FOR EARTHWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Includes providing equipment, materials, labor, and services required to furnish and install 40-mil-thick, high density polyethylene (HDPE) geomembrane as described in this Section and in the Contract Documents.
   2. The Installer shall be responsible for performing all Quality Assurance/Quality Control (QA/QC) activities.

B. Related Sections:
   1. Section 31 05 19.13, Geotextiles for Earthwork.

1.02 REFERENCES:

A. American Society for Testing and Materials (ASTM)
   1. D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
   2. D1004 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
   3. D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
   4. D1603 Standard Test Method for Carbon Black In Olefin Plastics
   5. D4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds By the Muffle-Furnace Technique
   6. D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
   7. D5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
   8. D5596 Standard Test Method For Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
   9. D5721 Standard Practice for Air-Oven Aging of Polyolefin Geomembranes
   10. D5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes
   11. D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
   12. D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes

B. Geosynthetic Research Institute (GRI)
   1. GRI Test Method GM 13: Test Methods, Test Properties and Testing Frequencies for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
   2. GRI Test Method GM 19: Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.

1.03 QUALIFICATIONS:

A. Geomembrane Manufacturer
   1. The Manufacturer shall be responsible for the production of HDPE geomembrane rolls from resin and will have sufficient production capacity and qualified personnel to meet the demands (e.g., quantity production and quality control) of this project.

B. Geomembrane Installer
   1. The Installer shall be approved and/or licensed by the Manufacturer for the installation of HDPE geomembrane.
   2. The Installer shall be responsible for field handling, storing, deploying, seaming, temporarily restraining (against wind), and other site aspects of the geomembrane material.

1.04 SUBMITTALS:

A. Prior to installation, submit the following information to the Engineer for review:
   1. Manufacturer's complete and detailed quality control manual, including written instructions for storage, handling, installation, seaming, and quality assurance/quality control (QA/QC) testing procedures.
   2. Written certification from the Manufacturer that the Minimum Average Roll Values (MARVs) given in this Section are guaranteed by the Manufacturer.
   3. Manufacturer's quality control test results. The quality control test results shall include lot and roll identification numbers, representative of the field delivered material. At a minimum, results shall be given in accordance with the Contract Drawings and Specifications for:
      a. Density (ASTM D1505);
      b. Carbon black content (ASTM D4218);
      c. Carbon black dispersion (ASTM D5596);
      d. Thickness (ASTM D5994);
      e. Tensile properties (ASTM D6693); and
      f. Tear resistance (ASTM D1004).
   4. Copy of the Installer's letter of approval or license from the Manufacturer.
   5. Resume of the "Master Seamer" to be assigned to this project, including dates and duration of employment.
   6. Shop drawings showing all details required to ensure a water-tight installation of the geomembrane liner for each area.
   7. Written certification from the Installer that the final surface on which the HDPE geomembrane is to be installed is acceptable to both the Engineer and the Contractor.
   8. Written certification from the Contractor certifying that the field-delivered HDPE geomembrane has not been damaged due to improper transportation, handling, or storage.

B. Following installation, submit the following information to the Engineer for review:
   1. Copies of the Installer's field quality control paperwork.
   2. Record drawings which include the following information:
      a. Panel locations referenced to the Contract Drawings which depict the identification number assigned to each geomembrane panel.
      b. Dimensions of all geomembrane panels.
      c. All field seams, patches, repairs, and seam test results with the appropriate number or code.
   3. Standard warranty against defects in the geomembrane material and/or workmanship in accordance with this Section.

1.05 WARRANTY

A. Provide a written warranty stating that the liner materials and workmanship provided shall be free from defects for the duration of the Project.

B. Such written warranty shall provide for the complete repair or replacement including all incidental costs associated with the defect

C. All repairs or replacements shall be performed within a reasonable period of time as determined by the Construction Manager.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. HDPE Geomembrane
   1. GSE Lining Technology, Inc.; or
   2. Poly-Flex, Inc.

B. An alternate manufacturer may be considered. Submit alternate Manufacturer and/or material to the Engineer for review.

2.02 MATERIALS

A. HDPE Geomembrane Material
   1. HDPE geomembrane material shall meet the following minimum specification values listed below and as listed in GRI GM13.

HDPE Geomembrane Material Properties		
Certified Properties	**Test Method (ASTM)**	**40-mil Textured**
Thickness (nominal) - minimum average - lowest for 8 out of 10 values - lowest for any of the 10 values	D5994	40 mil 38 mil 36 mil 34 mil
Density (min. ave.)	D1505/D792	0.940 g/ml
Break Strength (min. ave.)	D6693 (Type IV)	60 lbs/in
Break Elongation (min. ave.)		100%
Tear Resistance (min. ave.)	D1004	28 lbs
Puncture Resistance (min. ave.)	D4833	60 lbs
Carbon Black Content (range)	D4218	2.0-3.0%

Abbreviations:

ASTM = ASTM International	g = gram(s)
% = percent	in = inch(es)
lb(s) = pound(s)	max = maximum
ave = average	min = minimum

2. In addition to the property values listed above, the HDPE geomembrane shall:
   a. Be free of striations, pinholes, or bubbles on the surface or in the interior.
   b. Be produced free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.
   c. Be manufactured in a single layer (thinner layers shall not be welded together to produce the final required thickness) and have a uniform appearance on both sides.

B. Welding Material
   1. The resin used in the welding material shall be identical to the geomembrane material.
   2. All welding materials shall be of a type recommended and supplied by the Manufacturer and shall be delivered in the original sealed containers, each with an indelible label bearing the brand name, Manufacturer's mark number, and complete directions as to proper storage.

C. Fabrication
   1. The geomembrane shall be delivered to the site or support area in rolls or as factory panels. A factory panel is comprised of one or more rolls that have been seamed together in a factory.
   2. The geomembrane rolls or factory panel shall be labeled with the following information:
      a. Manufacturer;
      b. Product identification;
      c. Roll/field panel number;
      d. Lot number;
      e. Thickness of the material;
      f. Length and width of the roll or factory panel; and
      g. Direction to unroll the material.

2.03 TRANSPORTATION

A. Transportation of the geomembrane shall be the responsibility of the Manufacturer. The Manufacturer will be liable for all damaged to the materials incurred prior to and during transportation to the site.

2.04 DELIVERY, HANDLING, AND STORAGE

A. Handling, storage, and care of the geomembrane prior to and following installation within the site are the responsibility of the Contractor. The Contractor will be liable for all damage to the materials incurred prior to final acceptance by the Engineer.

B. The Contractor will be responsible for the storage of the geomembrane within the site. During storage, the geomembrane will be protected from excessive heat or cold, puncture, cutting, or other damaging or deleterious conditions. The geomembrane shall be stored in accordance with any additional requirements of the Manufacturer.

2.05 QUALITY ASSURANCE

A. Field delivered material shall be subject to the following conformance tests by the Engineer:
   1. Density (ASTM D1505)
   2. Carbon black content (ASTM D4218)
   3. Carbon black dispersion (ASTM D5596)
   4. Thickness (ASTM D5994)
   5. Tensile properties (ASTM D6693)
   6. Tear resistance (ASTM D1004)

B. All conformance test results will be submitted to the Engineer for review prior to the deployment of the geomembrane. The Engineer will review the results from laboratory conformance testing. If the Contractor has reason to believe that failing tests may be the result of the Construction Quality Assurance (CQA) Laboratory incorrectly conducting the tests, the Contractor may request that the sample in question be retested by the CQA Laboratory with a technical representative of the Manufacturer present during the testing. This retesting shall be done at the expense of the Contractor. Alternatively, the Contractor may request to have the sample retested at two different approved CQA laboratories at the expense of the Contractor. If both laboratories do not produce passing results, then the original CQA Laboratory's test results will hold and the material will be rejected. The use of these procedure for dealing with failed test results is subject to the discretion of the Engineer.

C. If a test result is not in conformance with a required MARV, all material from the lot represented by the failing test shall be considered out of specification and rejected. Alternatively, at the option of the Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting specification (note that this procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line). To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured after that roll (next larger roll number) will be rejected. If one or both additional tests fail, then the entire lot will be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

PART 3 – EXECUTION

3.01 GEOMEMBRANE INSTALLATION

A. Related Earthwork
   1. The geomembrane shall be installed on a geotextile-covered surface free from stones or protruding objects.
   2. All surfaces on which the geomembrane is to be installed shall be acceptable to the Engineer prior to geomembrane installation.
   3. Free edges of geomembrane shall be secured so as to prevent uplift by wind or the intrusion of water under the liner. Edge protection shall include sandbags, polyethylene sheeting, or other methods as deemed necessary by the Contractor and approved by the Engineer.
   4. The geomembrane shall be anchored (where required) in accordance with Manufacturer's recommendations.

B. Geomembrane Deployment
   1. Geomembrane shall be deployed according to the Manufacturer's recommendations and the following procedures:
      a. Placement of the geomembrane panels shall be according to the approved panel layout provided by the Installer. Placement shall follow all instructions on the boxes or wrapping containing the geomembrane materials that describe the proper methods for unrolling panels.
      b. Geomembrane deployment shall not be undertaken if weather conditions will preclude material seaming following deployment.
      c. The method of placement must ensure that:
         1) Deployed geomembrane must be visually inspected for uniformity, tears, punctures, blisters, or other damage or imperfections. Any such imperfections shall be immediately repaired and reinspected.

2) No equipment used shall damage the geomembrane by handling, trafficking, leakage of hydrocarbons, or other means.
3) No personnel working on the geomembrane shall smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane.
4) The prepared surface underlying the geomembrane must not be allowed to deteriorate after acceptance, and must remain acceptable up to the time of geomembrane placement and until completion of the project.
5) Adequate temporary loading and/or anchoring (e.g., sand bags), not likely to damage the geomembrane, shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along the edges of panels to minimize risk of wind flow under the panels).
6) Direct contact with the geomembrane shall be minimized (i.e., the geomembrane in excessively high traffic areas shall be protected by geotextiles, extra geomembrane, or other suitable materials).
7) The method used to unroll or adjust the panels does not cause excessive scratches or crimps in the geomembrane and does not damage the supporting soil or underlying geotextile (where applicable).
8) The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels).

d. Any damage to the geomembrane panels or portions of the panels as a result of placement must be replaced or repaired at the expense of the Contractor. The decision to replace or repair any panel or portions of panels shall be made by the Engineer.
e. The Installer shall assign an identification number to each geomembrane panel placed. The number system used shall be simple, logical, and shall identify the relative location in the field.

C. Seaming
1. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests.
2. The seaming procedures below shall be implemented, where applicable, during installation of the geomembrane. The seaming procedures are as follows:
a. Generally, all seams whether field or factory, shall be oriented parallel to the line of slope, not across slope. At liner penetrations and corners, the number of seams shall be minimized.
b. The area of the geomembrane to be seamed shall be cleaned and prepared in accordance with the Manufacturer's recommendations. Any abrading of the geomembrane shall not extend more than one-half inch on either side of the weld. Care shall be taken to eliminate or minimize the number of wrinkles and "fishmouths" resulting from seam orientation.
c. Field seaming is prohibited when either the air or sheet temperature is below 32ºF, when the sheet temperature exceeds 122ºF, or when the air temperature is above 104ºF. At air or sheet temperatures between 32ºF and 40ºF, seaming shall be conducted directly behind a preheating device. In addition, seaming shall not be conducted when geomembrane material is wet from precipitation, dew, fog, etc., or when winds are more than 20 miles per hour.
d. Seaming shall not be performed on frozen or excessively wet underlying soil surfaces.

e. The Installer shall perform trial seams on excess geomembrane material. A 1-foot by 3-foot seamed geomembrane sample shall be fabricated with the seam running down the 3-foot length in the center of the sample. Such trial seaming shall be conducted prior to the start of each seaming succession for each seaming crew, every 4 hours, after any significant change in weather conditions or geomembrane temperature, or after any change in seaming equipment. From each trial seam, four field test specimens shall be taken. The test specimens shall be 1-inch by 12-inch strips cut perpendicular to the trial seam. Two of these specimens shall be shear tested and two shall be peel tested using a field tensiometer, and recorded as pass (failure of liner material) or fail (failure of seam). The test specimen shall meet the minimum specification values listed below and as listed in GRI GM19:

Field Seam Properties	Test Method	Specification Limit
Shear Strength at Yield (lb/in width)	ASTM D6392	80 ppi
Peel Adhesion - Fusion	ASTM D6392	60 ppi and Film Tear Bond
Peel Adhesion - Extrusion	ASTM D6392	52 ppi and Film Tear Bond

If a trial seam does not meet the minimum specified values, a second trial seam shall be made; if both trial seams fail, then the seaming device and its operator shall not perform any seaming operations until the deficiencies are corrected and two successive passing trial seams are produced. Completed trial seam samples cannot be used as portions of a second sample and must be discarded.

Results of all trial seam testing shall be recorded by the Installer's field QA/QC personnel and submitted to the Engineer for review and approval.

f. Where fishmouths occur, the material shall be cut, overlapped, and an overlap weld shall be applied. Where necessary, patching using the same geomembrane material shall be welded to the geomembrane sheet.
g. Acceptable seaming methods for geomembrane are:
   1) Extrusion welding using extrudate with identical physical, chemical, and environmental properties; and
   2) Hot wedge welding using a proven fusion welder and master seamer.
h. Seaming device shall not have any sharp edges that might damage the geomembrane. Where self-propelled seaming devices are used, it shall be necessary to prevent "bulldozing" of the device into the underlying soil.

D. Seam Testing
   1. The Installer shall perform nondestructive seam testing on 100 percent of the field seams. The following test methods and procedures may be used.
      a. Air pressure testing may be used if double-track hot-wedge welding has been used to seam the geomembrane. Using approved pressure testing equipment, the following procedures shall be followed:
         1) Seal both ends of the air channel separating the double-track hot-wedge welds.
         2) Insert pressure needle into air channel and pressurize the air channel to 25 psi.
         3) Monitor the pressure gauge for 5 minutes and determine whether pressure is maintained without a loss of more than 4 psi.
         4) If the pressure test fails, localize the leak and mark the area for repair.
      b. Vacuum testing will be conducted on all seams not tested using air pressure testing. Using an approved vacuum box, the following procedure shall be followed:
         1) Apply a soapy water mixture over the seam.
         2) Place vacuum box over the soapy seam and form a tight seal.

3) Create a vacuum by reducing the vacuum box pressure to 5 psi for 10 seconds.
4) Observe through the vacuum box window any bubbles.
5) Where bubbles are observed, mark seam for repair.
6) Move vacuum box further down seam overlapping tested portion of seam by 3 inches.
7) Where hot-wedge seaming has been performed, the overlap must be cut back to the weld.

2. All seam test results shall be recorded by the Installer's field QA/QC personnel and submitted to the Engineer for review and approval.

E. Geomembrane Repair
1. All imperfections, flaws, construction damage, and nondestructive seam failures shall be repaired by the Installer of the geomembrane. The appropriate methods of repair are listed below:
   a. Patching, used to repair holes, tears, undispersed raw materials, and contamination by foreign matter.
   b. Grinding and rewelding, used to repair small sections of extruded seams.
   c. Spot welding or seaming, used to repair pinholes or other minor, localized flaws.
   d. Capping, used to repair large lengths of failed seams.
   e. Topping, used to repair areas of inadequate seams which have an exposed edge.
   f. Removing bad seams and replacing with a strip of new material welded into place.
2. All geomembrane repairs shall be tested in accordance with Part 3.01(d) of this Section.
3. All geomembrane repair information (e.g., repair ID, location, test results) shall be recorded by the Installer's field QA/QC personnel and submitted to the Engineer for review and approval.

3.02 POST-CONSTRUCTION

A. The Installer shall prepare and the Contractor shall submit to the Engineer, record drawings illustrating the following information:
1. Panel locations referenced to the Contract Drawings which depict the identification number assigned to each geomembrane panel.
2. Dimensions of all geomembrane panels.
3. All field seams, patches, repairs, and seam test results with the appropriate number or code.

3.03 PRODUCT PROTECTION

A. In the event of damage, immediately make all repairs and replacements necessary, to the approval of and at no additional cost to the Engineer.

END OF SECTION

SECTION 31 09 13

GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. The work under this Section includes conducting all activities on the project in such a manner that damage is prevented to adjacent utilities, structures (including the Fleet Building and fuel island), driveways/parking areas, property and Work, and such that the ground vibrations and ground/structure displacements are consistently maintained below the maximum levels specified in this Section.
   2. Notify the Engineer, prior to conducting any vibration producing activity, and conduct appropriate monitoring at nearby structures in accordance with the plan prepared by the Contractor's independent specialist and approved by the Engineer.
   3. Provide and install optical settlement monitoring points on the Fleet Building and fuel island.
   4. Provide, install, and set up two engineering seismographs on the Fleet Building and one on the ground surface above the 12-inch diameter, 99 pounds per square inch (psi) gas main north of the Fleet Building (i.e., the gas main closest to the building).
   5. Protect vibration monitoring equipment, benchmarks, settlement monitoring points and other monitoring equipment that are existing or installed as required by this Section.
   6. Protect/monitor existing installed construction; existing utilities; and adjacent buildings as shown on the Design Drawings.
   7. Work shall be coordinated with public (UDig NY) and private utility companies that have any above-ground, below-ground, or other utility lines within or adjacent to the site.
   8. Protect complete removal areas, including pre-ISS and excavation areas, installed components including ISS and built structures associated with the Design Drawings, such that once installed, the Contractor conducts operations in a manner that avoids deteriorating or otherwise damaging these features.

B. Related Sections:
   1. Section 01 71 23, Field Engineering.
   2. Section 02 21 19, Structural Surveys.
   3. Section 02 55 00, In-Situ Solidification.
   4. Section 31 00 00, Earthwork.

1.02 JOB CONDITIONS:

A. Install and monitor settlement monitoring points on the Fleet Building (three locations) and fuel island (one location) and install engineering seismographs on the Fleet Building (two locations) and above the 12-inch diameter gas main north of the Fleet Building (one location to be determined in the field by National Grid) for the purpose of monitoring and ensuring compliance with the vibration and ground and structure deformation limits specified herein.

B. Settlement point survey reading shall be made by the Contractor using a Land Surveyor licensed in the State of New York. Survey measurements shall be taken to a precision of 0.05 inch. Vibration monitoring shall be performed by the Contractor using personnel experienced in the correct placement and monitoring of engineering seismographs. Engineer seismographs shall be capable of recording vibration levels from 0.02 to 10 inches per second, at frequencies from 2 to 250 Hz.

C. Vibration monitoring shall be initiated just prior to and performed continuously during all excavation and ISS construction activities at the site.

D. Settlement monitoring shall be performed weekly when excavation and ISS construction activities are outside 100 feet from a monitored structure, and daily when within 100 feet of a monitored structure.

E. When excavation and ISS activities are within 50 feet of a monitored structure, vibration and settlement monitoring shall be conducted twice daily, as directed by the Contractor's independent specialist.

F. Reports of vibration and settlement monitoring shall be provided to the Engineer by the end of the next day after monitoring has been performed, and the Engineer shall be notified immediately if any vibration or settlement monitor readings exceed the threshold or limiting values specified herein.

1.03 SUBMITTALS:

A. Action Submittals: Prior to the start of work, submit the following to the Engineer for approval:
   1. Shop drawings showing excavation and in-situ implementation equipment and methods, with estimates of vibration at adjacent structures when excavation or in-situ implementation activities are taking place at the closest point to those adjacent structures.
   2. Submit qualifications for the independent specialist whose services have been selected by the Contractor for performing the vibration and settlement monitoring work demonstrating at least 5 similar assignments completed successfully during the last 5 years.
   3. Submit a Monitoring Plan and Installation Plan for monitoring devices prepared by the independent specialist prior to starting this work.
   4. Shop drawings and manufacturer's data for the following:
      a. Engineering seismographs.
      b. Monitoring Point Plan indicating locations of vibration and settlement monitoring points.
   5. Instrumentation Installation Methods: Submit the following:
      a. Detailed descriptions of the proposed installation procedures for the geotechnical instrumentation (i.e., engineering seismographs and optical survey points).
      b. Manufacturer's installation recommendations and requirements.
      c. Methods for demarcating the location of geotechnical instruments.
      d. Proposed methods for reinstalling the instruments if they are damaged, fail to operate properly, or otherwise require temporary removal and reinstallation.
      e. Proposed means of protecting geotechnical instrumentation during completion of the work.
   6. Monitoring reports in accordance with Paragraph 1.05.
   7. Pre-construction survey provided by a third-party structural engineer in accordance with Section 3.01 of this specification and Section 02 21 19.
   8. Post-construction survey provided by a third-party structural engineer in accordance with Section 3.01 of this specification and Section 02 21 19.

1.04 MOVEMENT MONITORING OF STRUCTURES

A. Establish a benchmark for settlement readings of the structures on a stable feature beyond the zone of influence of the construction.

1.05 RECORD KEEPING

A. Record the following information relating to the monitoring of movement or settling:
   1. Location/designation.
   2. Amount of settling or movement.
   3. Date and time.
   4. Current work activities.
   5. Ambient temperature during each recording.

B. Submit a record of each vibration operation no later than the beginning of the subsequent workday during vibration-causing construction activities. The record will include the following information:
   1. Peak hourly readings during vibration activities.
   2. Weather conditions.
   3. Name of the responsible person in charge.
   4. Signature and title of person making record entries.

C. Copies of these records shall be supplied to the Engineer on a daily basis.

D. Within twenty (20) days of completion of the remedial construction, submit a final report documenting all monitoring activities. This report shall consist of the following:
   1. As-built constructed drawings showing each monitored location point.
   2. Results of settlement monitoring.

1.06 INSTRUMENTATION

A. All instruments shall be installed in the presence of the Engineer. The Contractor shall allow access to the work area at all times for the purpose of observing instrumentation and obtaining data. The Contractor shall determine the elevation and location of all instrumentation a minimum of one week prior to excavation, demolition, or ISS.

B. The Contractor shall be responsible for any and all damage incurred to utilities and structures during geotechnical instrumentation installation.

C. Protect and maintain instrumentation until the end of the Project. Any instrumentation damaged or otherwise rendered non-functional shall be repaired or replaced with a new installation within five working days at no additional cost to National Grid. Repair or replacement work shall conform to the requirements specified herein for the respective type of geotechnical instrumentation.

D. Provide and maintain well-delineated protection devices at the surface of all instrumentation.

E. Provide installation plans for monitoring devices.

1.07 DELIVERY, STORAGE AND HANDLING

A. All instruments will be calibrated and in working order at the time of installation and will be verified onsite by the Engineer, immediately prior to installation.

B. All appropriate precautions for working with electricity, as indicated in the Contractor's HASP, will be followed at time of installation.

PART 2– PRODUCTS

2.01 ENGINEERING SEISMOGRAPH

A. Instantel Micromate Pro6 seismograph, or Engineer approved equal.

B. Equipment measuring specifications include:
   1. Range: 0.02 to 10 inches per second.
   2. Resolution: 0.005 inch per second
   3. Accuracy: plus-or-minus five percent.
   4. Frequency Response Range: Two to 250 Hertz
   5. Equipment shall come complete with readout displays, data loggers, protective housings software, and other accessories recommend by manufacturer for the intended application.

2.02 OPTICAL SURVEY POINTS

A. Optical survey equipment shall meet a 0.05 inch tolerance in order to know that any variances in movements are not due to the equipment tolerance, but rather they are due to actual movements due to implementation of ISS, excavating, and backfilling activities.

B. Optical Survey Points shall be fixed prisms or an approved equivalent that will allow the points to be optically surveyed.

PART 3– EXECUTION

3.01 PRE- AND POST-CONSTRUCTION STRUCTURAL SURVEYS

A. Pre- and post-construction structural surveys of the Fleet Building and fuel island will be conducted by a third-party structural engineer hired by the Contractor.

B. Structural surveys will be completed in accordance with Section 02 21 19.

C. Vibration-causing construction operations may not begin until the pre-construction report is reviewed and approved by the Engineer.

D. Post-construction structural survey shall be submitted to the Engineer within 14 days of completion of the remediation activities.

3.02 INSTALLATION

A. Engineering Seismograph:
   1. Supply and install electronic engineering seismograph, as per the manufacturer's recommendations, in accordance with the Contractor's Monitoring Plan and Installation Plan or as directed by the Engineer or National Grid. Vibration monitoring locations on the Fleet Building are shown on the Design Drawings. The vibration monitoring location above the gas main will be determined in the field by National Grid.
   2. The Engineer shall be notified at least 24 hours prior to installing each instrument.
   3. Engineering seismographs shall be firmly mounted in specified locations using methods consistent with the manufacturer's recommendations with consideration of the specific substrate of the site.

B. Optical Survey Points:
   1. Contractor shall have a qualified surveyor establish a benchmark and optical survey points, as shown on the Design Drawings.
   2. The Engineer shall be notified at least 24 hours prior to installing each instrument.
   3. Install optical survey points in approved locations (horizontal and vertical) and in accordance with manufacturer's specifications.

3.03 MONITORING

A. Engineering Seismograph:
   1. Monitoring Schedule:
      a. Baseline Monitoring:
         1) Perform baseline vibration monitoring before initiating any vibration activities.
         2) Baseline monitoring shall be performed continuously between the hours of 7:00 am to 5:00 pm over a period of not less than two working days.
      b. Routine monitoring: Continuously monitor vibrations simultaneously, at the three above-identified locations, during all vibration activities.
      c. Submit all results to the Engineer no later than the end of the subsequent workday.
   2. Notification level: peak particle velocity of 1.5 inches per second. Immediately notify Engineer. Continue work and continue to continuously monitor.
   3. Action Level: 2.0 inches per second. Immediately notify Engineer.
      a. Stop all work.
      b. Consult with Contractor and Engineer to determine appropriate mitigative measure, including, but not limited to, modifying injection/excavation techniques, sequencing, or equipment.

B. Optical Survey Points:
   1. Once installed, survey and document, by robotic total station, the baseline coordinates (northing and easting) and elevation of each optical survey point before any removal activities begin. Provide survey data to Engineer no later than the end of the subsequent workday.
   2. Survey and document, by robotic total station, the coordinates (northing and easting) and elevation of each optical survey point once a day during excavation and ISS activities, with results submitted to the Engineer no later than the end of the subsequent workday.
      a. Both raw and reduced data shall be provided on summary tables and plots. Data plots shall show absolute vertical deformation versus time and absolute horizontal deformation versus time.
   3. Notification Level: 0.2 inch of movement in any direction. Immediately notify Engineer.
      a. Additional optical surveying will continue twice daily for the location where the movement occurred, and any other optical monitoring points deemed necessary by Engineer, for at least two consecutive days to determine if further movement occurs.
      b. If movement ceases, work can continue. If work continues, optical surveying will continue daily at the monitoring point where the movement occurred, and any other monitoring points deemed necessary by Engineer.
   4. Action level: 0.5 inches of movement in any direction. Immediately notify Engineer.
      a. Stop all work.
      b. If additional movement is detected at or greater than 0.5 inches, work shall stop and Contractor must propose a method to continue removal activities and/or ISS implementation to be reviewed by the Engineer and National Grid that prevents further movement.

3.04 DAMAGE TO INSTRUMENTATION

A. Protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation from damage due to construction operations, weather and vandalism.

3.05 REMOVAL

A. Remove instrumentation only when directed by the Engineer.

B. Repair any damaged or disturbed surfaces to original condition.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Provide all materials, labor, equipment, and services and perform all operations in connection with dewatering of the site, including excavation areas. Complete as required to implement excavation and other Work, or as otherwise required by the Contract Documents.

B. Related Sections:
   1. Section 02 60 05, Contaminated Waste Management and Disposal
   2. Section 02 81 00, Transportation and Disposal of Wastes
   3. Section 31 00 00, Earthwork
   4. Section 31 05 19.13, Geotextiles for Earthwork
   5. Section 31 23 23, Fill Materials

1.02 PERFORMANCE REQUIREMENTS:

A. Dewatering Performance:
   1. Contractor shall design, provide, test, operate, monitor, and maintain a dewatering system of sufficient scope, size, and capacity to control groundwater, stormwater, and surface water flow into excavations and sumps in the site and permit construction to proceed on dry, stable subgrade. The Work includes:
      a. Design and construct a dewatering system capable of maintaining adequate dewatering conditions consistent and compatible with excavation construction methodologies as described in the Contract Documents. The dewatering is anticipated to be achieved by open pumping methods directly from the excavations during construction.
      b. Remove dewatering system when no longer needed.
      c. Maintain dewatering operations to ensure erosion control, excavation and constructed slope stability, and prevention of structure damage and excavation flooding.
      d. Prevent surface water from entering excavations by grading, diking, diverting, or other means.
      e. Accomplish dewatering system installation, operation, and removal without directly or indirectly damaging any existing building, structure, utility, roadway, or other onsite or offsite facility adjacent to the excavation.

B. Storage and Disposal:
   1. Dewatering is anticipated to be accomplished by open pumping of groundwater, stormwater, and any accumulated surface water directly from the excavations and sumps during construction and into the onsite frac tank for offsite disposal or onsite treatment and discharge to a wastewater treatment plant (WWTP), acceptable to National Grid and NYSDEC.

1.03 SUBMITTALS:

A. Submit a Water Management and Dewatering Plan for review and acceptance by the Engineer. The Contractor shall submit all information that substantiates that the proposed system can be operated successfully to meet the performance criteria specified in Paragraph 3.02 of this Section. Such information includes, but is not limited to, the following:
   1. Location and methods of sumps/extraction points to be used for accomplishing dewatering through open pumping from the excavations during construction and sumps at pads and detention basins.
   2. Pump(s), piping, and appurtenances to be used to extract accumulated groundwater/stormwater, including numbers, size, flow capacity, and fuel/power source.
   3. Location of system components within the Work Area.
   4. Shop Drawings and technical details for each system components and media (if any).
   5. Supporting data analysis and calculations.
   6. Electrical requirements and service connections.
   7. A discussion outlining control procedures and contingency plans to be adopted if dewatering problems (e.g., quantity, quality, duration, drawdown) arise.
   8. Contractor's anticipated operation of the extraction system, including monitoring, and coordination with other construction activities. Account for dewatering needs outside normal working hours.
   9. Decommissioning procedures following completion of system operation.

B. Shop Drawings for dewatering system shall indicate the arrangement, locations, and details of sumps, drains, and/or extraction points within the excavations; location and layout of storage tanks; containment system for the tanks; locations of headers; locations of filters or other pre-treatment; and means of discharge for load out and disposal of water.

1.04 PROJECT CONDITIONS:

A. Contractor shall not interrupt any utilities unless permitted in writing by the Engineer and after arranging to provide temporary utility services according to the requirements indicated.

B. Information regarding site hydrogeological conditions and groundwater quality for the Work Area is available in the Contract Documents. This information identifies the type and general range of constituents that may be present in the water subject to treatment. The Contractor shall note that there are limitations related to any available groundwater information because seepage conditions may exist that have not been identified. The information included in the Contract Documents represents interpretations of the subsoil conditions, tests, and results of analyses conducted by the Engineer. The Engineer shall not be responsible for interpretations or conclusions drawn from these data by the Contractor. The Contractor may make additional test borings and conduct other exploratory operations as deemed necessary to verify or otherwise independently establish the subsurface water conditions that may affect dewatering at the Work Area. The Contractor shall be solely responsible for the interpretation of existing or new data and the determination of the dewatering requirements necessary to accomplish the Work in a satisfactory manner and in compliance with these Specifications. The Contractor is not relieved of the responsibility to control all water, as required to maintain satisfactory conditions in the Work Area. The Contractor shall provide adequate methods for maintaining satisfactory conditions in the Work Area by means of earthen berming/diversions (for surface runoff collection/containment), pumping from wells/sump pumps, or any other measures necessary for particular site conditions.

C. Where required for management of contact water, trenches, excavations and other parts of the site shall be dewatered and kept free of standing water and muddy conditions as necessary for the proper execution of the Work.

PART 2 – PRODUCTS

2.01 QUALITY OF PRODUCTS

A. Standard products: For this Section, it is assumed that the dewatering system shall include processes for pumping, conveyance, and particulate settling and any additional treatment needed to meet the requirements of the offsite treatment facility. The Contractor shall select system components, as appropriate, to meet the relevant criteria and limitations, and propose it in the Water Management and Dewatering Plan for review and acceptance by the Engineer.

PART 3– EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork and dewatering operations.
   1. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrade, and from flooding the site and surrounding onsite and offsite properties.
   2. Protect the subgrade and foundation soils from softening and damage by rain, snow, or water accumulation.

B. Install the dewatering system in accordance with the documents referenced in the Contract Documents.

C. Install the dewatering system so as to ensure minimum interference with temporary and permanent roads, streets, walks, and other adjacent occupied and used facilities.

D. The Contractor shall, to the extent possible, minimize the size of excavation areas to control the quantity of groundwater and stormwater that may require treatment. In addition, temporary diversion features such as culverts, berms, and diversion swales may be constructed around excavations to control potential run-on from adjacent areas.

E. Dewatering activities shall be coordinated with the Engineer's overall approach for executing construction activities. The dewatering location(s), sequencing and timing, performance of survey confirmation, placement/compaction of backfill and other ancillary activities should be considered in the development of the Water Management and Material Dewatering Plan.

3.02 DEWATERING

A. Water that accumulates within Work Areas shall be removed. The Contractor shall take precautions to minimize the solids present in extracted water such as constructing a sump and keeping the intake of the pump off the bottom and away from the sidewalls of areas being dewatered. Install the dewatering system using sump pit construction. Provide sumps, storage tanks, and other flow-control devices as required by the Contract Documents and all authorities having jurisdiction. Sumps shall be constructed in accordance with the Contract Documents and the Contractor's Water Management and Material Dewatering Plan.

B. Provide an adequate system to lower and control groundwater, as needed, to permit the excavation, construction of structures, and placement of fill materials on dry subgrade.

C. Provide an adequate system to manage stormwater and dewatering liquids collected in sumps at containment/staging areas to permit and maintain dry Work Areas.

D. Store and convey water removed from the excavations in a manner to avoid endangering public health, property, and portions of the Work Area under construction or completed and in accordance with regulations and as directed by the Engineer.

E. Transfer all water collected during dewatering activities to the onsite frac tank.

F. Provide all pre-treatment required by the offsite treatment facility.

G. Provide standby equipment onsite, installed and available for immediate operation to maintain dewatering on a continuous basis if any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, restore damaged structures and foundation soils at no additional expense.

H. Promptly repair damages to adjacent facilities caused by dewatering operations.

I. Following completion of dewatering operations, the dewatering system shall be decommissioned in accordance with Water Management and Dewatering Plan and the vendor/supplier/manufacturer's recommendations.

J. All waste generated during water treatment system decommissioning shall be segregated and containerized. Transportation and disposal shall be coordinated by the Contractor and in accordance with the Contract Documents.

END OF SECTION

SECTION 31 23 23

FILL MATERIALS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope:
   1. Furnish and provide all labor, tools, materials, equipment, and services, and complete all work necessary for obtaining and placing fill materials for the backfilling of excavations, restoration of surfaces, and other purposes as indicated on the Design Drawings and specified herein.

B. Related Sections:
   1. Section 31 05 19.13, Geotextiles for Earthwork.
   2. Section 31 00 00, Earthwork.

C. Unified Soil Classification System (USCS)

D. American Society for Testing and Materials (ASTM)
   1. D422 – Standard Test Method for Particle-Size Analysis of Soils.
   2. D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 [600 kN-m/m^3]).
   3. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 [2,700 kN-m/m^3])
   4. D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
   5. D4129 – Standard Test Method for Total Organic Carbon Analysis of Soils.
   6. D4318 – Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   7. D4972 – Standard Test Method for pH of Soils
   8. D5519 – Standard Test Method for Particle Size Analysis of Natural and Man-Made Rip Rap Materials.
   9. D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

E. United States Environmental Protection Agency (USEPA) Methods 6010D/6020A/7471B, and 9012B (inorganics), 8270E (semi-volatile organic compounds [SVOCs], including 1,4-dioxane), 8260D (volatile organic compounds [VOCs]), 8082A (polychlorinated biphenyls [PCBs]), 8081B/8080A and 8141B (pesticides), 8151A (herbicides), and 1633 (per- and poly-fluoroalkyl substances [PFAS]).

F. New York State Department of Transportation (NYS DOT), Standard Specifications for Construction and Materials, September 2016.

G. New York State Department of Environmental Conservation document titled, “DER-10 Technical Guidance for Site Investigation and Remediation,” (DER-10) issued on May 3, 2010.

1.02 SUBMITTALS:

A. General Information

1. At least 3 weeks prior to delivery of fill materials to the site, submit to the Engineer for review the following general information:
    a. Vendor's name and location of fill material source(s).
    b. Identification of any state or local approval as a fill source.
    c. A brief history of the property that is the source of the fill.
    d. Description of the Work for which the fill material is proposed for use.

B. Physical Tests
    1. Sample and test all proposed fill materials for the physical properties listed below, and submit a summary of the physical test results to the Engineer for review at least 2 weeks prior to delivery of fill materials to the site. At a minimum, all proposed fill materials shall be sampled and tested as follows:
        a. At least one sample of each proposed fill material from each proposed source shall be tested for the following Physical Properties:
            1) Standard sieve analyses and Atterberg Limits; and
            2) Density testing in accordance with ASTM 1557 (Modified Method D).

C. Analytical Tests
    1. In addition to the Physical Tests indicated above, sample and test all proposed offsite (imported) fill materials for the parameters listed below, and submit a summary of the analytical test results to the Engineer for review at least 2 weeks prior to delivery of fill materials to the site. The analytical testing shall be performed to demonstrate that the offsite materials meet the soil cleanup objectives for commercial use outlined in Table 375-6.8(b) of 6 NYCRR Part 375 (Environmental Remediation Programs). The Contractor shall be responsible for retaining an independent testing laboratory to perform analytical testing. At least one sample of each proposed fill material from each proposed source in general accordance with the protocols outlined in Section 5.4(e)10 of DER-10. Samples shall be tested for the following Chemical Properties unless the fill meets NYSDEC's sampling exemption (gravel, rock, or stone, consisting of virgin material from a permitted mine or quarry, containing less than 10% by weight that would pass through a size 100 sieve), perform chemical testing as follows:
        a. Discrete Grab Samples:
            1) TCL VOCs by USEPA SW-846 Method 8260D.
        b. Composite Samples:
            1) TCL SVOCs by USEPA SW-846 Method 8270E (including 1,4-dioxane).
            2) Organochlorine Pesticides (Pesticides) by USEPA SW-846 Method 8081B.
            3) Organochlorine Herbicides (Herbicides) by USEPA SW-846 Method 8051A.
            4) PCBs by USEPA SW-846 Method 8082A.
            5) TAL inorganics by USEPA SW-846 Method 6010D/6020A/7471B/9012B.
            6) PFAS by USEPA Method 1633.
    2. The laboratory used to analyze offsite fill materials shall be certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for the parameters being analyzed. The laboratory shall be capable of providing detection limits at or below the soil cleanup objectives for commercial use outlined in 6 NYCRR Part 375-6.8(b) to allow for comparison of the analytical results to those objectives by the Contractor.
    3. Analytical results shall be accompanied by Analytical Services Protocol (ASP) Category B deliverables. Electronic data deliverables shall also be submitted in the NYSDEC approved format.

D. NYSDEC's Request to Import/Reuse Fill or Soil Form (latest version from NYSDEC's website: Request To Reuse Soil) for each type of backfill material needed for the project. The Contractor shall complete the form, sign and date the form, and provide the information identified as Items 1.02 A. through C. above as attachments to the form.

E. Engineer has the right to reject fill materials based on the results of any of the above physical or analytical test analyses. If fill materials are rejected for any reason, the Contractor will be responsible for providing an alternate fill source and performing/accommodating additional testing, as required, at no additional cost to National Grid.

F. Submit all Physical and Analytical Test Results listed above to the Engineer as a single submittal. Engineer will initiate review of the above-listed submittals once all portions of the required submittals have been received from the Contractor.

PART 2– PRODUCTS

2.01 GENERAL

A. Any offsite materials brought onsite for use as fill must be from a NYSDOT-certified source and meet the requirements of this Section.

B. If quality assurance testing shows that the material does not meet the requirements of this Section, the Contractor must identify a new source for the material and provide the required data and materials for testing by the Engineer for the new source of material prior to the use of such material onsite.

2.02 FILL MATERIALS

A. General Fill:
1. General fill shall consist of clean common earth fill free from excessive moisture, organic material, coatings, sharp angular stones, unsatisfactory soils; nuisance seeds, and other deleterious materials and having the following gradation by weight as specified in Table 31 23 23-A.

TABLE 31 23 23-A
GRADATION REQUIREMENTS FOR GENERAL FILL

U.S. Sieve Size	Percentage by Weight Passing Sieve
1.5-inch (37.5 mm)	>90
No. 200 (0.075 mm)	<12

2. General fill shall have a liquid limit not greater than 45, and plasticity index not greater than 25.

B. Sand:
1. Material will meet NYSDOT requirements for Sand Backfill as described in Section 733-15 and Table 733-15A of the NYSDOT Standard Specifications for Construction and Materials Gradation with the gradation as specified in Table 31 23 23-B.

TABLE 31 23 23-B
GRADATION REQUIREMENTS FOR SAND

U.S. Sieve Size	Percentage by Weight Passing Sieve
½ -inch (12.7 mm)	100
¼ -inch (6.35 mm)	90-100
No. 200 (0.075 mm)	0-5

C. Type 2 Crushed Gravel:
1. Material will consist of clean, durable, sharp-angled fragments of gravel free from coatings, fines, or organic materials.
2. Material will meet the NYSDOT Standard Specifications, Section 703-02 or similar.
3. Material gradation will be as specified in Table 31 23 23-C.

TABLE 31 23 23-C
GRADATION REQUIREMENTS FOR TYPE 2 CRUSHED GRAVEL

U.S. Sieve Size	Percentage by Weight Passing Sieve
1½ -inch (37.5 mm)	100
1 -inch (25 mm)	90-100
½ -inch (12.7 mm)	0-15
No. 200 (0.075 mm)	0-1

D. Type 1 & 2 Blend Crushed Stone:
   1. Material will meet the NYSDOT Standard Specification for Construction and Materials Section 703-02 or will be functionally equivalent as reviewed and approved by the Engineer.
   2. Material gradation will be as specified in Table 31 23 23-D.

TABLE 31 23 23-D
GRADATION REQUIREMENTS FOR TYPE 1 & 2 BLEND CRUSHED STONE

U.S. Sieve Size	Percentage by Weight Passing Sieve
1½ -inch (37.5 mm)	100
1 -inch (25 mm)	95-100
½ -inch (12.7 mm)	45-58
¼ -inch (6.35 mm)	1-8
No. 200 (0.075 mm)	0-1

PART 3– EXECUTION

3.01 GENERAL

A. Fill materials shall be installed as specified in Specification Section 31 00 00.

END OF SECTION

Appendix B

Community Air Monitoring Plan

National Grid

Community Air Monitoring Plan

Interim Remedial Measure for
Fleet Building Addition
North Albany Former MGP Site
Albany, New York
NYSDEC Site #401040

March 2025

Community Air Monitoring Plan

Interim Remedial Measure for

Fleet Building Addition

North Albany Former MGP Site

Albany, New York

NYSDEC Site #401040

March 2025

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Acronyms and Abbreviations

bgs	below ground surface
CAMP	Community Air Monitoring Plan
COC	constituent of concern
DER	Department of Environmental Remediation
ISS	in-situ soil solidification
MGP	manufactured gas plant
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	polycyclic aromatic hydrocarbon
PM10	particulate matter less than 10 micrometers in diameter
ppm	parts per million
RD	Remedial Design
TWA	time-weighted average
VOC	volatile organic compound
µg/m3	micrograms per cubic meter

1 Introduction

This *Community Air Monitoring Plan* (CAMP) has been prepared to support the implementation of remedial activities at the National Grid – North Albany former manufactured gas plant (MGP) site (the site) located in Albany, New York. This CAMP fulfills the general requirements set forth by the New York State Department Environmental Conservation (NYSDEC) in *DER-10 / Technical Guidance for Site Investigation and Remediation* (DER-10; NYSDEC 2010). Specifically, Appendix 1A of DER-10 (included herein as Exhibit I) provides general guidance and protocols for the preparation and implementation of a CAMP. In addition, Appendix 1B of DER-10 (included herein as Exhibit II) supplements the contents of Appendix 1A and provides additional requirements for fugitive dust/particulate monitoring. Details related to the remedial activities are presented in the Fleet Building Addition Interim Remedial Measure Design (IRM Design; Arcadis, 2025).

The intent of this CAMP is to provide a measure of protection for downwind communities from potential airborne releases of constituents of concern during intrusive and/or potential dust-generating remedial construction activities at the site. This CAMP specifies the air emission action levels, air monitoring procedures, monitoring schedule, and data collection and reporting to be performed during the implementation of remedial activities.

As indicated in Specification Section 01 35 49 (Community Air Monitoring Plan), the Contractor will be required to obtain the services of a qualified third-party subcontractor to provide all labor, materials, and equipment necessary to implement the community air monitoring program specified in this CAMP.

1.1 Site Location and Description

The former MGP site is located in the northern portion of the National Grid North Albany Service Center in Albany, New York. Land use in the surrounding area is primarily commercial/industrial, with residential areas located to the west of the facility. The site is bordered by Interstate I-90 to the north, Bridge Street to the south, a Canadian Pacific (CP) Railroad right-of-way to the east, and Broadway to the west. The Hudson River is located approximately 0.5 miles east of the site. The site consists of the following areas:

- Former MGP Area (FMA) – consists of the paved area immediately north and east of Building #2 where the former MGP operations were located.
- Hazardous Waste Storage Tank Area (HWSTA) – consists of the aboveground storage tank area immediately south of Building #2.
- Yard Storage Area (YSA) – consists of the equipment storage area located south of Building #2.
- Off-Site/Downgradient Area (OSDA) – consists of the area east of the National Grid property to approximately 200 feet east of Erie Boulevard.

The site operates as an active utility service center that serves as the primary maintenance, supply, storage, and office support facility for National Grid's operations in Eastern New York State. The North Albany Service Center is located on an approximately 25-acre parcel that consists of several buildings, parking lots, and storage areas. A natural gas regulator station and an electrical substation (the Genesee Street Substation) are located in the northwestern corner of the property.

1.2 Summary of Remedial Activities

In general, the remedial activities to be performed at the site include: (1) excavating approximately 804 in-situ cubic yards of soil, debris, and cover material (asphalt) extending from ground surface to approximately 6 feet below ground surface (bgs); (2) performing in-situ soil solidification (ISS) to treat approximately 2,632 in-situ cubic yards of soils; (3) transporting and disposing of excavated materials at one or more permitted landfills; (4) backfilling the remediated area; and (5) performing various restoration activities.

Additional details regarding the remedial activities are provided in the IRM Design.

1.3 Potential Air Emissions Related to Remedial Activities

Ground-intrusive and certain non-intrusive activities have the potential to generate localized impacts to air quality. Such activities are anticipated to include, but may not be limited to the following:

- Material excavation to the limits shown in the IRM Design.
- Material handling and storage (e.g., ISS mixing, manipulation of excavated materials to render them suitable for offsite treatment/disposal, stockpiling of materials, loading of materials for transport to the offsite treatment and/or disposal facility[ies], etc.).
- Decontamination activities.
- Unloading/stockpiling clean backfill and materials subject to re-use for subsequent placement onsite.
- Backfilling/restoring remediated and other disturbed areas.

1.4 Community Air Monitoring Objective

Community air monitoring will be performed during the remedial construction activities to provide a measure of protection for the downwind community from: (1) potential airborne releases of MGP related constituents of concern (COCs) – specifically, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs); and (2) nuisance MGP-related odors. VOCs are more volatile (easily evaporated) than PAHs and, therefore, are generally of greater concern when monitoring air quality during the remediation associated with former MGP sites. The airborne concentration of respirable dust (particulate matter less than 10 micrometers in diameter [PM_{10}]) will also be monitored due to its ability to co-transport MGP-related COCs.

1.5 Basis of Design for Community Air Monitoring

The community air monitoring program has been designed to:

- Establish baseline (pre-remediation) concentrations of MGP-related COCs in ambient air before ground-intrusive or dust-generating activities are initiated at the site.
- Provide an early warning system, through the use of alert levels (levels set below action levels) and automated notifications, so that vapor and dust emissions can be controlled onsite at the source before action levels are exceeded at the downwind perimeter of the site.

- Evaluate the on-going effectiveness of vapor/dust controls and construction techniques to maintain or reduce airborne concentrations of the MGP-related COCs below action levels at the downwind perimeter of the site.

2 Odor, Vapor, and Dust Controls

Odor, vapor, and dust emissions resulting from the activities identified in Section 1.3 will be controlled using a combination of: (1) water-based, biodegradable vapor mitigation agents (BioSolve® Pinkwater® and Rusmar AC-645 Long-Duration Foam); (2) construction techniques; and (3) site management practices. A solution of BioSolve® Pinkwater® and water will be sprayed on exposed soils and excavation faces to control vapors/odors (as needed) when actively excavating, performing ISS, or handling excavated materials. Rusmar AC-645 Long-Duration Foam will be sprayed on excavated soils and excavation faces to form a thick, viscous vapor barrier before extended work breaks and at the end of each workday (as needed). The foam will also be applied (as needed) on uncovered soil stockpiles during the workday. BioSolve® Pinkwater® and Rusmar AC-645 Long-Duration Foam will be mobilized to the site before any ground-intrusive or dust-generating activities are initiated and will be maintained on-site in sufficient supply throughout the project. The following construction techniques and site management practices will also be used during the project to control odor, vapor, and dust emissions:

- Applying a water spray to control dust.
- Covering excavation faces, material stockpiles, and clean fill materials using polyethylene sheeting (anchored appropriately to resist wind forces) before extended work breaks and at the end of each work day.
- Excavating, backfilling, loading, handling, and unloading excavated material and clean fill material in a manner that minimizes the generation of airborne dust.
- Hauling excavated material and clean fill material in properly covered vehicles.
- Restricting vehicle speeds on temporary access roads and active haul routes.
- Covering shallow excavations and stockpiles of clean fill material with polyethylene liners (anchored appropriately to resist wind forces) before extended work breaks and at the end of each work day.
- Minimizing the areas of bare soil exposed at one time and complying with other applicable erosion and sediment control requirements of Specification Section 01 57 05 (Temporary Controls).
- Complying with cleaning and dust control requirements of Specification Section 01 74 05 (Cleaning).

As required by Specification Section 01 57 05 (Temporary Controls), odor, vapor, and dust controls will be proactively employed during the work to: (1) prevent exceedances of the total VOC and PM_{10} action levels specified in Specification Section 01 35 49 (Community Air Monitoring Plan) and in Section 3.2 of this CAMP; and (2) mitigate MGP-related odor emissions to the extent practicable and to the satisfaction of National Grid, the Remediation Engineer, NYSDEC, and the New York State Department of Health (NYSDOH).

A portion of the remediation will be performed within 20 feet of an existing structure (Fleet Building). Accordingly, special requirements will include an additional dedicated CAMP monitoring station located adjacent to the Fleet Building (centered between Garage Bays 6 and 7, which is midway between the eastern and western ISS limits) during construction activities. Monitoring air within the Fleet Building is not proposed, due to the use of potential VOC containing products, oil, and/or gasoline/diesel for routine vehicle maintenance and repair.

3 Real-Time Air Monitoring for Total VOCs and PM_{10}

The community air monitoring program is intended to be a discrete program that will be operated in conjunction with the Exclusion Zone (i.e., work zone) air monitoring. The Contractor will be responsible for conducting work zone air monitoring. The third-party subcontractor will conduct real-time community air monitoring throughout the remedial construction.

Real-time air monitoring for total VOCs and PM_{10} will be performed at one upwind and two downwind locations at or beyond the perimeter of the work area during all ground-intrusive or dust-generating construction activities. An additional air monitoring location will be deployed between the work area and Fleet Building (between Garage Bays 6 and 7) throughout the remediation project, regardless of wind direction. For the purpose of this CAMP, the "perimeter of the work area" is defined as the limits of the area where ground-intrusive or dust-generating work is being performed. If the wind direction is from the north or northeast, one of the downwind community air monitoring stations will be located approximately 20 feet off the northeast corner of Building 2 (within the area where parking/driving is currently restricted).

Community air monitoring will be conducted prior to initiating the remedial action to establish adequate baseline data and until such time that intrusive and/or potential dust generating activities are complete. The frequency of community air monitoring will be relative to the level of site work activities being conducted, and may be adjusted as the work proceeds and in consideration of the monitoring results. Air monitoring for VOCs or PM_{10} may be discontinued during periods of heavy precipitation that would otherwise result in unreliable data or damage to the monitoring equipment. Meteorological monitoring will be performed continuously during work activities.

Additionally, each air monitoring station and the meteorological station will be equipped with a telemetry package to allow for real-time management of community air monitoring data by office-based personnel (i.e., National Grid and the Remediation Engineer) in accordance with Specification Section 01 35 49, CAMP. Additional information regarding the monitoring locations, equipment, and action levels is presented below.

3.1 Perimeter Air Monitoring System

As described in Specification Section 01 35 49 (CAMP), real-time air monitoring for total VOCs and PM_{10} will be performed using a perimeter air monitoring system generally consisting of four portable air monitoring stations and a portable weather station. Each of these components is described in further detail below.

3.1.1 Air Monitoring Stations

Each air monitoring station will contain: (1) a portable, data-logging photoionization detector (MiniRAE 3000 by RAE Systems, Inc. or equal) for monitoring the airborne concentration of total VOCs; and (2) a portable, data-logging aerosol photometer (DustTrak II Aerosol Monitor Model 8530 by TSI, Inc. or equal) for monitoring the airborne concentration of PM_{10}. The monitoring equipment will be housed in portable, weather-tight enclosures, which will be mounted on surveying tripods at a height of approximately 4.5 to 5.5 feet (breathing zone height). All average concentrations (calculated for continuous 15-minute increments [e.g., 08:00 to 08:15, 08:15 to 08:30]) and any instantaneous readings taken to assess appropriate course of action will be recorded using an electronic data logger and/or in the field logbook and summarized in weekly CAMP reports to National Grid, the Remediation Engineer, NYSDEC, and NYSDOH.

Air monitoring stations will be deployed at the start of each work day before any ground-intrusive or dust-generating activities are initiated. One upwind and two downwind monitoring locations will be selected based on the prevailing wind direction and the nature and location of the activities anticipated to be performed that day. In addition, one air monitoring station will be deployed between the work area and Fleet Building (between Garage Bays 6 and 7) throughout the remediation project, regardless of wind direction. If the wind direction is from the north or northeast, one of the downwind community air monitoring stations will be located approximately 20 feet off the northeast corner of Building 2 (within the area where parking/driving is currently restricted).

The monitoring stations will be designated as follows: “UPW” for the upwind station; “DNW1” and “DNW2” for the two downwind stations; and “FLT” for the dedicated station adjacent to the Fleet Building. Example air monitoring station location layouts are shown on Figures 1 through 4 for winds from the four cardinal directions. Based on historic weather data and wind roses for the Albany Airport, the predominant wind direction in the Albany area is from the south (https://www.wcc.nrcs.usda.gov/ftpref/downloads/climate/windrose/new_york/albany/). Wind direction will be monitored throughout the day, and stations will be re-located or re-assigned, as appropriate. If wind direction shifts radically during the workday and for an extended period of time such that the upwind location and downwind locations no longer fall within acceptable guidelines (+/- 60° compass change from the original wind direction), the monitoring stations will be relocated so that the upwind and downwind locations are maintained. Any such changes in monitoring locations will be documented.

Monitoring equipment will be calibrated on a daily basis or more frequently if recommended by the manufacturers. Hourly or more frequent field checks of the monitoring equipment will also be performed during the work day to verify proper function. Damaged or malfunctioning equipment will be promptly removed from service and replaced. The date, time, and outcome of each equipment calibration and field check will be documented in a field log book.

Total VOC and PM_{10} data will be downloaded from the air monitoring stations at the end of each work day. Data files will be stored onsite in a computer database, indexed by date, station number, and station location (upwind or downwind), and will be backed-up periodically to disc or a portable hard drive.

3.1.2 Weather Station

A portable weather station (Wireless Vantage Pro2 by Davis Instruments Corporation, Inc. or equal) will be used to monitor local meteorological conditions during the project. The weather station will be installed in a prominent location at the site to provide representative meteorological data, including wind speed, wind direction, relative humidity, and ambient temperature. The meteorological monitoring system will be equipped with electronic data-logging capabilities. The meteorological monitoring system will be deployed at a location in accordance with siting criteria established by the NYSDEC for meteorological monitoring systems *(Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV - Meteorological Measurements*, as revised August 1989; and New York State Air Guide-19 – “Oversight of Private Air Monitoring Networks,” dated June 1989). Use of these guidelines enables the meteorological monitoring system to provide representative observations of the local meteorological conditions. Security and accessibility will also be considered in selecting a location for the weather station.

3.2 Air Monitoring Action Levels

The total VOC and PM_{10} action levels for the community air monitoring program are time-weighted average (TWA) concentrations, as calculated over a 15-minute period, and represent the difference between the ambient air TWA concentrations measured at the upwind and downwind monitoring stations. As described below, these action levels, if exceeded, trigger requirements for increased monitoring, corrective actions to abate emissions, and/or temporary work stoppages. Monitoring equipment will be programmed to immediately notify site personnel (via audible/visible alarms and wireless telemetry) if the total VOC or PM_{10} action level is exceeded during the project.

3.2.1 Action Levels for Total VOCs

If the ambient air concentration of total VOCs at the dedicated Fleet Building station or downwind station off the northeast corner of Building 2 exceeds 1 part per million (ppm) above the background (upwind) concentration for the 15-minute average, then work will cease, and corrective actions will be promptly taken to limit VOC vapors. Work will resume provided that VOC concentrations at these stations are less than 1 ppm above background.

If the ambient air concentration of total VOCs at the other downwind monitoring stations (i.e., downwind perimeter of the work area) exceeds 5 ppm above the background (upwind) concentration for the 15-minute average, work activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above the background (upwind) concentration, work activities will resume with continued monitoring.

If the ambient air concentration of total VOCs at the downwind perimeter of the work area persists at levels in excess of 5 ppm but less than 25 ppm above the background (upwind) concentration: (1) work activities will be halted; (2) the source of the elevated total VOC concentration will be identified; (3) corrective actions will be implemented to reduce or abate the emissions; and (4) air monitoring will be continued. Once these activities have been implemented, work activities will resume provided the following two conditions are met:

- The 15-minute average total VOC concentrations remain below 5 ppm above background.
- The total VOC concentration at the dedicated Fleet Building station or downwind station off the northeast corner of Building 2 is below 1 ppm over the background (upwind) concentration for the 15-minute average.

If the ambient air concentration of total VOCs at the downwind perimeter of the work area air monitoring station exceeds 25 ppm above the background (upwind) concentration, work activities will stop and corrective actions will be implemented to reduce or abate the emissions. Work will not resume until authorized by National Grid, the Remediation Engineer, or NYSDEC.

3.2.2 Action Levels for PM_{10}

If the average ambient air concentration of PM_{10} at the dedicated Fleet Building station or either of the downwind perimeter locations exceeds 100 micrograms per cubic meter ($\mu g/m^3$) above the upwind concentration for the 15-minute average, or if airborne dust is observed leaving the work area, then dust control measures will be implemented. Work may continue while dust controls are employed provided that the Fleet Building PM_{10} concentration or downwind PM_{10} concentration does not exceed 150 $\mu g/m^3$ above the upwind concentration for the 15-minute average.

If, after employing dust controls, the Fleet Building PM_{10} concentration or downwind PM_{10} concentration is greater than 150 µg/m^3 above upwind concentration for the 15-minute average, work will be stopped while activities are re-evaluated. Work will resume provided that the dust controls are successful in: (1) reducing the Fleet Building PM_{10} concentration or downwind PM_{10} concentration to less than 150 µg/m^3 above the upwind concentration for the 15-minute average; and (2) preventing visible dust from leaving the work area.

3.3 Notification and Exceedance Report

National Grid or a designated representative will notify the NYSDEC project manager (by telephone or e-mail) within two hours if the total VOC or PM_{10} action level is exceeded during the project. Within 24 hours after the exceedance, the Remediation Engineer will submit an exceedance report to the NYSDEC, NYSDOH, and National Grid project managers. As described in Specification Section 01 35 49 (CAMP), each exceedance report will include, at a minimum, the following:

- Date, day of the week, and time of exceedance.
- General location and brief description of work being performed at time of exceedance.
- Weather conditions at time of exceedance.
- For each air monitoring station, 15-minute time weighted average concentration of total VOCs and PM_{10} at time of exceedance.
- Source or cause of exceedance.
- Corrective actions taken or to be taken in response to exceedance.
- Date and time verbal or written notification was provided to NYSDEC.

A copy of the exceedance report will also be included in the weekly air monitoring report, which is more fully described in Section 5 of this CAMP.

4 Periodic Monitoring for MGP-Related Odors

During work hours, hourly or more frequent walks around the perimeter of the work area will be performed to monitor for the presence of MGP-related odors. Odor monitoring will be performed by the third-party air monitoring technician, who will not be involved in the day-to-day construction activities within the work area where such personnel may become acclimated to MGP-related odors. Perimeter checks will be performed more frequently, as necessary, depending on: (1) the nature and location of work being performed; and (2) local meteorological conditions.

Meteorological conditions, including temperature, humidity, precipitation, atmospheric pressure, wind direction, and wind speed, can work synergistically with a positive or negative impact on the generation and dissemination of MGP-related odors. For example, MGP-related odors generally tend to be less prevalent with lower temperatures, precipitation, or high humidity. MGP-related odor dissemination is greatly influenced by wind direction and wind speed.

4.1 MGP-Related Odor Response

If MGP-related odors are noticed at the perimeter of the work area, work will continue and odor, vapor, and dust controls will be employed to abate emissions. Additionally, construction techniques will be evaluated and modified, if necessary and appropriate, and more frequent checks of the perimeter of the work area will be performed. If MGP-related odors persist at the perimeter of the work area, work will be stopped while activities are re-evaluated. The source or cause of the MGP-related odors will be identified, and additional odor, vapor, and dust controls will be employed. Work will resume provided that the controls are successful in abating odors at the perimeter of the work area.

Any odor complaints received from the public or National Grid personnel at the service center (i.e., people not involved in the remediation, such as workers in the Fleet Garage or in Building 2) will be directed to the third-party air monitoring technician and NYSDEC's on-site representative. The legitimacy of the complaint will be verified based on the work activities being performed, the prevailing wind direction, and other meteorological factors. In response to a verified odor complaint, perimeter monitoring will continue and additional odor, vapor, and dust controls will be employed to abate odor emissions. Construction techniques will also be evaluated and modified, if necessary and appropriate.

4.2 Daily Odor Monitoring Log

The time and outcome of each perimeter check will be documented in a daily odor monitoring log, specifically noting the presence or absence of MGP-related odors and identifying the general location(s) along the perimeter of the work area where MGP-related odors (if any) are noticed. The time and outcome of any odor complaints from the public will also be documented in the daily odor monitoring log.

Copies of the daily odor monitoring logs will be included in the weekly air monitoring report, which is described in Section 5 of this CAMP.

5 Reporting

Air monitoring reports will be prepared on a weekly basis to summarize the total VOC, PM_{10}, and MGP-related odor monitoring results. Each weekly report will include, at a minimum, the following information for each day that monitoring is performed:

- Date and day of the week.
- General location and brief description of work performed at the site.
- Graphs showing concentrations of VOCs and PM_{10} for each air monitoring station.
- Daily maximum 15-minute TWA concentration of total VOCs and PM_{10} for each air monitoring station.
- Exceedances (if any) of total VOC and PM_{10} action levels, including copy of exceedance report(s).
- Site plan showing approximate locations of upwind and downwind air monitoring stations at the site and prevailing wind direction for the day.
- Copy of the daily odor monitoring log.

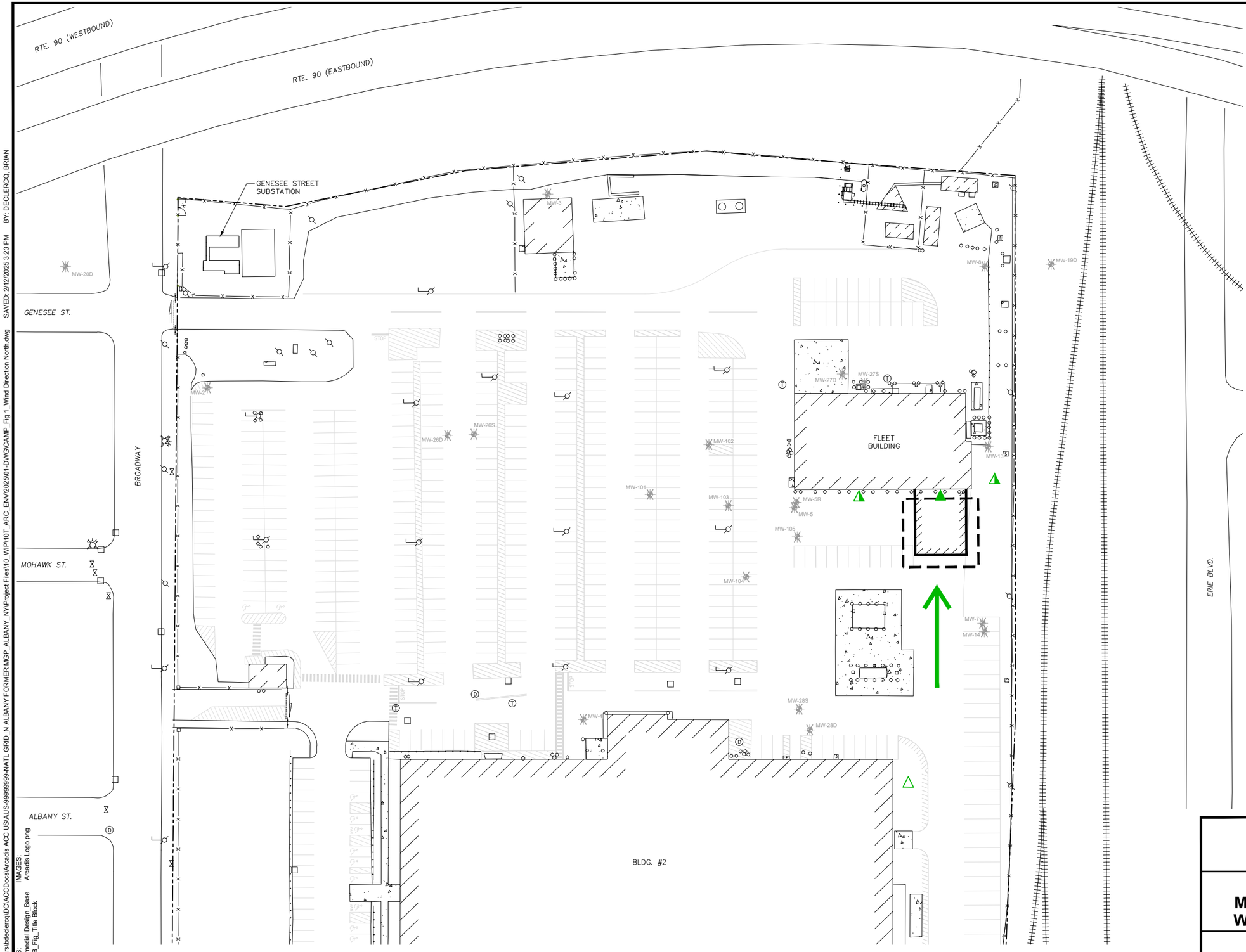
Air monitoring reports will be submitted on a weekly basis to National Grid, the Remediation Engineer, NYSDEC, and NYSDOH throughout the project.

6 References

NYSDEC. 1989. New York State Air Guide-19 – Oversight of Private Air Monitoring Networks. June 1989.

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

Figures



LEGEND:

- APPROXIMATE PROPERTY LINE
- BUILDING
- CONCRETE PAD
- FENCE
- GUARD RAIL
- RAILROAD
- UTILITY POLE
- UTILITY POLE WITH LIGHT
- TELEPHONE MANHOLE
- HYDRANT
- DRAINAGE MANHOLE
- CATCH BASIN
- MISCELLANEOUS UTILITY
- BOLLARD
- MW-17S MONITORING WELL
- MW-101 DESTROYED MONITORING WELL
- PROPOSED FLEET BUILDING ADDITION
- PROPOSED FLEET BUILDING ADDITION ISS AREA
- UPWIND AIR MONITORING STATION
- DOWNWIND AIR MONITORING STATION
- SUPPLEMENTAL (NEAREST OCCUPIED BUILDING) AIR MONITORING STATION
- WIND DIRECTION

0 80' 160'

GRAPHIC SCALE

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
ALBANY, NEW YORK

EXAMPLE COMMUNITY AIR MONITORING STATIONS LAYOUT - WIND DIRECTION TOWARD NORTH

ARCADIS

FIGURE 1

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N_ALB_Fig_Title Block

IMAGES:
Arcadis Logo.png

RTE. 90 (WESTBOUND)

RTE. 90 (EASTBOUND)

GENESEE STREET SUBSTATION

GENESEE ST.

BROADWAY

MOHAWK ST.

ALBANY ST.

ERIE BLVD.

STOP

FLEET BUILDING

BLDG. #2

MW-20D
MW-2
MW-3
MW-26D
MW-26S
MW-27D
MW-27S
MW-8
MW-19D
MW-13
MW-102
MW-101
MW-103
MW-5R
MW-5
MW-105
MW-104
MW-7
MW-14
MW-28S
MW-28D
MW-4

TRUE NORTH

PLANT NORTH

LEGEND:

- APPROXIMATE PROPERTY LINE
- BUILDING
- CONCRETE PAD
- FENCE
- GUARD RAIL
- RAILROAD
- UTILITY POLE
- UTILITY POLE WITH LIGHT
- TELEPHONE MANHOLE
- HYDRANT
- DRAINAGE MANHOLE
- CATCH BASIN
- MISCELLANEOUS UTILITY
- BOLLARD
- MW-17S MONITORING WELL
- MW-101 DESTROYED MONITORING WELL
- PROPOSED FLEET BUILDING ADDITION
- PROPOSED FLEET BUILDING ADDITION ISS AREA
- UPWIND AIR MONITORING STATION
- DOWNWIND AIR MONITORING STATION
- SUPPLEMENTAL (NEAREST OCCUPIED BUILDING) AIR MONITORING STATION
- WIND DIRECTION

0 80' 160'

GRAPHIC SCALE

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
ALBANY, NEW YORK

EXAMPLE COMMUNITY AIR MONITORING STATIONS LAYOUT - WIND DIRECTION TOWARD SOUTH

ARCADIS

FIGURE 2

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RTE. 90 (WESTBOUND)

RTE. 90 (EASTBOUND)

GENESEE STREET SUBSTATION

GENESEE ST.

BROADWAY

MOHAWK ST.

ALBANY ST.

ERIE BLVD.

STOP

FLEET BUILDING

BLDG. #2

MW-20D
MW-3
MW-8
MW-19D
MW-2
MW-26D
MW-26S
MW-27D
MW-27S
MW-102
MW-13
MW-101
MW-103
MW-5R
MW-5
MW-105
MW-104
MW-7
MW-14
MW-28S
MW-28D
MW-4

TRUE NORTH

PLANT NORTH

LEGEND:

- APPROXIMATE PROPERTY LINE
- BUILDING
- CONCRETE PAD
- FENCE
- GUARD RAIL
- RAILROAD
- UTILITY POLE
- UTILITY POLE WITH LIGHT
- TELEPHONE MANHOLE
- HYDRANT
- DRAINAGE MANHOLE
- CATCH BASIN
- MISCELLANEOUS UTILITY
- BOLLARD
- MW-17S — MONITORING WELL
- MW-101 — DESTROYED MONITORING WELL
- PROPOSED FLEET BUILDING ADDITION
- PROPOSED FLEET BUILDING ADDITION ISS AREA
- UPWIND AIR MONITORING STATION
- DOWNWIND AIR MONITORING STATION
- SUPPLEMENTAL (NEAREST OCCUPIED BUILDING) AIR MONITORING STATION
- WIND DIRECTION

0 80' 160'

GRAPHIC SCALE

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
ALBANY, NEW YORK

EXAMPLE COMMUNITY AIR MONITORING STATIONS LAYOUT - WIND DIRECTION TOWARD EAST

ARCADIS

FIGURE 3

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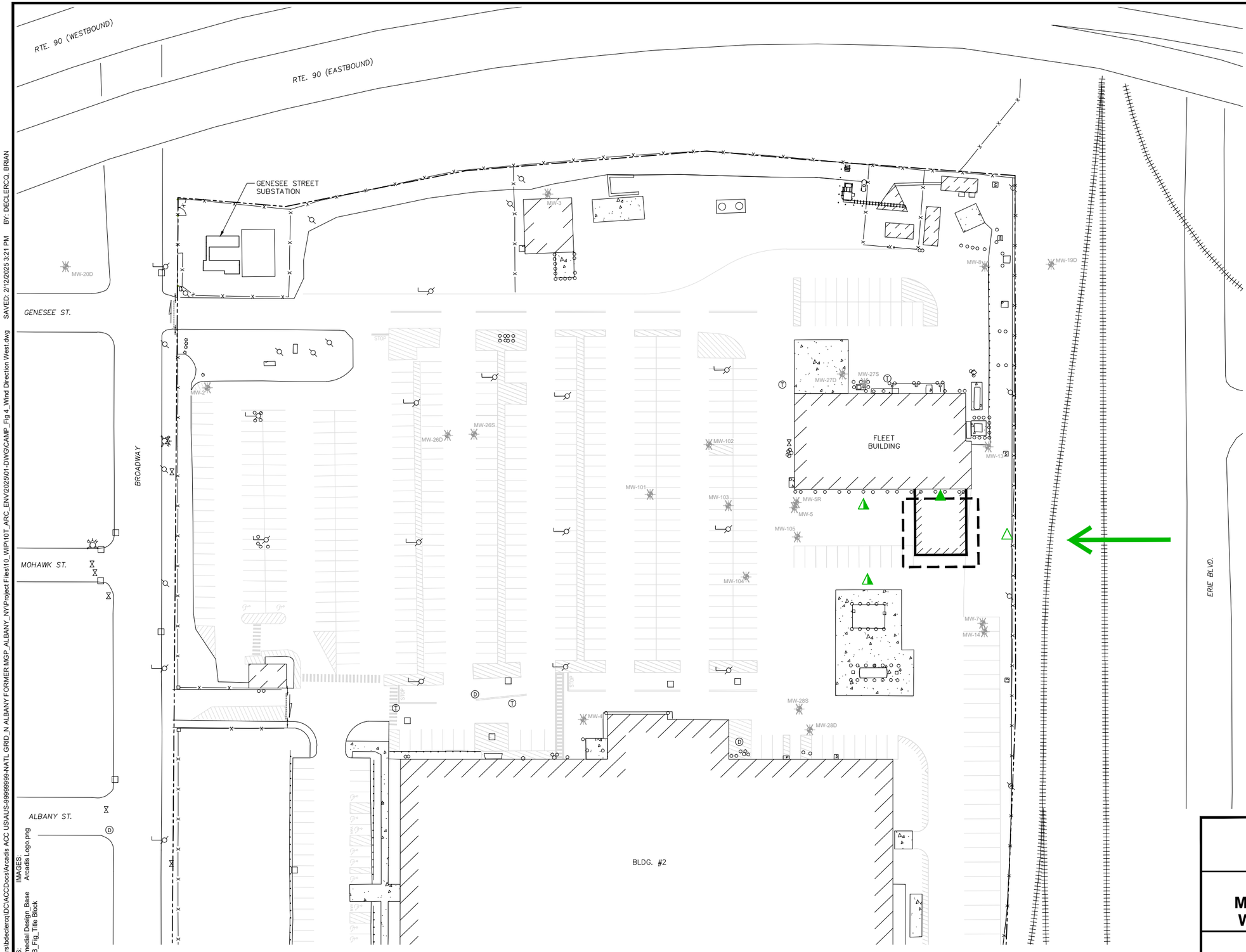

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IMAGES:
Arcadis Logo.png

NATIONAL GRID
NORTH ALBANY FORMER MGP SITE
ALBANY, NEW YORK

EXAMPLE COMMUNITY AIR MONITORING STATIONS LAYOUT - WIND DIRECTION TOWARD WEST

ARCADIS

FIGURE
4

Exhibits

Exhibit 1

New York State Department of Health Generic Community Air Monitoring Plan (Appendix 1A of DER-10)

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 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

Exhibit 2

Fugitive Dust Suppression and Particulate Monitoring (Appendix 1B of DER-10)

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.

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One Lincoln Center, 110 West Fayette Street, Suite 300
Syracuse, NY 13202
United States
Phone: 315 446 9120
Fax: 315 449 0017
www.arcadis.com

Appendix C

Health and Safety Plan

Site Specific Health and Safety Plan

Template Revision: 21

Project Name:	North Albany Service Center
Project Number:	30003953.00011
Client Name:	National Grid
Date:	12/6/2024
HASP Expires	12/6/2025
Revision:	2/20/2025

Approvals:

HASP Developer: Matthew Hysell

Project Manager: John Brussel

HASP Reviewer: Elizabeth Hover

HASP Reviewer Name Typed

HASP Reviewer Signature (handwritten or digital signature)

Arcadis Culture of Caring

Arcadis is committed to a Culture of Caring that ensures each Arcadis employee, part time as needed employee (PTAN), temporary agency employee under Arcadis day to day control, Inexperienced Workers and contractor (cumulatively referred to here as "field staff") goes home at the end of the day free from injury or illness. I certify that the following has been performed with all Arcadis field staff on this project either in person or virtually through Teams:

☐ Reviewed the HASP including a discussion of hazard identification and controls.

- ☐ If conducting activities deemed by Arcadis to be "High Risk", frontline management has reviewed applicable H&S standards (Job Safety Analysis [JSA] when authorized by H&S) for these activities with field staff.
- ☐ If permit to work is required, frontline management has reviewed the permit(s) with field staff.

☐ Reviewed proactive H&S engagement expectations/injury prevention actions.
☐ Reviewed Stop Work Authority.
☐ Reviewed the incident reporting process and expectations including when WorkCare should be contacted by staff (WorkCare incident intervention for all minor, non-emergency injuries) and that the WorkCare phone number is programmed into field team cell phone.
☐ For Inexperienced Workers, a mentor has been assigned for the new task being performed.

For short service employees (SSEs), PTANS* and temporary agency employees* :

☐ Provided coaching and mentoring on Arcadis H&S expectations during project work. Reviewed in detail specific hazards and controls and provided a resource who can be contacted if individual has questions regarding planned or unplanned work tasks.

Mentor/Resource # _____ (Name) _____ (Phone Number)

Signed:

_____ Select

* Upon hiring/contracting for the first time.

Emergency Information

Site Address: 1125 Broadway,
Menands, NY 12204

Emergency Phone Numbers:

Emergency (fire, police, ambulance)		911
Emergency (facility specific, if applicable):		
Emergency Other (specify):	Local Police	518-462-8013
	Mohawk Ambulance	518-434-4151
	Local Fire Department	518-447-7879
Primary Client Contact:	Gerald Cummins	315-428-6073
WorkCare (non-life-threatening injury/illness):		1-888-449-7787
Project H&S:	Matt Hysell	315-671-9189
Task Manager:	Matt Hysell	315-671-9189
Project Manager:	John Brussel	315-671-9441
H&S Specialist:	Alec MacAdam	720-454-0948
Area H&S Director:	Aaron Svitana	925-360-2313

Hospital Name and Address: Albany Memorial Hospital
600 Northern Boulevard
Albany, NY 12204

Hospital Phone Number:	518-471-3221
Emergency:	518-471-3111

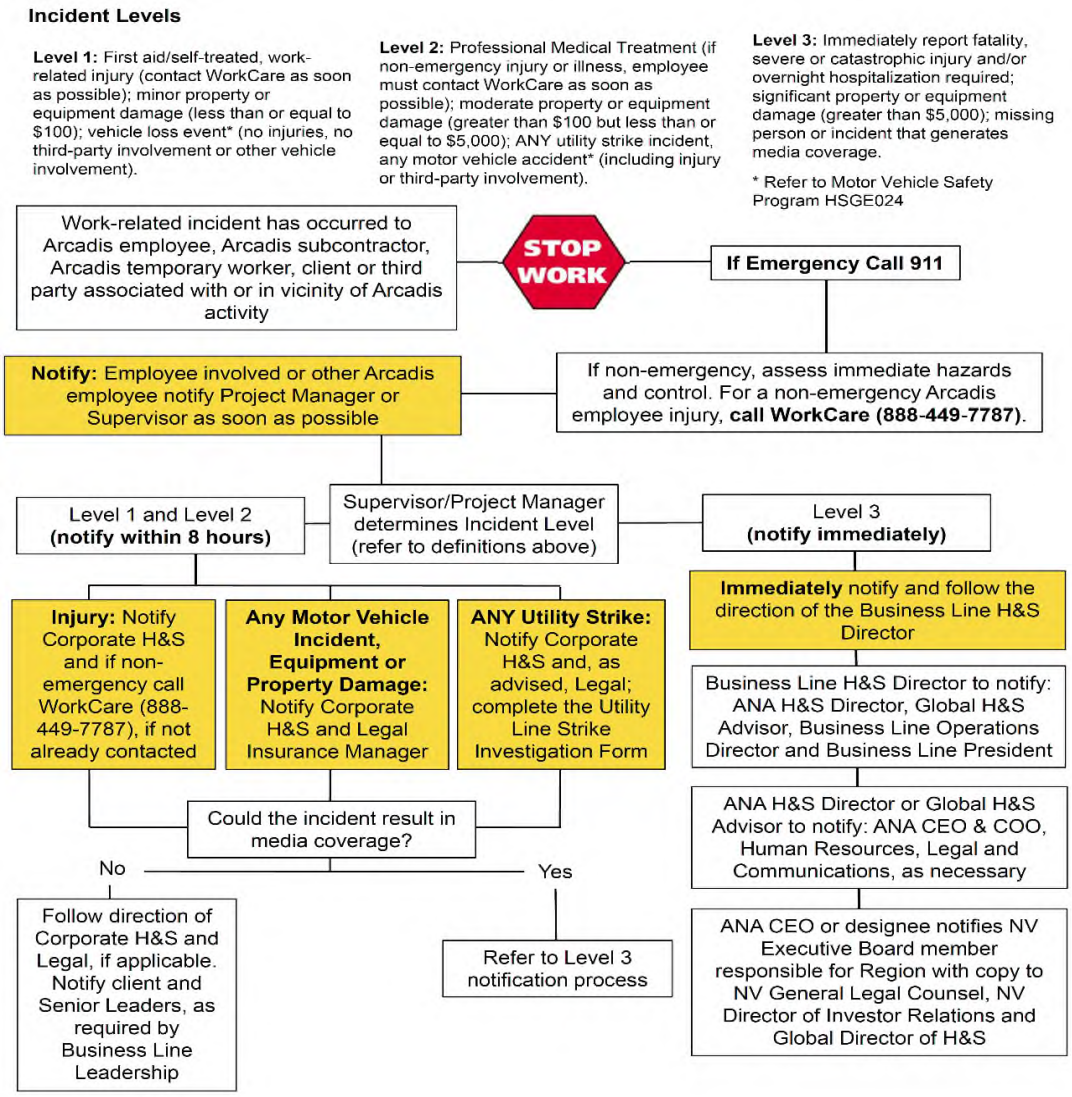
Supplemental Client Contact Information:

Garry Cummins (National Grid SIR Project Mgr)	315-440-5825
Randy Hastings (National Grid Property Services Senior Supervisor	518-937-5884
Derek Lobban (National Grid Fleet Supervisor)	518-416-8635
Mathew Root (National Grid Sr. Project Engineer)	518-227-7508
Matt Bunal (NAAE Architectural Engineer)	315-617-2879

Other Important Phone Numbers:

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

Incident Reporting Protocol Within Arcadis



Client Incident Reporting Protocol

Step 1: Dial 911 (if necessary) and/or Work Care 800-455-6155
Step 2: Contact PIC/PM/TM
Step 3: Contact H&S
Step 4: Contact Client

Route to the Hospital

1125 Broadway
Menands, NY 12204

1. Head north toward Broadway — 387 ft
2. Turn left onto Broadway — 0.3 mi
3. Sharp right onto Loudonville Rd — 0.5 mi
4. Continue onto Shaker Rd — 0.1 mi

Albany Mem Campus
600 Northern Blvd, Albany, NY 12204

Site Map Showing Assembly Areas

Site Type

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

Utility	
Parking Lot/Private Drive (NON ROW)	
Railroad	
Commercial	
Roadway (public, including ROW)	

For class I railroads, work within 25 ft of the rails is prohibited unless FRA On-Track Safety and railroad specific trained. For other railroads (i.e. short line railroads), the project or task manager will specify any special training needs. For all rail related work, field staff will have access to the Arcadis Railroad Safety Handbook and/or client rail safety handbook.Work in parking lots will require preparation of a Non-ROW Traffic Safety Plan. Work on roadways or in the right of way will require a ROW Traffic Safety Plan.

Surrounding Land Use and Topography

The North Albany Service Center serves as the primary maintenance, supply, storage, and office support facility for National Grid's (formerly Niagara Mohawk) eastern New York operating division. The North Albany Service Center is located on an approximately 25-acre parcel and is bordered by interstate 90 to the north, Bridge Street to the south, a CP Rail Systems, Inc. (CP Rail) railroad right-of-way to the east, and Broadway to the west. The Eric Canal was formerly located to the east of the railroad right-of-way that borders the site. The section of the canal east of the site was abandoned during the 1920s and was filled during the late 1920s/early 1930s.

Simultaneous Operations (SimOps)

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

Site Background

MGP operations were conducted at the property from the 1870s until the 1940s. MGP operations were primarily conducted in the portion of the property located north of the main service center building (Building 2). Electric/gas utility support services, which began in connection with MGP operation, continue to the present. The southern portion of the property was historically used for ice storage and distribution, lumber planning and milling, and petroleum distribution operations. During the period of industrial use, the property has been bordered to the west by Broadway and to the east by the railroad right-of-way. Historical site usage to the north and south of the current property includes transportation facilities (railway and streetcar), lumber planning and milling, chemical manufacturing, and rendering.

Previous site investigation activities have identified the presence of MGP-related materials (including oils, coal tar, tar-saturated wood chips, purifier waste, light non-aqueous phase liquid and dense nonaqueous phase liquid) and elevated concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganic constituents in soil and groundwater. Benzene, ethylbenzene, toluene, and xylenes (BTEX) are the primary VOCs of concern, and polynuclear aromatic hydrocarbons are the primary SVOCs of concern. Polychlorinated biphenyls have also been detected in surface and shallow subsurface soil samples collected from the yard storage area in the southern portion of the service center (south of Building 2).

Project Tasks

The following tasks are identified for this project:

1	Construction - Construction contractor oversight
2	Decontamination - Arcadis oversight of contractors performing decontamination
3	Drilling - Contractor oversight
4	Monitoring - Air monitoring using hand held or stationary equipment - non-radiation
5	Waste- Arcadis oversight of contractors performing IDW containment, segregation and/or sampling
6	Sampling - Well sampling using peristaltic pumps
7	Sampling - Free product - all media and all manual methods
8	Sampling - Soil sampling using mechanical methods
9	Sampling - Soil sampling using shovel, spade, spoon or trowel
10	Drilling - Using mechanical methods
11	Select
12	Select
13	Select
14	Select
15	Select
16	Select
17	Select
18	Select
19	Select
20	Select

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

[X] Required Checklists/Work Forms

Tailgate Safety Briefing Form

Vehicle Inspection Checklist

[ ] Required Permits

Not Applicable

[ ] Required H&S Standards

Not applicable

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

SSEs (employees who are employed with Arcadis for less than 1 year or are Inexperienced Workers) have the potential to work on this project. If SSEs are utilized, the project team working in conjunction with the SSE's administrative supervisor will ensure requirements of ARC HSGE019 "Short Service Employees" are completed. SSE's will be identified on the project Tailgate Safety Meeting Form.

Roles and Responsibilities

	Name	Role	Short Service Employee
1	John Brussel	Project Manager (PM)	No
2	Matt Hysell	Associate Project Manager (APM)	No
3	Matt Hysell	Task Manager	No
4	To Be Decided	Field Technical Lead	No
5	To Be Decided	Site Safety Officer (SSO) (HAZWOPER)	No
6			
7			
8			
9			
10			

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

Training

All Arcadis employees are required to have the following training to be on site:	Selected Arcadis employees are required to have the following additional training:	Names or Numbers from above
Arcadis Basic H&S Training Suite(1)	DOT HazMat #1	4,5
Defensive Driving - Smith On-Line	None	
Hazwoper 40-Hour	None	
Hazwoper 8-Hour Annual Refresher	None	
None	None	
None	None	
None	None	
None	None	
None	None	
None	None	
None	None	
None	None	
None	None	
Client specific/Other:	None	
	None	

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

Protecting Our People: Our Health, Safety and Wellbeing Principles

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

General Task Hazard Assessment and Risk Control (HARC)

General:	Site-Wide

The 12 hazard category HARC ratings are not available in this General THA. The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet project needs.

Risk Assessment Matrix		Likelihood Ratings			
Consequences Ratings		A	B	C	D
People	Property	0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	3 Almost Certain to Happen
1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low
2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium
3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High

Hazard

Driving - On road - Injury or vehicle damage from motor vehicle accident or incident

Suggested FHSHB Ref:	3.4	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	HIGH	Smith System (on line)
Mitigated Risk:	MEDIUM	JSAs
Comments:	Use Smith System "5-Keys" when driving. See Driving JSA for details.	

Hazard

Driving - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.

Suggested FHSHB Ref:	3.4, 3.21	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	HIGH	Smith System (on line)
Mitigated Risk:	LOW	Driver awareness/use of stop work authority
Comments:	Use route planning. Keep eyes moving while driving. See Driving JSA.	

Hazard

Biological - skin/eye irritation or damage from poisonous plants

Suggested FHSHB Ref:	3.17.11	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	LOW	See HASP "Tick/Poisonous Plant Hazards" Section
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Use skin pre-treatment lotions when available.	

Hazard

Biological - bites or stings from exposure to insects or arachnids

Suggested FHSHB Ref:	3.17: 2,3,7,8,9,10	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	LOW	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Do body check daily. For ticks, see also HASP Tick/Poisonous Plant section.	

Hazard

Biological - cuts, scrapes, skin/eye puncture from exposure to physically damaging plants

Suggested FHSHB Ref:	3.17.11	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Job Briefing/Site Awareness
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:		

General Task HARC (continued)

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

Task Specific HARC

Task 1:	Construction - Construction contractor oversight

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 4

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

* *Hazard rating, if present, excludes General THA hazards in this category.*

Hazard #1

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref:	3.26.2	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Job Briefing/Site Awareness
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:	Keep a safe distance from raised machinery (e.g., excavator bucket). Wear hard hat onsite.	

Hazard #2

Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring,

Suggested FHSHB Ref:	3.25	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	LOW	Housekeeping
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Maintain awareness of electrical components.	

Hazard #3

Environmental - Utilities - Injury or property damage from utility strike/damage

Suggested FHSHB Ref:	3.36	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	HIGH	Specialized Checklist/Forms
Mitigated Risk:	MEDIUM	Field H&S Handbook (see ref. above)
Comments:	Various utilities onsite. Use the utility checklist included in this HASP and ensure that three line's of evidence for clearance have been identified. Contact dig safe. Review utility mapping. Soft dig, as needed. GPR/EM surveys strongly recommended.	

Hazard #4

Pressure - Hydraulic - Injury from hydraulic process or device failure

Suggested FHSHB Ref:	2.5, 4.5, 4.6	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	H&S Standards
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:	Inspect equipment each day before use. Ensure hydraulic lines are in good condition.	

Hazard #5

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	SDS (see also HASP Hazcom/GHS section)
Comments:	Air monitoring required during excavation and earth moving activities.	

Hazard #6

Chemical - liquids, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Hazcom Training
Comments:	Wear safety glasses during intrusive activities.	

Task Specific HARC (continued)

Task 2:	Decontamination - Arcadis oversight of contractors performing decontamination							
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):						FHSHB Ref:		3.10.4
Biological*	L	Chemical	M	Driving*	-	Electrical	-	
Environmental*	L	Gravity*	M	Mechanical	-	Motion*	M	
Personal Safety	L	Pressure	L	Radiation	-	Sound	M	

Hazard #1

Chemical - liquids, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Keep out of range of water spray. Avoid areas in direction of water spray. Wear safety glasses and chemical resistant gloves.	

Hazard #2

Gravity - Struck by - Injury from falling object

Suggested FHSHB Ref:	3.26.2	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Keep out of range of water spray. Avoid areas in direction of water spray. Where safety glasses during decontamination activities.	

Task Specific HARC (continued)

Task 3:	Drilling - Contractor oversight

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 4.5

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

Hazard #1

Chemical - solids/particulates, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Keep distance away from rig when drill is in use.	

Hazard #2

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	See HASP "Monitoring" section
Mitigated Risk:	LOW	SDS (see also HASP Hazcom/GHS section)
Comments:	Keep distance away from rig when drill is in use. Air monitoring is required.	

Hazard #3

Environmental - Utilities - Injury or property damage from utility strike/damage

Suggested FHSHB Ref:	3.36	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	HIGH	Specialized Checklist/Forms
Mitigated Risk:	MEDIUM	Field H&S Handbook (see ref. above)
Comments:	Various utilities onsite. Use the utility checklist included in this HASP and ensure that three line's of evidence for clearance have been identified. Contact dig safe. Review utility mapping. Soft dig, as needed. GPR/EM surveys strongly recommended.	

Hazard #4

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

Suggested FHSHB Ref:	3.27.4	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Machine Guarding
Mitigated Risk:	LOW	Field H&S Handbook (see ref. above)
Comments:	Have familiarity with drilling equipment. Know the location and operation of kill switch.	

Task Specific HARC (continued)

Task 4:	Monitoring - Air monitoring using hand held or stationary equipment - non-radiation

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 5.7

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

Hazard #1

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Specialized Equipment (specify in comments)
Comments:	Understand operation of MiniRAE PID and DustTrack particulate monitors.	

Hazard #2

Chemical - solids/particulates, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Wear chemical resistant gloves and safety glasses during intrusive activities.	

Hazard #3

Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring,

Suggested FHSHB Ref:	3.25	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Housekeeping
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Maintain and operate equipment as specified by the manufacturer.	

Task Specific HARC (continued)

Task 5:	Waste- Arcadis oversight of contractors performing IDW containment, segregation a							
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):						FHSHB Ref:		3.31
Biological*	L	Chemical	M	Driving*	-	Electrical	-	
Environmental*	L	Gravity*	L	Mechanical	L	Motion*	L	
Personal Safety	L	Pressure	M	Radiation	-	Sound	L	

Hazard #1

Chemical - liquids, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Where safety glasses and chemical resistant gloves.	

Hazard #2

Chemical - liquids - injury or illness from vapor inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Air monitoring required when accessing waste containers.	

Hazard #3

Chemical - solids/particulates, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Where safety glasses and chemical resistant gloves.	

Hazard #4

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Air monitoring required when accessing waste containers.	

Hazard #5

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

Suggested FHSHB Ref:	3.27.4	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Site Awareness
Comments:	Be careful when securing or loosening drum rings.	

Task Specific HARC (continued)

Task 6:	Sampling - Well sampling using peristaltic pumps							
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):						FHSHB Ref:	3.9	
Biological*	L	Chemical	M	Driving*	-	Electrical	L	
Environmental*	L	Gravity*	L	Mechanical	-	Motion*	L	
Personal Safety	L	Pressure	L	Radiation	-	Sound	L	

Hazard #1

Chemical - liquids, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	JSAs
Comments:	Where safety glasses and chemical resistant gloves.	

Hazard #2

Chemical - liquids - injury or illness from vapor inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	See HASP "Monitoring" section
Comments:	Record PID headspace readings when opening well, and keep PID on during sampling.	

Hazard #3

Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring,

Suggested FHSHB Ref:	3.25	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Housekeeping
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Maintain and operate equipment as specified by the manufacturer.	

Task Specific HARC (continued)

Task 7:	Sampling - Free product - all media and all manual methods

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

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

Hazard #1

Chemical- liquids - injury or illness from skin absorption

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Avoid splashing. Wear chemical resistant gloves and safety glasses.	

Hazard #2

Chemical- solids/particulates - injury or illness from skin absorption

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Wear chemical resistant gloves and safety glasses.	

Hazard #3

Chemical - liquids - injury or illness from vapor inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	See HASP "Monitoring" section
Comments:	Air monitoring required if free product is visible.	

Hazard #4

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	See HASP "Monitoring" section
Comments:	Air monitoring required when soil is exposed to surrounding air.	

Hazard #5

Chemical - solids/particulates, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Wear chemical resistant gloves and safety glasses.	

Hazard #6

Motion - Cuts and scrapes - Injury from moving object impacting skin or eye

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Site Awareness
Comments:	Wear work gloves under chemical resistant gloves.	

Task Specific HARC (continued)

Task 8:	Sampling - Soil sampling using mechanical methods

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

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

Hazard #1

Chemical - solids/particulates, skin or eye irritation/damage/allergy

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Wear chemical resistant gloves and safety glasses.	

Hazard #2

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	See HASP "Monitoring" section
Comments:	Air monitoring required when soil is exposed to surrounding air.	

Hazard #3

Motion - Cuts and scrapes - Injury from moving object impacting skin or eye

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Site Awareness
Comments:	Wear work gloves under chemical resistant gloves.	

Hazard #4

Electrical - Housekeeping - Injury or property damage due to frayed wiring, improperly mounted wiring,

Suggested FHSHB Ref:	3.25	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Housekeeping
Mitigated Risk:	LOW	Inspections
Comments:	Maintain and operate equipment as specified by the manufacturer.	

Task Specific HARC (continued)

Task 9:	Sampling - Soil sampling using shovel, spade, spoon or trowel

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 3.9

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

Hazard #1

Chemical- solids/particulates - injury or illness from skin absorption

Suggested FHSHB Ref:	3.9, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Wear chemical resistant gloves and safety glasses.	

Hazard #2

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	See HASP "Monitoring" section
Comments:	Air monitoring required when soil is exposed to surrounding air.	

Hazard #3

Motion - Cuts and scrapes - Injury from moving object impacting skin or eye

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	Wear work gloves under chemical resistant gloves.	

Task Specific HARC (continued)

Task 10:	Drilling - Using mechanical methods

HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low): FHSHB Ref: 4.5

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

Hazard #1

Motion - Struck by - Bodily injury from impact with moving object

Suggested FHSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	ROW TSP
Mitigated Risk:	LOW	Site Awareness
Comments:	Reference ROW TSP to set up traffic controls. Use a flagger. Use the buddy system when setting up traffic controls.	

Hazard #2

Sound - Noise - Injury or illness due to noise exposure

Suggested FHSHB Ref:	3.15	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Medical Surveillance
Comments:	Use ear protection during drilling operations. All onsite employees must be enrolled in medical surveillance.	

Hazard #3

Mechanical - Pinch point - Injury by pinching of body part in mechanical process

Suggested FHSHB Ref:	3.27.4	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)
Comments:	Stay at least 5 feet away from moving parts of the drill rig. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling.	

Hazard #4

Chemical - solids/particulates, injury or illness from inhalation

Suggested FHSHB Ref:	3.2, 3.22, 3.30, 3.33	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Job Briefing/Site Awareness
Comments:	If excessive dust is being generated, use water or other mitigation methods. Wear safety-glasses.	

Hazard #5

Environmental - Utilities - Injury or property damage from utility strike/damage

Suggested FHSHB Ref:	3.36	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	HIGH	Site Awareness
Mitigated Risk:	MEDIUM	H&S Standards
Comments:	Various utilities onsite. Use the utility checklist included in this HASP and ensure that three line's of evidence for clearance have been identified. Contact dig safe. Review utility mapping. Soft dig, as needed. GPR/EM surveys strongly recommended.	

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

	HAZCOM/GHS for this project is managed by the client or contractor
	Project will utilize <=3 Chemical(s)/Product(s) subject to HAZCOM/GHS

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

	Preservatives	Qty
	Not applicable	
X	Hydrochloric acid	<500 ml
	Nitric acid	<500 ml
X	Sulfuric acid	<500 ml
X	Sodium hydroxide	<500 ml
	Zinc acetate	<500 ml
X	Ascorbic acid	<500 ml
	Acetic acid	<500 ml
	Isopropyl alcohol	< 4 gal.
	Formalin (<10%)	< 4 gal.
	Methanol	<500 ml
	Sodium bisulfate	<500 ml

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

	Calibration	Qty.
	Not applicable	
X	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	Qty.
X	Not applicable	
	Gasoline	≤ 5 gal
	Diesel	≤ 5 gal
	Kerosene	≤ 5 gal
	Propane	1 cyl
	Other:	

	Kits	
X	Not applicable	
	Hach (specify):	1 kit
	DTECH (specify):	1 kit
	Other:	1 kit

	Remediation	Qty.
X	Not applicable	

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

	DOT(1):	Qty.
	MOT eligible soils	
	MOT eligible water	
	MOT eligible solids	
	MOT eligible liquids	

(1) Attach applicable Materials of Trade (MOT) Quick Form to shipping determination or this HASP. SDS not generally applicable to this category.

SDSs for this project are attached to this HASP.

Contractors on this project are anticipated to use materials subject to the HAZCOM Standard under OSHA (or state OSHA) regulations. Contractor SDSs are not required for this project.

This project will not be utilizing materials subject to the HAZCOM Standard in bulk storage. In this HASP, bulk storage means any material stored on the project site in a bulk packaging >119 gallons (> 450 L) liquid capacity or a palletized quantity of a material in packagings ≤119 gallons (≤450 L) liquid capacity.

Air Monitoring

	There are no atmospheric chemical, radiological, or particulate hazards on this project requiring air monitoring.
	Air monitoring is the responsibility of the client or subcontractor.
X	Air monitoring is required for the following tasks:

Construction - Construction contractor oversight
Drilling - Contractor oversight
Monitoring - Air monitoring using hand held or stationary equipment - non-radiation
Waste- Arcadis oversight of contractors performing IDW containment, segregation and/or sampling
Select

Constituents of Interest:

Time Weighted Averages (TWAs) are ACGIH 8 Hr Threshold Limit Values (TLVs) unless noted.

Benzene			
TWA	0.5 ppm, OSHA Reg. See Notes	LEL/UEL (%):	1.2/7.8
STEL	2.5 ppm	RGD (Air = 1):	NA
IDLH	500 ppm, NIOSH	VP (mmHg):	75
Ethylbenzene			
TWA	20 ppm	LEL/UEL (%):	0.8/6.7
STEL	125 ppm, NIOSH	RGD (Air = 1):	NA
IDLH	800 ppm, NIOSH	VP (mmHg):	7
Toluene			
TWA	20 ppm	LEL/UEL (%):	1.1/7.1
STEL	150 ppm, NIOSH	RGD (Air = 1):	NA
IDLH	500 ppm, NIOSH	VP (mmHg):	21
Xylenes			
TWA	20 ppm	LEL/UEL (%):	1.1/7.0
STEL	150 ppm, NIOSH	RGD (Air = 1):	NA
IDLH	900 ppm, NIOSH	VP (mmHg):	9
Naphthalene			
TWA	10 ppm, skin	LEL/UEL (%):	0.9/5.9
STEL	NA	RGD (Air = 1):	NA
IDLH	250 ppm, NIOSH	VP (mmHg):	0.08
Cyanide as CN		Anticipated Breathing Zone Concentration <=	3 mg/m3
TWA	5 mg/m3, skin, OSHA	LEL/UEL (%):	NA/NA
STEL	NA	RGD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA
None			
TWA	NA	LEL/UEL (%):	NA
STEL	NA	RGD (Air = 1):	NA
IDLH	NA	VP (mmHg):	NA

TWA - Time Weighted Average (ACGIH TLV unless noted)
STEL - Short Term Exposure Limit
IDLH - Immediately Dangerous to Life and Health

LEL/UEL - Lower/Upper Explosive Limit
RGD - Relative Gas Density
VP (mmHg) - Vapor Pressure (millimeters mercury)

Notes:
One or more constituents above is listed with a skin notation. Avoid conditions where dusts, mists, or aerosols are created. Avoid skin contact with impacted media.

As noted, one or more of the above constituents is an OSHA regulated substance. If exposure is expected to be above the TWA, contact a CIH or CSP for assistance unless otherwise permitted by a substance specific plan template identified in this section.

Required Monitoring Instruments, Action Levels and Monitoring Frequency

Photoionization Detector Select Lamp: 10.6 eV

Action levels are in PID units (1):			Computed action levels have been manually adjusted.
<	2.3		Continue working
	2.3	- 4.6	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	4.6		Stop work and contact SSO

(1) Computed action levels are for PIDs which have not been programmed to correct TLVs for specific constituents or mixtures.

Particulate/Aerosol monitoring is required.

Action levels are in mg/m3			Computed action levels have been manually adjusted.
<	1.500		Continue working
	1.5 - 3		Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	3.000		Stop work and contact SSO

Breathing zone air monitoring using the above instruments will be performed at the following frequency:
Continuously

The monitoring instrument(s) used must be capable of data logging if continuous monitoring is required. Staff using these instruments must be trained in data logging procedures for the actual instrument(s) used. Data logging results must be backed up daily.

Multigas (including LEL/O2 and Hg vapor) monitoring is not required.

Compound specific monitoring using indicator tubes, chips, or electrochemical sensors is not required.

Tick and Poisonous Plant Hazards

For all projects with outdoor work, biological hazards must be addressed in the tailgate safety meeting each day. The following controls must be used to mitigate biological hazards while working and must also be discussed in the tailgate safety meeting. For low risk situations, the discussion must include exposure to weeds/vegetation near fences, buildings, etc.

Controlling Tick Hazards

Risk Guide for Ticks:

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

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

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

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

Select required controls below:

Engineering Controls

- [ ] Mowing of work area
- [ ] Clearing overgrown vegetation
- [ ] Pesticide application
- [ ] Other: _____

Administrative Controls

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

Personal Protective Equipment

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

Heat stress signs/symptoms and controls to also be addressed in tailgate safety meeting if temperatures >80°F

Repellents

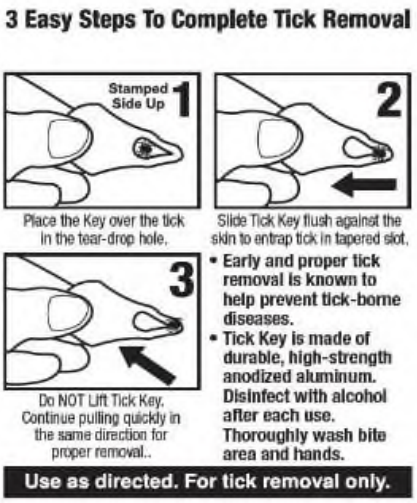
- [X] Repellents will not be used
- [ ] Permethrin impregnated clothing (purchased)
- [ ] Permethrin (0.5% self applied/treated to clothing)
- [ ] Deet 20-40% applied to skin
- [ ] Other: _____

If repellents are not used, additional PPE controls must be considered.

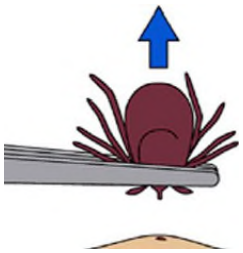
Tick Removal and First Aid

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

Using a Tick Removal Tool



Using Tweezers



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

Do not crush tick with fingers

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

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

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

Controlling Exposure to Poisonous Plants

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

Select required controls below:

Engineering Controls

- [ ] Not applicable
- [ ] Mowing of work area
- [ ] Clearing overgrown vegetation
- [ ] Herbicide application
- [ ] Other: _____

Administrative Controls

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

Personal Protective Equipment

- [ ] Gloves
- [ ] Hat/hardhat/head covering
- [ ] Pants tucked in boots
- [ ] Shirt tucked into pants
- [X] Long sleeved shirt and long pants
- [ ] White coveralls/Tyvek
- [ ] Taped cuffs/pant legs
- [ ] Dust mask (during burning activities, etc.)
- [ ] Other: _____

Heat stress signs/symptoms and controls to also be addressed in tailgate safety meeting if temperatures >80°F

Repellents

- [X] Repellents will not be used
- [ ] Barrier creams
- [ ] Other: _____

Skin Decontamination

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

Equipment Decontamination

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

Clothing Decontamination

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

First Aid

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

Identification Quick Guide

Ticks:

American Dog Tick

Blacklegged (Deer) Tick

Brown Dog Tick

Groundhog Tick

Gulf Coast Tick

Lone Star Tick

Rocky Mountain Wood Tick

Soft Tick

Poison Ivy:

Poison Oak:

Poison Sumac:

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

Personal Protective Equipment (PPE)

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

Minimum PPE required to be worn by all staff on project:						Specify Type:
X	Hard hat		Snake chaps/guards		Coveralls:	
X	Safety glasses		Briar chaps		Apron:	
	Safety goggles		Chainsaw chaps	X	Chem. resistant gloves:	Nitrile
	Face shield		Sturdy boot		Gloves other:	
X	Hearing protection	X	Steel or comp. toe boot		Chemical boot:	
	Rain suit		Metatarsal boot		Boot other:	
	Other:			X	Traffic vest, shirt or coat:	Class II
					Life vest:	

Task specific PPE:
Comments:

Medical Surveillance

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

Client and DOT mandated drug and alcohol testing is not required for this project and will not be performed.

Hazardous Materials Shipping and Transportation

A non-regulated shipping determination is attached to this HASP. There are currently no plans to sample hazardous soil/material on-Site. Shipping of this material is being entirely performed by the client and the client's waste handling subcontractor. Arcadis will not sample or ship this material without creating a new shipping determination. Known locations of hazardous waste are as follows:
WC-5 (9-15 ft bgs), WC-6 (11-16 ft bgs), WC-7 (7-16 ft bgs), WC-8 (8-16 ft bgs), WC-10 (11-21.6 ft bgs)

Traffic Safety and Traffic Safety Plans (TSPs)

All or portions of the project work will be conducted in a parking lot and/or private roadway. A Non-ROW TSP addressing this work is attached to this HASP.

Arcadis Commercial Motor Vehicles (CMVs)

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

Site Control

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

Decontamination

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

Sanitation

Restroom facilities and potable water will be provided by the client for this project. Unless alternate requirements are stipulated in a plan supplement (i.e. Heat Injury and Illness Prevention Plan), permit or JSA, temporary restroom facilities will be provided with one toilet for every 20 project workers and bottled or non-plumbed potable water will be provided to project workers at 1 gallon/worker/day.

Safety Briefings

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

Employee Health and Safety Engagement

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

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

Close Call reporting (via H&S app) goals for this project:
1 NM per event

Other (specify):

Safety Equipment and Supplies

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

X	First aid kit		Insect repellent:
	Bloodborne pathogens kit	X	Sunscreen
X	Fire extinguisher		Air horn
	Eyewash (ANSI compliant)	X	Traffic cones
X	Eyewash (bottle)		2-way radios
X	Drinking water		Heat stress monitor
	Other:	X	See Tick and Poisonous Plant Hazards section for additional equipment/supply information.

International Travel

International travel is not required for this project.

Spill Control and Containment

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

Use of Electronic Devices in Areas of Increased Safety Risk

Use of electronic devices (tablets, laptops, and/or cell phones) to collect data or document work is not anticipated on this project. If electronic devices are used, distraction hazards and use must be addressed and documented in the job briefing/safety briefing.

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

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

Attachment A
JSAs

Job Safety Analysis

General

JSA ID	HASP 1	**Status**	Complete
Job Name	General Industry-Driving - passenger vehicles	**Created Date**	12/6/2024
Task Description	Driving a car, van, or truck on public roadways.	**Completed Date**	12/06/2024

Client / Project

Client	National Grid
Project Number	30003953.00011
Project Name	North Albany Service Center
Project Manager	John Brussel

User Roles

Role	Employee	Due Date	Completed Date
Developer	Matthew Hysell	12/6/2024	12/6/2024
HASP Reviewer	Elizabeth Hover	12/6/2024	12/6/2024
Quality Reviewer			

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Pre-Trip Inspection	1	Failing to perform pre-trip inspections may cause mechanical failure, accident or injury.	Perform walk around of vehicle with particular attention to tire inflation and condition. Check lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP.	ARC HSGE024 Motor Vehicle Safety Standard (MVSP)
		2	Scrapes, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk, or tailgate.	Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.	
		3	Struck by other vehicles while walking around vehicle performing inspections.	Wear high visibility vest, shirt, or coat while performing inspections in parking lots or other areas with a traffic hazard. Remain vigilant of moving vehicles or equipment in area, face oncoming vehicles to extent practical.	
		4	Improperly secured cargo may dislodge creating injury, property damage, or road hazard.	Ensure all cargo is properly secured to prevent movement while the vehicle is in operation. This includes cargo in the cab of	
2	Driving a motor vehicle on public streets	1	Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind, and decreases decision making time.	Use Smith System Key #1, "Aim High in Steering". **Look ahead (15 seconds if possible) to observe traffic flow and traffic signals.** Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.	Smith System "5-Keys" is a registered trademark of Smith System Driver Improvement Institute, Inc.
		2	Failing to observe vehicles, pedestrians, bicyclists, and other relevant objects in vicinity of your vehicle increases risk of side swipes, rear ending, and third party injury.	Use Smith System Key #2, "Get the Big Picture". **Maintain 360 degrees of awareness around vehicle.** Check a mirror every 6-8 seconds, maintain space around the vehicle, choose a lane that avoids being boxed in. Look for pedestrian activity ahead in crosswalks or sidewalks. Watch for construction zone approach signs and act early by executing lane changes and reducing speed.	

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
2	Driving a motor vehicle on public streets	3	Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians, and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.	Use Smith System Key #3, "Keep Your Eyes Moving". **Move your eyes every 2 seconds and avoid staring while evaluating relevant objects.** Scan major and minor intersections prior to entering them. Check mirrors.	
		4	Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.	Use Smith System #4, "Leave Yourself an Out". **Use 4 second rule when following a vehicle.** Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.	
		5	Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.	Use Smith System Key #5, "Make Sure They See You". **Brake early and gradually when stopping to reduce potential of being rear ended.** Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.	
		6	Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.	**Cell phone use (any type or configuration) is prohibited while the vehicle is in motion.** Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Avoid consuming food or drink while driving.	
3	Parking	1	Parking vehicle in areas of clustered parked vehicles or near facility entrance may impair visibility to oncoming traffic in lot and increase exposure to pedestrian traffic.	**Use pull through parking or back into parking space when permitted or practical.** When practical and safe to do so, park away from other vehicles and avoid parking near the facility entrance or loading docks. If available, use a spotter to aid in backing activity. Back no further than necessary and back slowly. Get out and look (GOAL) if uncertain of immediate surroundings. Tap horn prior to backing.	

PPE Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses	While checking engine or tires	Required
Hand Protection	work gloves (specify type)	Leather or equivalent checking engine or	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	other	Vehicle kit (applies to company trucks)	Required
Miscellaneous	fire extinguisher	Applies to company trucks	Required
	first aid kit	Applies to company trucks	Required

Job Safety Analysis

General

JSA ID	16892	**Status**	(3) Completed
Job Name	Environment-Drilling, soil sampling, well installation	**Created Date**	4/19/2019
Task Description	Drilling and soil sampling	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

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. If work is conducted in a ROW, reference ROW Traffic Safety Plan and use a flagger for traffic.	FHSFB V (F) Traffic Safety Plan.
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
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.	FHSFB III (F,L) and IV (E)
		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.	
		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.	

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
4	Hollow stem auger drilling	1	All hazards in step 3 apply. Additionally, 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 Location H&S policy and procedure for guidance.	FHSFB III (F,L,S,AD) and IV (E)
		2	Hands or fingers can get caught and crushed if trying to clean by hand or with tools while the auger is still turning.	Auger should always be stopped and clutch disengaged prior to cleaning.	
5	Direct push drilling	1	The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts.	Keep a minimum of 5 feet away from drill rig operation and moving parts.	FHSFB III (F,L,S,AD)
		2	The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers.	Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next.	
		3	Some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property.	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	
		4	Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations.	It's preferable to let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If you cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	
		5	Soil cores may contain contaminated media.	Wear nitrile gloves and safety glasses for protection from contaminated media when logging soil borings.	
6	Sample collection and processing	1	Injuries can result from pinch points on sampling equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break.	Sample Cooler Handling JSA
		2	Lifting heavy coolers can cause back injuries.	Use two people to move heavy coolers. Use proper lifting techniques.	
7	Soil cutting 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 perform 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. FHSFB III (S,AJ)

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	ANSI A2 Cut Resistant Gloves	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

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
Personal	eye wash (specify type)	bottle	Required
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	traffic cones		Required
	signage		Required
	flag		

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hover, Elizabeth A HASP Reviewer Approve 4/22/2019	

Job Safety Analysis

General

JSA ID	16888	**Status**	(3) Completed
Job Name	Environment-Drum sampling/handling	**Created Date**	4/19/2019
Task Description	Drum Sampling	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Inspect Drums for signs of Bulging, Leaking, Crystals, Temperature, and Odor	1	Exposure to chemicals stored in drum or container.	Read drum labels for information about contents. Review all relevant MSDSs about chemical contents. If labels are not attached, call PM or Local H&S Representative.	None
		2	Contents of the drum can cause fire/explosion hazard.	Use air monitoring meters to screen drums. % LEL and VOCs (PPM). If either of the values are above the action levels described in the HASP or MSDS then Stop Work, move away from the area, and reassess the situation. Call PM and H&S staff for support.	
2	Remove lids or bungs from Drums	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	Wear appropriate work gloves. When removing ring from drum, fingers can get pinched between ring and drum. Keep fingers clear of this space. Select proper tool for task. If large amount of drums will be encountered, use a speed or drum wrench.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.
		2	Rapid depressurization from empty or partially full drums can cause flying parts or volatile COCs releasing on staff.	Do not handle or open bulging drums (contact Corp H&S for assistance). Bleed any built up pressure by carefully loosening bung prior to removing ring. Keep face and arms away from bung opening when loosening. Slightly lift lid, insert end of air monitoring device to monitor air inside drum.	
		3	Use of mechanical tools to remove bolts from drum lids causes excessive noise.	Wear hearing protection.	
		4	Splashing can occur if filling drum, or collecting samples.	Wear eye and face protection. Pour liquids into drum slowly to minimize splashing.	
		5	When working with COCs that have fire/explosive properties, sparking or heat could cause fire/explosion.	Use brass or non-spark hand tools if such a hazard exists or is suspected.	
3	Sample Contents from Drums	1	Exposure to COCs can occur by contacting impacted contents.	Select proper dermal protection for task, at a minimum nitrile gloves should be worn. Wear appropriate eye face and body protection as outlined in the HASP.	
		2	Staff can be exposed to chemical vapors/fumes when sampling.	Conduct air monitoring as outlined in the HASP, and if required, select appropriate respiratory protection for the task.	
		3	Sharp edges and broken sample containers can cause lacerations.	Discard any broken sample ware or glass properly. Where ANSI Level A2 cut resistant gloves. Do not over tighten sample containers.	
		4	Chemical burns or skin irritation can occur from contact with sample preservatives.	Wear chemical protective gloves when collecting samples, or when handling damaged sample containers.	

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
3	Sample Contents from Drums	4	Chemical burns or skin irritation can occur from contact with sample preservatives.	Wear chemical protective gloves when collecting samples, or when handling damaged sample containers.	
4	Replace drum lids	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	see step 2 above	
5	Moving and Storing Drums	1	Drum storage areas can be accessed by the general public, or may not be secure.	Calculate how many drums will be stored in new location. Ensure that drums are not easily accessed by the general public. Do not store such that drums impede pedestrian or vehicular traffic.	
		2	Muscle strain can occur when lifting/pulling/pushing drums.	Drums that are full can weigh as much as 800 lbs. Use a lift assist device whenever possible, and use a team lift approach. When moving soil drum generated by drilling, have drillers use their equipment to move the drums. Using dolly, slightly lift drum away from dolly to install forks under drum. Slowly let drum come back down and rest on dolly. Using hook on top of dolly, ensure it latches on top of drum bung.	
		3	Body parts can be pinched between lift device, or drum and the ground.	Be aware of hand and foot placement during drum staging. Do not hurry through task.	
		4	When moving, the drum can tip or the dolly could become unstable from uneven ground surface.	Plan travel route with drum prior to moving. With drum secure on dolly, have one employee pull back on dolly, and other employee slowly push back on drum toward dolly. Have second worker act as spotter for traffic, pedestrians, and any trip hazards along the way.	
		5	Drum label missing, damage, or hard to read.	If content of drum cannot be discerned. Call SSO or project manager about content of drum and label correctly. If sampling for waste characterization use "This container on hold pending analysis label".	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Recommended
Eye Protection	face shield		Required
	safety goggles		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	ANSI Leve A2 Cut Resistant	Required
Hearing Protection	ear plugs		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hover, Elizabeth A HASP Reviewer Approve 4/22/2019	

Job Safety Analysis

General

JSA ID	16889	**Status**	(3) Completed
Job Name	Environment-Groundwater Sampling and free product recovery	**Created Date**	4/19/2019
Task Description	Groundwater Sampling	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

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.	FHSFB III (L,AM)
		2	Vehicles parked too close to stationary objects may strike them when driving from location.	Park vehicle so first movement is forward. Park in a location that will be free of stationary objects, such as bollards, monitoring wells, fence posts, etc. when the vehicle pulls forward. Avoid backing!	
		3	Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
2	Open wells to equilibrate and gauge wells	1	When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	FHSFB III (S,AF)
		2	Pinch points on well vault can pinch or lacerate fingers	Use correct tools to open well vault/cap. Wear ANSI Level A2 cut-resistant 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.	FHSFB III (C,M,AB,AF)
		2	Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		3	Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
3 (cont.)	Begin Purging Well and Collecting Parameter Measurements	4	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. When possible wear work gloves, ANSI Level A2 cut-resistant gloves.	
		5	Purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
4	Collect GW or Free Product Sample	1	Working with bailer rope can cause rope burns on hands.	Slowly raise and lower the rope or string for the bailer. Wear appropriate gloves for the task.	FHSFB III (S, AF)
		2	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves over ANSI Level A2 cut-resistant 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 face shield, or respiratory protection may be required. Verify in the HASP.	
6	Staging of Well Purge water and/or Free Product	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	Drum handling JSA

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	ANSI Level A2 Cut Resistant	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	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 repellent		Recommended
	sunscreen		Recommended
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee:	Hover, Elizabeth A	
Role	HASP Reviewer	
Review Type	Approve	
Completed Date	4/22/2019	

Job Safety Analysis

General

JSA ID	16891	**Status**	(3) Completed
Job Name	Environment-Sample cooler handling	**Created Date**	4/19/2019
Task Description	Sample Cooler Handling	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Transfer field samples to sample packing area	1	Lifting heavy coolers may result in muscle strain especially to lower back.	Use proper lifting techniques and keep back straight. Use buddy system for large coolers, Use mechanical aids like hand trucks if readily available to move coolers. Do not over fill coolers with full sample containers for temporary movement to the sample prep area. Ensure an adequate supply of sample coolers are in field.	FHSFB III (B,F,I,AF,AG)
		2	Hazards to hands from broken glass caused by over tightening lids or improper placement in cooler	Inspect all bottles and bottle caps for cracks/leaks before and after filling container. Do not over tighten sample lids. Clean up any broken bottles immediately, avoid contact with sample preservatives. Wear ANSI Level A2 cut-resistant gloves (under nitrile gloves) when handling broken glass.	
		3	Exposure to chemicals (acid preservatives or site contaminants) on the exterior of sample bottles after filling.	Wear protective gloves for acid preservatives and safety glasses with side shields during all sample container handling activities (before and after filling), Once filled follow project specific HASP PPE requirements for skin and eye protection.	
		4	Samples containing hazardous materials may violate DOT/IATA HazMat shipping regulations	All persons filling a sample bottle or preparing a cooler for shipment must have complete ARCADIS DOT HazMat shipping training. Compare the samples collected to the materials described in the Shipping Determination for the Project and ensure consistent. Re-perform all Shipping determinations if free product is collected and not anticipated during planning.	
2	Sample cooler selection	1	Sample coolers with defective handles, lid hinges, lid hasps cracked or otherwise damaged may result in injury (cuts to hands, crushing of feet if handle breaks etc.)	Only use coolers that are new or in like new condition, No rope handled coolers unless part of the manufacturer's handle design.	ARCADIS Shipping Guide US-001
		2	Selection of excessively large coolers introduces lifting hazards once the cooler is filled.	Select coolers and instruct lab to only provide coolers of a size appropriate for the material being shipped. For ordinary sample shipping sample coolers should be 48 quart capacity or smaller to reduce lifting hazards.	

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
3	Pack Samples	1	Pinch points and abrasions to hands from cooler lid closing unexpectedly	Beware that lid could slam shut; block/brace if needed; be wary of packing in strong winds. New coolers may be more prone to self-closing, tilt cooler back slightly to facilitate keeping lid open.	FHSFB III (M,AF)
		2	Awkward body positions and contact stress to legs and knees when preparing coolers on irregular or hard ground surfaces.	Plan cooler prep activities. Situate cooler where neutral body positions can be maintained if practical, like truck tailgate. Avoid cooler prep on rough gravel surfaces unless knees and legs protected during kneeling.	
		3	Frostbite or potential for oxygen deficiency when packing with dry ice. Contact cold stress to fingers handling blue ice or wet ice	Dry ice temperature is -109.30F. Wear thermal protective gloves. DO NOT TOUCH with bare skin! Dry ice sublimates at room temp and could create oxygen deficiency in closed environment. Maintain adequate ventilation! Do not keep dry ice in cab of truck. Wear gloves when handling blue ice or gaging wet ice. Dry Ice is DOT regulated for air shipping, follow procedures in Shipping Determination.	
4	Sealing, labeling and Marking Cooler	1	Cuts to hands and forearms from strapping tape placement or removing old tape and labels	Do not use a fixed, open-blade knife to remove old tags/labels, USE SCISSORS or other safety style cutting device. Only use devices designed for cutting. Do not hurry through task.	FHSHB III (M,AF)
		2	Lifting and awkward body position hazards from taping heavy coolers, dropping coolers on feet during taping.	Do not hurry through the taping tasks, ensure samples in cooler are evenly distributed in cooler to reduce potential for overhanging cooler falling off edge of tailgate/table when taping.	
		3	Improper labeling and marking may result in violation of DOT/IATA HazMat shipping regulations delaying shipment or resulting in regulatory penalty	Do not deviate from ARCADIS Shipping Guide or Shipping Determination marking or labeling requirements.	
5	Offering sample cooler to a carrier or lab courier for shipment.	1	Lifting heavy coolers may result in muscle strain especially to lower back.	See lifting hazard controls above.	FHSHB III (M,AF)
		2	Carrier refusal to accept cooler may cause shipping delay and/or result in violation of DOT HazMat shipping regulations.	Promptly report all rejected and refused shipments to the ARCADIS DOT Program Manager. Do Not re-offer shipment if carrier requires additional labels markings or paperwork inconsistent with your training or Shipping Determination without contacting the ARCADIS DOT Compliance Manager.	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	ANSI Cut Level A2 Gloves	Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Miscellaneous	first aid kit		Required
	Other	Scissors	Required
Personal	eye wash (specify type)	bottle	Required
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hover, Elizabeth A HASP Reviewer Approve 4/22/2019	

Job Safety Analysis

General

JSA ID	16890	**Status**	(3) Completed
Job Name	Environment-Soil sampling/well installation - manual	**Created Date**	4/19/2019
Task Description	Soil sampling using manual methods	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Sampling set-up	1	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	EFHSHB III (A,H,EE)
		2	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	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.	FHSFB III (A,C,G,R,EE)
		2	Sharp edges and broken glassware can cause lacerations	Discard any broken sample containers or glass. Do not overtighten sample containers. Wear ANSI level A2 cut-resistant gloves.	
		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.	
3	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.	
		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	splash apron		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	ANSI Level A2 Cut Resistant	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required
Decontamination	Decon supplies (specify type)	DI water and Alconox	Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
	sunscreen		Recommended
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hover, Elizabeth A HASP Reviewer Approve 4/22/2019	

Job Safety Analysis

General

JSA ID	16886	**Status**	(3) Completed
Job Name	Environment-Air Monitoring	**Created Date**	4/19/2019
Task Description	Community Air Monitoring	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Mobilization/Demobilization	1	Heavy lifting	Utilize appropriate lifting techniques. Team lift object heavier than 50 lbs. Utilize material handling equipment whenever possible.	EFHSHB section 3, subsection R, EE, and LL.
		2	Abrasions	Use work gloves when handling equipment and supplies.	
		3	Motor vehicle accident	Use Smith System defensive driving techniques.	
2	Tailgate Safety Meeting	1	Unaware of job site hazards, conditions and critical safety actions.	Conduct a tailgate safety briefing each day prior to the start of work and if job site and/or conditions change during the day. Review appropriate sections of the Field Safety & Health Handbook. Ensure that all employees are fully aware of all hazards and are wearing all necessary PPE. Ensure all employees are aware of the locations of emergency equipment and contacts.	ARCHSGE001. EFHSHB section 3, subsection A.
3	General Environmental Conditions	1	Heat Stress	a. Dress appropriately for the weather. b. Take frequent breaks as necessary to cool off. c. Stay hydrated by drinking plenty of water. d. Stay out of direct sunlight when possible.	EFHSHB section 3, subsections A, I, M, N, P, R, and EE.
		2	Severe weather	a. Monitor the weather forecast for each day's activities. b. Take immediate shelter in a protected structure or field vehicle in the event of lightning, hail, high winds, or flooding.	
		3	Bites/Stings - Insects/Spiders/Snakes	a. Wear insect repellant during outdoor activities. b. Avoid disturbing area that may be a habitat for insects, spiders, or snakes. Use caution when moving rocks, equipment, or other items that may be providing shelter for these animals. c. Wear sturdy boots to protect from snake bites.	
		4	Heavy equipment operation in vicinity	a. Establish clearly marked work areas using barrier tape, cones, or other highly visible material. b. Wear safety vests when working in areas within 200 ft of heavy equipment operation. c. Notify the site contact of the work area.	
		5	Uneven terrain	a. Survey the working area prior to set up. Mark any holes, pits, or other hazardous terrain. b. Wear sturdy safety shoes.	
		6	Struck by vehicle due to improper traffic controls	Wear Class II traffic vest. If work is conducted in a ROW, reference ROW Traffic Safety Plan and use a flagger for traffic.	FHSFB V (F) Traffic Safety Plan.

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
4	Calibrate air monitoring equipment	1	Injury due to gas under pressure	Ensure that tubing and connections between gas cylinders, regulators instrument and tubing are secure and damage/leak free. If damaged remove and replace. Install and remove regulator valves away from face, body and other workers. Never leave the regulator installed in the cylinder when not in use.	ARC HSGE017
		2	Exposure to calibration gases (isobutylene, mixture five gases, benzene)	Conduct calibration in a well-ventilated area.	
		3	Malfunctioning meters or skipped steps resulting in inadequate personnel protection	Make sure equipment is in proper working order and meets standards set by manufacturer. Replace equipment when needed. Follow operators manual.	
		4	Poor or inadequate record keeping	Document all calibration data and note any deficiencies in the calibration or equipment readings. Have second person verify results.	
5	Equipment/Site Set Up	1	Materials handling/heavy lifting	Utilize appropriate lifting techniques. Team lift objects over 50 lbs. Utilize materials handling equipment whenever possible.	
		2	Falls from height	Utilize personal fall arrest equipment when exposed to unprotected falls greater than 4 feet in height.	
		3	Electricity- shock or electrocution	a. Inspect all extension cords prior to use. Mark all damaged cords and take them out of service. b. Protect cords in use from traffic or other damage. c. Ensure cords are appropriate for the load.	
6	Monitoring/Data Collection	1	Heat stress/Sunburn	Utilize a canopy over the monitoring area. Work in shaded areas when possible. Use sunscreen. Drink plenty of water and take breaks as necessary.	EFHSHB section 3, subsection A, M, R, M, and EE.
7	Decontamination	1	Contact with COC	Wipe down and clean monitoring equipment. Dispose properly of all protective clothing and spent decontamination supplies before leaving the exclusion zone. Remove any soil from boots before leaving the exclusion zone.	EFHSHB section 3, subsections A, I, M, N, P, R, and EE.
8	Care and storage of air monitoring equipment	1	Equipment breakage / malfunction - including batteries and power supply	Maintain integrity of dedicated systems. Properly store all equipment. Charge equipment nightly and as needed during the day. Have extra batteries / power supply onsite. Keep equipment clean. Inspect equipment to verify it is operational. Report any equipment issues to rental company for timely repair/replacement. Replace the saturated filters and clean the bulb with the cleaning kit periodically.	EFHSHB section 3, subsection A, I, M, N, P, and R.

PPE — Personal Protective Equipment

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

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required
	Other	Cones/Traffic control	Required
Personal	insect repellent		Recommended
	sunscreen		Recommended
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	traffic cones		Required

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference

Review Comments

Reviewer		Comments
Employee:	Hover, Elizabeth A	
Role	HASP Reviewer	
Review Type	Approve	
Completed Date	4/22/2019	

Job Safety Analysis

General

JSA ID	16887	**Status**	(3) Completed
Job Name	Construction-Oversight - excavation and construction	**Created Date**	4/19/2019
Task Description	Construction Oversight	**Completed Date**	04/22/2019
Template	False	**Auto Closed**	False

Client / Project

Client	National Grid
Project Number	B00366481401
Project Name	NG SIR NORTH ALBANY MGP SITE
PIC	YOUNG, TERRY
Project Manager	JONES, MICHAEL

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Healy, Lawrence C	5/10/2019	4/19/2019	Brien, Jason D	;
HASP Reviewer	Hover, Elizabeth A	5/3/2019	4/22/2019	Hill, Sarah A	;

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Ensure that necessary traffic and public access controls are set up	1	Struck by vehicle due to improper traffic controls	Ensure a buddy system is used when placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest. If work is conducted in a ROW, reference ROW Traffic Safety Plan and use a flagger for traffic.	FHSFB V (F) Traffic Safety Plan.
2	Utility Clearance	1	Contact with utilities can cause injury, property damage, and cause releases of hazardous substances to the environment.	Establish a minimum of three lines of evidence, and obtain additional lines of evidence as needed for site specific conditions. Maintain utility markings, perform detailed site inspections, and keep open and constant communication between operators, onsite staff, and project management. Always Use Stop Work Authority if there is a question or concern about the location of a utility.	ARCHSFS019 - Utility Clearance HS Standard. FHSHB III (A, G, Q, and MM).
		2	Slip trip and falls while performing site clearance activities	Focus on task at hand and do not hurry through task. Avoid reading maps/drawings while walking, stop walking when looking up for overhead utilities.	
3	Excavation/Trenching and Backfilling Oversight	1	Slips trips and falls from poor housekeeping around trench or excavation.	Maintain work area and minimize clutter near excavation. Place excavated material properly and at least 2 feet away from the edge of excavation. Remove potential hazards when possible. Mark hazards when it cannot be removed. Create and maintain awareness of hazard. Maintain barriers, fall hazard warning signage and traffic controls properly. Do not cross over caution tape, safety fencing etc. Follow Project specific STAR Plan	FHSHB III (A,E,G,K,BB,JJ,KK,FF) and FHSHB IV(A,D,L)
		2	Excavation or trench collapse trapping workers or creating falls.	Excavation/Trench greater than five (5) feet deep in which subcontractor, employees or others will be entering must be properly sloped, benched, shored or have a trench box in place. Sloping, benching, shoring or use of trench box is not required IF an excavation is less than five (5) feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in. Ensure a Competent Person is on site to inspect and oversee excavation/ trenching activities. Where feasible, stay six (6) feet from edge of excavation/trench. A safe means of egress, such as a stairway, ladder, or ramp, shall be located so that no more than twenty-five (25) feet of lateral travel is necessary for site workers conducting activities in trenches exceeding four (4) feet in depth.	

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
4	Excavation/Trenching and Backfilling Oversight	1	Potential high level of dust, fumes, vapors or particulates creating visibility or inhalation/contact hazards could result in exposure above occupational exposure limit or create an IDLH atmosphere.	Visually monitor air for dust, and wet excavated soil as needed to control dust. Monitor for chemical vapors if hazard exists. The atmosphere must be tested in excavations greater than four (4) feet in depth where oxygen deficiency or toxic or flammable gases are likely to be present, before workers will be permitted to enter. Ensure downwind and perimeter monitoring also performed, if atmospheric hazards exists.	
		2	Excessive noise from excavating equipment or pumps.	Make sure all authorized personnel including subcontractors are wearing hearing protection (ear plugs/muffs) when working around noisy equipment. Increase distance from noise hazard when practical.	
		3	Potential Leaks of Petroleum Fluids and Lubricants from excavating equipment and support equipment.	Make sure all authorized personnel including subcontractors perform equipment inspections looking for leaks, cracked hoses, and loose fittings. Promptly and properly repair all leaks.	
		4	Open Excavation, Unauthorized Entry, or Property Damage	Make sure all authorized personnel including subcontractors mark open excavation with demarcation tape, orange fencing, orange cones, etc. to prevent unauthorized / accidental entry. Make sure controls are adequate for traffic protection after dark or when the site is unstaffed. Backfill excavation area as soon as possible and fence off any excavation not backfilled at the end of the work day.	
		5	Contact with potentially impacted groundwater and soil.	Conduct task in a calm, cautious manner. Wear appropriate PPE. Ensure equipment is in working conditions before start of work every day. Stop work immediately and report to the site manager, if any life threatening conditions exist.	
		6	Working Around Heavy Machinery	Where feasible, maintain distance from excavation equipment in excess of the swing radius. Maintain eye contact with operators at all time. Ensure equipment is in good working condition before work begins. Wear appropriate PPE, including safety vest. Do not wear loose clothing and pull back long hair. Be aware of and avoid standing in red zones (equipment operator "blind-spots"). No personnel are permitted to stand underneath suspended loads.	
5	Stockpile Maintenance and Sampling	1	Falls climbing on or during covering of stockpile.	Avoid climbing on stockpiles when possible, keep hands free, do not hurry trough tasks such as pulling plastic sheeting up onto or over piles.	FHSHB III (A,E,D,H,M,EE,FF)
		2	Overexertion placing plastic sheeting, weight, and straw bales.	Use proper lifting techniques, avoid twisting of body, and forceful pulling/pushing. Do not hurry through task.	
		3	Cuts, scrapes, impalement from debris in stockpiles.	Have excavation contractor remove/isolate large chunks of concrete, exposed rebar etc. from stockpile to extent practical. Inspect areas prior to kneeling or placing hands when sampling upon stockpile.	

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 when hand hazard exists; nitrile for soil/	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs	When working near heavy equipment	Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone	Remote area, check reception	Required
Decontamination	Decon supplies (specify type)	Water and Alconox	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	flashlight		Required
Personal	eye wash (specify type)		Required
	insect repellent		Recommended
	sunscreen		Recommended
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	Other	Cones/tape to delineate trenches prior to backfill	Required
	traffic cones		Recommended

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**	Hover, Elizabeth A HASP Reviewer Approve 4/22/2019	

Attachment B
Shipping Determination

SHIPPING/TRANSPORTATION DETERMINATION FORM Revision 11

Non-Regulated Shipping Determination

Date:	9/9/2020
Project Name:	North Albany Service Center
Project Number:	300058019

1) Check the following to certify the sample media being transported/shipped meet non-regulated or not restricted status:

☐ Samples will not be collected on this project

OR

☑ The following samples have been reviewed and do not meet criteria of a regulated shipment under DOT or IATA:

Check applicable media that will be sampled on the project:

☑ Soil	☑ Groundwater	☐ Air samples
☐ Sediment	☐ Surface water	☐ Tissue, body part, or body fluid (1)
☐ Sludge	☐ Process water	☐ Plant tissue, part or fluid
☐ Bldg. materials	☐ Waste water	☐ Mold
☐ Articles	☐ Potable water	☐ Investigation derived waste (all media types)
	☐ Product	☐ Other:

☑ The following location(s) and media are not covered by above, are considered HazMat for shipping/transportation, and are subject to an additional shipping determination:

1a NAPL's, Free-Product, and/or Coal tar-like material, if encountered.

The following locations are known to contain hazardous waste and are not covered under this shipping determination:

WC-5 (9-15 ft bgs) WC-6 (11-16 ft bgs) WC-7 (7-16 ft bgs)
WC-8 (8-16 ft bgs) WC-10 (11-21.6 ft bgs)

2) For sample preservatives, the following checkboxes must be checked confirming a non-regulated/not restricted determination:

☐ Sample containers will be filled and preserved in accordance with EPA SW-846 protocols (2)
☑ Sample containers will not be field preserved with acids or bases by Arcadis staff
☐ Empty but preserved sample containers will not be return shipped to the laboratory or office
☐ EPA Method 5035 (TerraCore) samples will not be collected (3)

Supplemental information used to confirm section 1 and 2 conclusions:

- Work plan/QAPP
- Analytical data (attached)

3) Certify the following by checking the applicable categories that will be shipped or transported on this project (at least one category must be checked):

☐ Equipment and supplies will not be transported or shipped on this project.

OR

☑ Rental equipment being transported/shipped will not contain materials subject to DOT/IATA regulation (4)
☑ Field test kits, fire extinguishers and first aid kits will not be shipped
☐ Remediation chemicals transported in quantities >440 pounds gross weight per vehicle are not DOT regulated
☐ Other equipment and supplies used on this project are:
  ☐ Not regulated for transport; and/or
  ☐ Eligible for materials of trade exception (5)

☐ The following equipment/supplies are not covered by above, are considered HazMat for shipping/transportation, and are subject to an additional shipping determination:

3a

Supplemental information used to confirm this conclusion:

Completion of the "Determination" worksheet or use of generic shipping determination is required for each material listed in section 1a and/or 3a above. Issue this worksheet and "Field Quick View" worksheet(s), and/or generic shipping determination(s) to field staff unless otherwise instructed on "Determination" worksheet.

3) Certification:

I certify that I am current in HazMat #1 or approved equivalent and the above determination is true and correct to the best of my knowledge.

Name : L. Carey Healy

Signature:

Reviewed By: Josh Sinay

May be signed by any currently trained HazMat #1 employee

Notes:

1) This category applies to mammals, reptiles, birds, fish, insects, arachnids and all other vertebrate and invertebrate organisms.
2) This category is limited to containers preserved with ≤4 ml of preservatives and excludes containers used to preserve human or animal tissue described in footnote 1.
3) Unhide and review the generic Quick Form for TerraCores for details
4) Unhide and attach the generic Quick Form for rental equipment.
5) Unhide and attach the generic Quick Form for MOT transport.

Attachment C
Traffic Safety Plan

Traffic Safety Plan (TSP)

1.0 General

Plan type	Non-Right of Way (Non-ROW)
Project Name:	North Albany Service Center
Project Number:	30003953.00011
Developer Name:	Matt Hysell
Duration of Project (in hours or days):	7.9 Hours per day for 2 days
Time Restrictions (Y/N, if Y describe below):	N
Not Applicable	
Not Applicable	
Not Applicable	NA
Not Applicable	
Not Applicable	NA

☐ Working on multiple roads?

Comments:

2.0 Work Description

Provide a brief description of scope of work:

Construction oversight to vacuum excavate trenches and perform community air monitoring. Work will take place near the Versaire building on an active facility parking lot.

3.0 Type and Duration

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

Non-ROW work will be performed in: Active 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 Non-ROW requirements in the Traffic Safety Handbook applies:

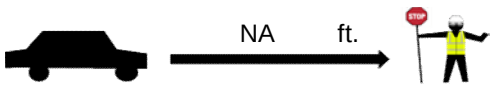
Section 7.3 Intermediate Duration Work in Parking Areas (1 to 8 Hours) (DOT Facts-302b)

The menu below will be blank and is not applicable.

The menu below will be blank and is not applicable.

Non-ROW configuration:
An example non-ROW 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 with Caution Tape

ROW minimum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts.	ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop.
A NA ft. B NA ft. C NA ft.	 NA ft.

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

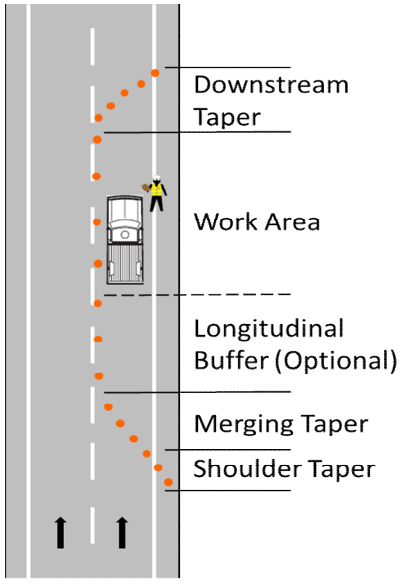
	Active work area length (feet)	200
☐	Apply Optional Longitudinal Buffer (ft)?	0
	Lane width of offset (feet)	12
	Shoulder width of offset (feet)	8
	Posted speed limit	NA

☐ **Shoulder Taper**

Taper Length (feet)	NA
Cones Required	NA
Cones Spacing (max., ft)	NA

☐ **Merging Taper**

Taper Length (feet)	NA
Cones Required	NA
Cones Spacing (max., ft)	NA



☐ **Work Area**

Cone Spacing (max., ft)	NA
Cones Required	NA

Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.

☐ **Downstream Taper**

Taper Length (feet)	NA
Cones Required	NA
Cone Spacing (max., ft)	NA

Cones Required (minimum) NA

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		
6	Channelizer cone (42 inch height, 10 lb base)		
☐	Channelizer cone (42 inch height, 30 lb base)		
☐	Traffic cones (≥ 18 inches tall)		NA
☐	Barricade:		
6	Flags for cones		
☐	Lights (for night work)		
☐	Plastic fencing (rolls)		
2	Caution tape (rolls)		
☐	Other (specify):		

Non-ROW 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

Electronic Device Use Safety

Electronic devices (tablets, laptops and cell phones) used for data collection or work documentation are not anticipated to be used on this project. If these devices are used for data collection or work documentation, their use and distraction hazards must be addressed in the safety briefing.

Reviewed By:

HASP Reviewer: _____

_____

Traffic Safety Plan (TSP)

1.0 General

Plan type	Right of Way (ROW)
Project Name:	North Albany Service Center
Project Number:	30003953.00011
Developer Name:	Matt Hysell
Duration of Project (in hours or days):	7.9 Hours per day for 2 days
Time Restrictions (Y/N, if Y describe below):	N
Roadway Work Zone Start Point	Bridge street just south of Broadway intersection
Roadway Work Zone End Point	Bridge Street just north of Mill Street
Posted Speed Limit (roadway in mph)	30
Number of Lanes (each direction)	1
Road Category Type (select)	Urban (≤40 mph)

☐ Working on multiple roads?

Comments: Vacuum truck will be located within the parking lanes. There will be no encroachment into travel lanes. Use Road Work Ahead sign instead of Shoulder Work Ahead.

2.0 Work Description

Provide a brief description of scope of work:

Vacuum excavation for soil borings along Bridge Street between Broadway and Mill Street.

3.0 Type and Duration

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

Roadway work will be performed: On shoulder

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

4.0 Traffic Control Layout, Number of Devices Required, and Phasing

The following traffic control configuration in the Traffic Safety Handbook applies:

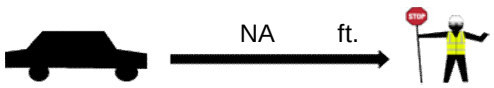
Section 6.2 Work on the Shoulder (DOT Facts-301j)

The menu below will be blank and is not applicable.

The menu below will be blank and is not applicable.

All Arcadis vehicles in a ROW will, at a minimum, have a functioning high intensity strobe or rotating orange light. All Arcadis employees in the ROW will wear, at a minimum, a retroreflective high visibility outer clothing meeting ANSI Class II or III requirements and other PPE required by JSA or HASP. Don't leave vehicle doors open. Park vehicles in ROW with front wheels turned to the right. Avoid work configurations requiring standing to rear of vehicles. Stage equipment in vehicles where it can be accessed from the right side of the vehicle to the extent practical. Do not park within 25 ft of the rear or front of parked large vehicles/construction equipment.

Intermediate Term (1-8 Hours)
Channelizing Cones with Caution Tape

ROW minimum sign spacing distances for "A", "B" and "C" (as applicable) in referenced DOT Facts.	ROW oncoming traffic minimum site distance required to see Flagger and properly decelerate and stop.
A 100 ft. B 100 ft. C 100 ft.	NA ft. 

ROW Cone Calculation (Values are default. Light grey fields may be modified based on actual road conditions)

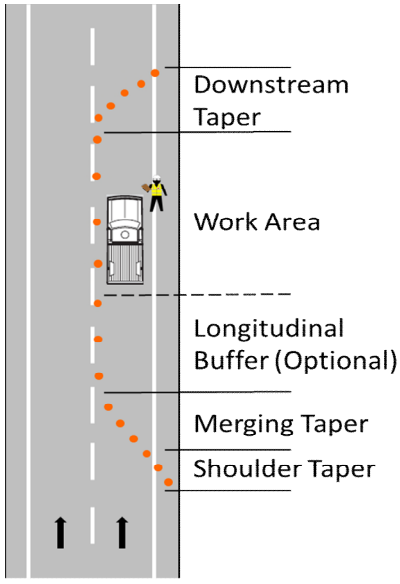
	Active work area length (feet)	200
☐	Apply Optional Longitudinal Buffer (ft)?	0
	Lane width of offset (feet)	
	Shoulder width of offset (feet)	8
	Posted speed limit	30

☐ **Shoulder Taper**

Taper Length (feet)	NA
Cones Required	0
Cones Spacing (max., ft)	NA

☐ **Merging Taper**

Taper Length (feet)	NA
Cones Required	0
Cones Spacing (max., ft)	NA



x	**Work Area**		
	Cone Spacing (max., ft)	60	
	Cones Required	3	Note: Review taper configuration and cone spacing after ROW implementation to ensure traffic is moving efficiently without motorist confusion in the RWZ.
	Downstream Taper		
	Taper Length (feet)	NA	
	Cones Required	0	
	Cone Spacing (max., ft)	NA	
	Cones Required (minimum)	3	

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

Check all that apply:		*Wording or Pictogram*	*Number:*
x	Warning signs	Road Work Ahead	1
x	Warning signs	End Road Work	1
	Warning signs		
	Stop/Slow paddle		
	Red flag		
	Drums		
3	Channelizer cone (42 inch height, 10 lb base)		
	Channelizer cone (42 inch height, 30 lb base)		
	Traffic cones (≥ 18 inches tall)		3
	Barricade:		
	Flags for cones		
	Lights (for night work)		
	Plastic fencing (rolls)		
	Caution tape (rolls)		
	Other (specify):		

ROW Phasing:

1) Deploy warning signs at first approach, if required

2) Deploy subsequent approach warning signs, if required

3) Deploy channeling devices, if required, starting with first approach

4) Deploy "End Road Work" signs, if required

5) Position vehicle as shield to the extent practical

6) Commence work, SSO or designated contractor to maintain devices

7) Remove devices in reverse order

Electronic Device Use Safety

Electronic devices (tablets, laptops and cell phones) used for data collection or work documentation are not anticipated to be used on this project. If these devices are used for data collection or work documentation, their use and distraction hazards must be addressed in the safety briefing.

Reviewed By:

HASP Reviewer: _____

EJE Reviewer Ari Deitch, PE, PTOE, PTP, RSP

Attachment D
HASP Forms

Task Improvement Process

General

Observed Company:

Observation Type:

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

Task Observed:

Observee Name:

Observer Name:

Observation Date:

Project Number: 30003953.00011

Project Name: North Albany Service Center

Supervisor:

Equipment On Site:

Pertinent Information:

Observation

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

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

Tip Summary **Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.**

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

- ☐ Supervisor Led
- ☐ Peer to Peer
- ☐ Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

PID Calibration Log

Zero Gas Source: ______________ Instrument Type: ______________ PAGE ____ of ____

Lot Number/Expiration Date: ______________ Serial Number: ______________

Calibration Gas Source: ______________ Instrument Type: ______________

Lot Number/Expiration Date: ______________ Serial Number: ______________

Concentration: ______________ ______________

Instrument Number	Date	Time	Zero Cal. OK (Y/N)	Calibration Gas Reading	Comments	Calibration w/in 2% (Y/N)?	Alarms Set (Yes/No)?	User Initials

THIS FORM MUST BE ENTIRELY COMPLETED PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project Name: North Albany Service Center Start Date:

Project #: 30003953.00011 End Date:

Utility markings valid for 15 days. Initiate clearance renewal 5 days prior to expiration for ongoing work

PRE-FIELD WORK REQUIREMENTS

DigSafe 811 notified 48-72 hrs. in advance of work? ☐ DigSafe Ticket #:

Ticket Expiration Date: State Utility Laws: www.commongroundalliance.com/map

Ticket(s) Attached(Y/N)? ☐ List utility owners notified via DigSafe 811 & response status:

List addt'l. utilities requiring notification not included in DigSafe811 Notice:

Review task details w/ private utility location subcontractor. ID work areas, clearance equipment needed, depth of clearance needed, types of features, utilities, anticipated/known/unknown. Verify DigSafe 811 markings to confirm public utility clearance.

Private Utility Locator Name, if used: AUS onsite meeting (Y/N)? ☐

FIELD WORK REQUIREMENTS

This portion of the checklist must be completed on site. AUS staff must have a minimum of one year of field experience in identifying utilities to complete the checklist. Field staff will review the completed checklist with PM or designee prior to beginning intrusive work.

Heavy equipment/mechanized intrusive work w/in the Arcadis Tolerance Zone (utility or structure present within 30-in. of point of work) REQUIRES pre-approval by Corporate H&S prior to working at all such locations. STOP WORK if the Arcadis Tolerance Zone work has not been approved.

List work type & locations for utility location and clearance as applicable to this checklist:

3 Reliable Lines of Evidence are REQUIRED for EACH INTRUSIVE LOCATION prior to starting any subsurface intrusive work. Check corresponding boxes below to document utility clearance efforts.

☐ OneCall/DigSafe 811 Public Utility Locate (required by State law for subsurface work)

811 is only reliable as a Line of Evidence when working in/adjacent to a public ROW or easement.

Marking type: ☐ Paint ☐ Pin Flags/Stakes ☐ Other: ☐ None

☐ Client provided maps/drawings (Y/N)? ☐ Maps/drawings not provided (Y/N)?

☐ Client Clearance (Y/N)? Name(s)/Affiliation(s):

☐ Interviews (Y/N)? Name(s)/Affiliation(s):

☐ Specific subsurface feature types and depths provided by person interviewed (Y/N)?

Details provided:

☐ Site Inspected (Y/N)? (document on Pg. 2.) Photo Document Marked Utilities & Structures

☐ Public records/Client Dwgs/As-Builts (Y/N)? Type:

List private locator tools used: ☐ Radio Freq. Detection ☐ Electromagnetic ☐ GPR

☐ Metal Detector ☐ Acoustic Pipe Locator ☐ Downhole sonde Other:

☐ Soft Dig Methods used (Y/N)? ☐ Hand auger ☐ Probing ☐ Hand tools (shovel/rake)

☐ Air knife ☐ Hydro Knife ☐ Potholing/Vacuum extraction

☐ Other soft dig tools used (Y/N)? If Yes, list here:

ALL BOXES BELOW MUST BE COMPLETED BEFORE PROCEEDING

Site inspection also requires investigating vicinity outside of the work area for structures and utilities.
Noting "YES" requires addt'l. investigation. Utilities must be field marked prior to intrusive work.

Is the utility present (Y/N)?		Utility Color Code
	Utilities entering/exiting structures?	No Color
	Intrusive work area marked out?	White
	Structural features above or below?	White
	Public natural gas line or meter?	Yellow
	Private natural gas laterals/feeders?	Yellow
	Public electrical service?	Red
	Conduit from meter or on wall?	Red
	Conduit from poles into ground?	Red
	Poles/devices w/ no visible lines?	Red
	Overhead electrical lines?	Red
	Solar arrays or wind turbines?	Red
	Public water line(s)?	Blue
	Private water line(s) or lateral(s)?	Blue
	Water meter onsite?	Blue
	Fire hydrants/post indicator valves?	Blue
	Irrigation system control box/valve?	Blue
	Sprinkler heads, drip lines, vaults?	Blue
	Water dispensers, fill stations?	Blue
	Telecomm. overhead or buried?	Orange
	Telecomm. ground box or relays?	Orange
	Telecomm./security CCTV devices?	Orange
	Public sanitary sewer pipes?	Green
	Combined sanitary/storm pipes?	Green
	Private sanitary laterals/clean outs?	Green
	Restrooms, kitchens, wash bays?	Green

Is the utility present (Y/N)?		Utility Color Code
	Evidence of stormwater network?	Green
	Curb drains/catch basins/manholes?	Green
	Stormwater culverts, outfalls?	Green

ABOVEGROUND Features Present?

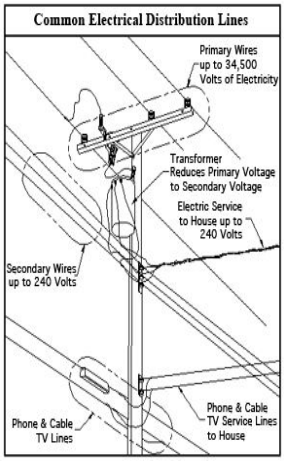
	Transportation tunnels/structures/markers present?	
	Overhead electrical lines?	Red
	< 50 kV w/in 10 ft of work area?	Red
	>50-200 kV w/in 15 ft of work area?	Red
	>200-350 kV w/in 20 ft of work area?	Red
	>350-500 kV w/in 25 ft of work area?	Red
	>500-750 kV w/in 35 ft of work area?	Red
	>750-1000 kV w/in 45 ft of work area?	Red
	Aboveground fire suppression?	Blue
	Aboveground communications?	Orange
	Aboveground chases/racks/trays?	Orange
	Private/Remediation system lines?	Various
	Unclassed utilities/anomalies?	Pink
	Warning signs/stakes/markers present?	
	Heavy Equipment: Mark travel route for overhead, next to route, and/or under route (e.g. crush risk) utilities.	

Signs of other utilities/ground disturbance

	Signs of asphalt or concrete disturbance/repair?
	Any ground subsidence or change in vegetation?
	Unknown manholes or valve covers in work area?

Tips for Thorough Utility Location (HSS Section 5.6):

1. Don't forget to look up for utilities
2. Be on-site with Private Utility Locators.
3. Ask Private Locators to "confirm" other's markings.
4. Also clear alternate/backup locations
5. Mark all known utilities.
6. No hammering, no pickaxes, no digging bars, no shortcutting.
7. No excessive turning or downward force of hand tools, especially hand augers.
8. Utilities may run in or directly under asphalt/concrete
9. Heavy equipment may damage shallow utilities. Especially during clearing and grubbing.
10. Use spotter for heavy equipment near aboveground utilities?



☐ Utilities & Structures Checklist reviewed by the PM or Designee (Y/N)? *If no, STOP WORK call PM*

PM or Designee Name: _____

Name and Signature of person completing the checklist: _____

Date of checklist review / update: _____

ALL SUSPECT UTILITY STRIKES REQUIRE CORPORATE H&S NOTIFICATION WITHIN 24 hrs. OF KNOWLEDGE OF STRIKE WITH A CONFIRMED RESPONSE FROM CORPORATE H&S.

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

ARCADIS

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												
	ires 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												
	range/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**

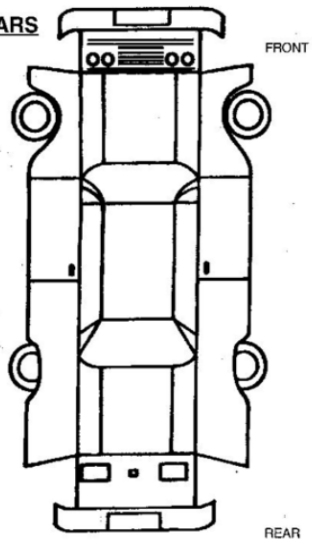
Note All Vehicle Damage Below

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

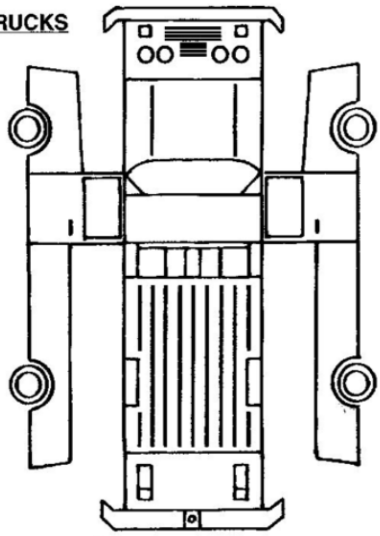
CODES:

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

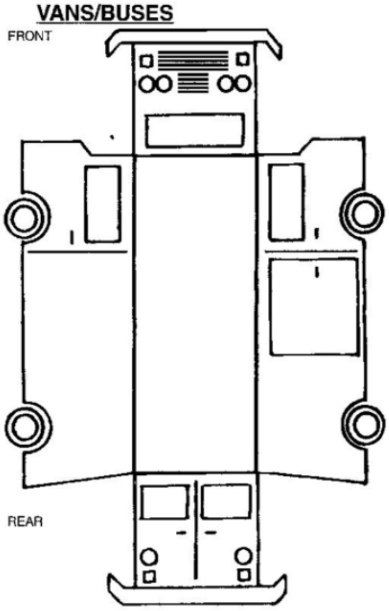
CARS



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

Control Number: TSM- 30003953.00011

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

TAILGATE HEALTH & SAFETY MEETING FORM

Project Name:			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**

Issues or concerns from previous day's activities:

Task anticipated to be performed today:

☐ Additional permits/checklists attached

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

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

☐ Refer to the attached Hazard Analysis Sheet(s) or JSA

Comments:

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

SSE Employee*

Non-Life Threatening Injury or Illness
Call WorkCare 1-888-449-7787

	Printed Name/Signature/Company	Sign In Time	Sign Out Time

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

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

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

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

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

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

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

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

Control Number: TSM- 30003953.00011

ARCADIS

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

TAILGATE HEALTH & SAFETY MEETING FORM

Project Name: North Albany Service Center			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**

Issues or concerns from previous day's activities:

Task anticipated to be performed today:

The following was used to communicate H&S information in this briefing (check all that apply):

- ☐ HASP (*including THA*)
- ☐ JSAs (*specify JSA #s*): _____
- ☐ Permits (*specify type or #*): _____
- ☐ Traffic Safety Plan
- ☐ FHSHB (*specify sections*): _____
- ☐ H&S Standard (*specify number*): _____
- ☐ H&S checklist (*specify type*): _____
- ☐ Activity specific hazard analysis:

Activity: _____

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

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

Controls required to be used:

PPE Required (If not using JSA or Permit with PPE requirements):

- ☐ Hard hat
- ☐ Safety glasses
- ☐ Face shield
- ☐ Safety goggles
- ☐ Steel/composite toe boots
- ☐ Traffic vest (*specify II or III*): _____
- ☐ Life Vest (*specify type*): _____
- ☐ Protective Suit (*specify type*): _____
- ☐ Protective gloves (*specify type*): _____
- ☐ Other (*specify*): _____

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

Non-Life Threatening Injury or Illness
Call WorkCare 1-888-449-7787

SSE Employee*	Printed Name/Signature/Company	Sign In Time	Sign Out Time

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

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

What You Need to Know

Emergency Phone:	911	*WorkCare Phone:*	1-888-449-7787
Your nearest hospital:	Albany Memorial Hospital, 600 Northern Boulevard, Albany, NY 12204, , , 518-471		

H&S Specialist for this project:	Alec MacAdam	*Cell Phone:*	720-454-0948
Project Site Safety Officer:	To Be Decided		
Nearest assembly area(s):	0		
Nearest storm shelter(s):	0		

Confirm the following PPE is on site: hard hat, safety glasses, boots with protective toe and shank, traffic vest Class II, hearing protection, Nitrile gloves. Applicability of PPE to a particular work task is specified in the JSA or permit.

Confirm the following supplies and equipment are on site: first aid kit, fire extinguisher, eyewash (bottle), drinking water, sunscreen, traffic cones. Applicability of supplies and equipment to a specific task is specified in the JSA or permit and must be reviewed in the safety briefing.

Review applicable JSA or permit for the task being performed in the safety briefing.

You must remain at least 25 ft from the railroad track unless your job requires you to perform a task within 25 ft of the track. You must be On Track Safety Trained in accordance with client or host railroad requirements.

Confirm traffic controls in place are consistent with the project NON-ROW TSP for the parking lot or other non-right-of-way location.

You must stop work and contact Corporate H&S, CIH or a CSP if you exceed 4.6 PID units for volatile organics during work.

One or more shipping determinations apply this project. Review of the shipping determination(s) is required during initial safety briefing for project.

Due to the tick hazards associated with this project, review of the HASP Tick and Poisonous Plant section is required for specific controls to prevent tick hazards. These controls must be discussed in the safety briefing.

Due to the poisonous plant hazards associated with this project, review of the HASP Tick and Poisonous Plant section is required for specific controls to prevent tick hazards. These controls must be discussed in the safety briefing. See FHSHB for addtional description information.

SDSs for this project are attached to this HASP.

Contractors on this project are anticipated to use materials subject to the HAZCOM Standard under OSHA (or state OSHA) regulations. Contractor SDSs are not required for this project.

This project will not be utilizing materials subject to the HAZCOM Standard in bulk storage. In this HASP, bulk storage means any material stored on the project site in a bulk packaging >119 gallons (> 450 L) liquid capacity or a palletized quantity of a material in packagings ≤119 gallons (≤450 L) liquid capacity.

Attachment E
H&S Reference

UNITED STATES EMPLOYEE FIELD HEALTH & SAFETY HANDBOOK

January 2025

United States Employee Field Health & Safety Handbook

Prepared by:

Arcadis U.S., Inc.

630 Plaza Drive

Suite 100

Highlands Ranch

Colorado 80129

Tel 720 344 3500

Fax 720 344 3535

Revision Date:

January 31, 2025

Version Control

Date Issued	Description	Reviewed by
May 2020	New template, significant document revisions.	G. Mason, D. Balcer
December 2021	Annual Review	G. Mason
October 2022	Annual Review and edits; inclusion of sewer work; inclusion of vacuum truck work	G. Mason
January 2025	Opening and closing gates; added material relating to cold stress and excavation safety; added what to do if someone seems under the influence	G. Mason

Contents

Tables

Figures

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
ASDP	Arcadis Scientific Diving Program
ATM	automatic teller machine
ATV	all-terrain vehicle
°C	degrees Celsius
CAA	Civil Aviation Authority
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CNG	compressed natural gas
COC	constituent of concern
COPC	constituent of potential concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DCB	Diving Control Board
DEET	N,NN, N-diethyl-meta-toluamide
DOT	Department of Transportation
DSM	Diving Safety Manual
EMS	Emergency Medical Services
EZ	Exclusion Zone
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FRA	Federal Railroad Administration
GAWR	gross axle weight rating
GFCI	ground fault circuit interrupter
GPS	global positioning system
H&S	Health and Safety
handbook	Arcadis Health and Safety Field Handbook
HASP	Health and Safety Plan

HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
HBV	hepatitis B virus
JSA	Job Safety Analysis
kV	kilovolt(s)
LEL	lower explosive limit
LO/TO	lockout/tagout
LPG	liquid petroleum gas
MOHUV	Multipurpose off-highway utility vehicle
MSHA	Mining Safety and Health Administration
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PFD	personal flotation device
PHSM	project health and safety manager
PM	project manager
PPE	personal protective equipment
PSM	Process Safety Management
ROPS	rollover protective structure
SDS	safety data sheet
SS	Site Supervisor
SSW	short-service worker
SSO	site safety officer
SZ	Support Zone
TSP	Traffic Safety Plan
TM	task manager
USEPA	United States Environmental Protection Agency
UST	underground storage tank

1 Introduction

1.1 Purpose of this Handbook

This Arcadis Health and Safety Field Handbook (FHSHB, Handbook) provides our employees with minimum Arcadis workers with minimum Arcadis workplace health and safety (H&S) expectations and best practices. It is to be used as a supplement to Arcadis H&S standards (HSSs), project specific H&S Plans (HASPs), and job safety analyses (JSAs) and summarizes many of the Arcadis H&S procedures and standards.

Did You Know? Arcadis Standard ARC HSFS010 “Health & Safety Plans” includes requirements for completing and utilizing HASPs for all field work.

At Arcadis, we strive to achieve zero incidents to ensure the health, safety and well-being of our workers and stakeholders. We have the responsibility to keep the well-being of our workers central in all we do. For that reason, H&S is embraced by our workers who are guided at home and at work by the following six Fundamental Principles:

1. Demonstrate H&S Stewardship daily
2. Use TRACK
3. Exercise Stop Work Authority
4. Practice “If not me, then who?”
5. Undertake H&S Planning
6. Report injuries and incidents immediately

Additionally, we integrate H&S into our client solutions to manage risk and bring the best outcomes for our clients and workers, demonstrating our best-in-class H&S culture and performance.

Arcadis workers are expected to understand and use this handbook and apply the H&S best practices contained herein when performing their daily work activities. Where they require more prescriptive and protective control requirements, the Arcadis Health and Safety Standards, the project HASP and/or the project specific Job Safety Analyses (JSAs) will take precedence to this Handbook. This handbook does not replace or substitute the need for reviewing established Arcadis H&S procedures, regulatory and client requirements, and associated forms and work permits.

The following Arcadis company intranet site provides access to the most current and up-to-date Arcadis H&S standards and associated forms and permits:

https://arcadiso365.sharepoint.com/sites/Intranet-ANA-Health-Safety/SitePages/Home.aspx

1.2 Using the Handbook

This handbook covers many of the workplace hazards and work activities typically encountered during Arcadis operations.

It is not the definitive guide to safe work practices and procedures nor is it wholly applicable under every circumstance, or jurisdiction. Review and apply appropriate government regulations, company-specific and client work practices and requirements, and equipment manufacturers' instructions with due diligence. If situations arise that are not adequately covered in this handbook or other reference manuals, seek assistance from your local or project H&S contacts.

The handbook includes essential and nonessential language that conforms to Arcadis' H&S governance. Sentences with essential requirements contain the verb "must," "shall," or "will," which means the requirement is mandatory. Words that imply or suggest non-essential, discretionary requirements include "recommend," "might," "should," or "may."

The Project Manager, the project Site Supervisor and/or site safety officer (SSO) will use this handbook as part of the overall hazard assessment/control process for all projects.

This handbook provides general H&S information and control recommendations for workers working in the U.S. While much of the information contained herein could be used by non-U.S. Regions, work outside the U.S. may have different hazards and regulatory requirements. If there are questions about any hazards or regulatory requirements, please contact Corporate Health and Safety (Arcadis H&S).

Local regulatory requirements, Arcadis' Health & Safety Standards, Arcadis' project specific HASPs, and Arcadis project specific JSAs generally take precedence over the material in this handbook.

1.3 Arcadis Global H&S Vision and Policy Statement

Figure 1-1 Health & Safety Commitment

1.4 TRACK

At Arcadis, the acronym TRACK is a tool to we use help workers probe day-to-day operational and procedural activities to proactively identify hazards and control risks at all levels and stages of work planning and execution. Often the use of TRACK helps to identify hazards that may have been overlooked while planning a project or task. These hazards may develop after the job or task started, or may exist due to a lack of procedure, training, equipment/process modification, or because of site-specific changes in weather, location, traffic, or other circumstances. TRACK can be documented but not always. It fully depends on the stage of the work to which TRACK is applied. Each person performs the process or communicates it to all workers affected by the hazard, whether it is a last-minute risk assessment in the field, or a comprehensive project planning workshop before the work is ready to begin.

ANA H&S App is provided within Microsoft Power Apps. This app links to the Arcadis US H&S Dashboard and allows users to enter Safety Captures, Document Stewardship Activity, Hazards, Close Calls, Unsafe Behavior and record Personal Observations made outside of work hours.

The second step in TRACK, Recognize the hazards, is the cornerstone of the Arcadis H&S program. “R” is the most important step in TRACK because you must identify and recognize a hazard to appropriately control it. Our Hazard Recognition program challenges us to look at every site, project, job, or task and identify potential hazards from 12 hazard categories. Instead of identifying an object or activity as a hazard, we look at the sources of the potential hazards associated with that object or activity (see **Table 1-1**).

Table 1.1 Hazard Source Categories

Hazard Source	Definition	Examples
Mechanical	Of or relating to machines or tools or mechanical systems, such as rotating parts or vibration in a machine.	A rotating auger, motors, compressed springs, moving belts, closing a step ladder, sharp objects, or edges.
Electrical	Presence or flow of electrical charge.	Power lines, electrical cords, transformers, batteries, static electricity.
Pressure	Energy applied to compress something, such as a liquid or gas.	Compressed gas cylinders, pneumatic, or hydraulic lines or equipment, tanks, well heads, heated vessels.

Hazard Source	Definition	Examples
Environment	The circumstances or conditions that surround a person or object.	Weather, hot or cold surfaces, fire, sunlight, lighting, water bodies.
Chemical	Substances that inherently, or through reaction, have the potential to create a physical or health hazard to people, environment or equipment.	Flammable vapors, reactive hazards, carcinogens or other toxic compounds, corrosives, pyrophorics, combustibles, oxygen-deficient atmospheres, welding fumes, dusts.
Biological	Relating to, caused by or affecting life or living organisms.	Insects, plants, animals, medical wastes, spoiled food, blood-borne pathogens, viruses, bacteria, molds.
Radiation	Emission and propagation of energy in the form of rays, waves or particles.	Radioactive materials, lasers, infrared or ultraviolet sources, microwaves, radio waves, light waves, sun exposure, Naturally Occurring Radioactive Materials (NORM).
Sound	Vibrations transmitted through the air with frequencies capable of being detected by the ears.	Equipment noise, impact noise, vibration, high-pressure release.
Gravity	The natural force of attraction between a body of mass and the Earth.	A falling object, a body tripping or falling, a collapsing trench wall or crane.
Motion	The act or process of an object changing position or place.	Flowing liquid, a rolling vehicle, wind moving an object, bending over, lifting an object.
Personal Safety	Those situations that endanger a person through criminal activity, isolated areas, or working alone.	Working at night, working in a wilderness area, working in a high-crime area.
Driving	Operation of a vehicle on or off road, on water, or in the air.	Automobile or truck operation, all-terrain vehicle (ATV) operation, boating, charter aircraft.

1.5 Behavior-Based H&S

As part of Arcadis' overall H&S program, we acknowledge the importance of promoting a strong behavior-based H&S culture. In addition to the other tools presented in this handbook (e.g., HASPs, medical surveillance exams, respiratory protection program), our behavior-based H&S system also provides tools that include:

- TRACK
- STOP WORK
- Task/job safety analysis
- Workplace/jobsite H&S observations
- Incident investigations using proper root-cause analysis

- Corrective and preventive actions and supervisory follow-up with lessons learned via Safety Shares and Alerts
- Stewardship at all levels

All Arcadis workers complete behavior-based H&S training as part of their on-boarding process and they are expected to use the tools appropriately.

Before every task, STOP and…

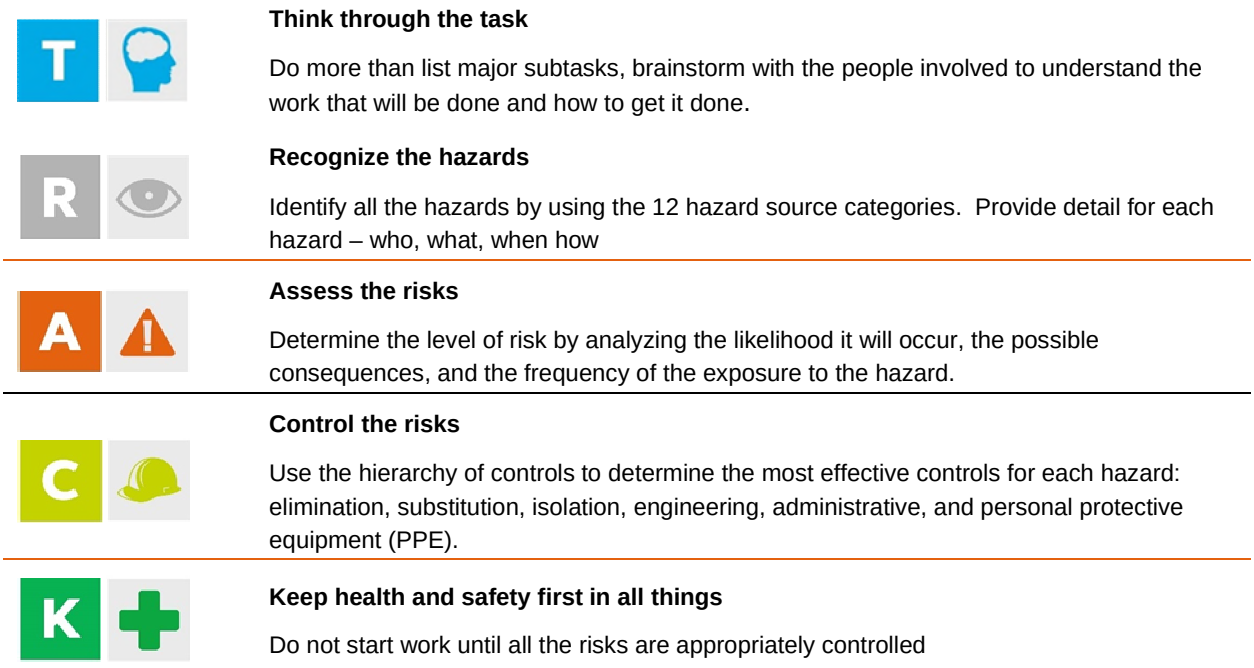


Figure 1-2 TRACK

2 Health and Safety Administration

2.1 Arcadis Responsibilities

Arcadis shall:

- Develop, implement, and maintain a current and effective H&S program (aligned with corporate objectives and policies, and compliant with government regulations)
- Continually improve H&S processes and procedures
- Provide the programs, procedures, policies, and tools to protect the H&S of workers and the public
- Inform workers of any known or potential hazards
- Confirm that supervisors and workers are informed of new or revised requirements related to H&S
- Provide new-hire and project-/site-specific orientation on H&S issues
- Update Arcadis policies, practices, and guidelines, as required, to reflect changes in regulations, client requirements, or industry standards
- Develop best practices and operating procedures for work activities and review periodically for effectiveness
- Confirm that workers are adequately trained, competent, and equipped to perform their work safely
- Report and investigate workplace hazards and incidents (including near misses) in a timely manner, and develop and implement solutions to prevent recurrence
- Share lessons learned from near misses and incidents
- Conduct hazard assessments, including inspections and conformance assessments, of Arcadis project sites
- Maintain company and workers H&S records, statistics, and audits; and
- Purchase and distribute H&S equipment (e.g., fire extinguishers, first-aid supplies) and personal protective equipment (PPE)

Did You Know? Arcadis Standard ARC HSMS009 “Conformance Assessment” assists trained workers with completing thorough safety audits.

2.2 Employee Responsibilities

As an Arcadis worker, you must:

- Understand that you have the authority, right and responsibility to Stop Work as warranted per the conditions, situations, behaviors, and other factors that may place people or property in jeopardy.
- Be fit for duty or notify a person in authority if you are not. You must be physically and mentally fit to safely perform your work. Impairments that could affect your performance include, but are not limited to:
    - Fatigue or inadequate rest
    - Medical conditions
    - Physical disabilities
    - Emotional state
    - Effects of:
        - Prescriptions
        - Over-the-counter medicines
        - Supplements
        - Illegal substances
- Notify your supervisor if you are taking any prescribed or over-the-counter medication that could impair your work performance.
- Notify your supervisor of any coworker that you or anyone you suspect is impaired or under the influence of medications or other substances while at work, or not performing within normal and expected workplace behavior.
- Protect your H&S as well as that of others at Arcadis offices and project sites;
- Follow all company operating procedures, codes of practice, and safe work practices;
- Wear or use all PPE required by Arcadis and our clients;
- Follow JSAs, HASP, and other instructions;
- Comply with government regulations or client requirements;
- Operate all vehicles and other equipment in a defensive, safe manner and within their rated capacity;
- Report to your supervisor, in a timely manner, any unsafe practices, hazards, conditions, or dangerous acts that may come to your attention.
- Report to your supervisor, in a timely manner, all incidents including near misses, injuries, or illnesses, and property damage.

- Know emergency response and rescue procedures applicable to the project site and found in this handbook or in other site- or location-specific documents;
- Know where emergency equipment, alarms, and emergency response numbers are located, and how to evacuate when working at facilities or project sites;
- Attend all applicable H&S meetings and training courses;
- Consult a supervisor if there is any doubt about the job procedure or H&S requirements before proceeding with an assigned task;
- Assist your supervisor and any H&S representative with inspections and investigation of accidents, incidents and workplace hazards;
- Share lessons learned resulting from near misses or incidents with others; and,
- Prior to wearing a respirator or any PPE, make certain you are trained on its use and that it will be effective in the work environment. Make certain you have been medically cleared to wear a respirator and that PPE fits you.

2.3 Visitors

All visitors to Arcadis project site areas must check in with the Site Supervisor (SS),Site Safety Officer (SSO), or other designated worker. Visitors will receive a site orientation about hazards they may encounter and controls that will mitigate those hazards.

Visitors who request to observe work must wear appropriate PPE, as designated in the HASP, prior to entering the project site, and must have the appropriate training and medical clearances. If visitors who wish to enter a project site that requires the use of a respirator they must have a current medical clearance and be respirator-trained and fit-tested for a respirator, all within the past 24 months.

Did You Know? Arcadis Standard ARC HSSP006 “Powered Industrial Trucks (Forklifts)” includes requirements and recommendations for operating a forklift.

2.4 Communications

With the potential for many hazards on a project site, clear communication is vital. Arcadis supervisors, workers, and contract workers must exchange information on a regular basis. Everyone at the project site must be aware of the work to be performed, all hazards and the control measures to take, and the correct procedures to follow.

Arcadis supports, encourages, and documents site safety meetings, requires morning tailgate meetings, and recommends after-lunch tailgate meetings to promote safety awareness and hazard mitigation.

2.5 Hazard Identification, Risk Assessment, and Risk Control Process

Arcadis uses systematic approaches to identify, assess, control, and manage H&S hazards and associated risks. These approaches (including TRACK) serve as the foundation for identifying hazards in the Arcadis U.S. work environment, assessing H&S risks posed by the hazards, and identifying the means and methods of control for those risks. Hazard identification, risk assessment, and risk control apply to all routine and nonroutine activities completed by or overseen by Arcadis U.S workers. All workers must use these processes and associated risk tools wherever hazards require classification as low, medium, and high to help determine the appropriate hazard control. Use hazard recognition, risk assessment, and risk control processes in H&S planning, JSA development, project planning, during the TRACK process, in tailgate safety meetings, and as part of any other process where hazards require identification, assessment, and control.

Did You Know? Arcadis Standard ARC HSMS002 “Hazard Identification, Risk Assessment and Risk Control” includes guidance on how to systematically identify and control risk.

2.6 Near Miss, Incident Reporting, and Investigation

Arcadis will report and complete an investigation following any work-related incident. A work-related incident includes any of the following types of events that occur during the completion of Arcadis work activities:

- Injuries and illnesses, including those needing only first aid;
- Near misses/incident;
- Spills or leaks;
- Equipment and property damage;

- Motor vehicle accidents;
- Regulatory inspections and/or violations;
- Fires;
- Business interruptions; and,
- Utility strikes (aboveground or below ground)

See the 4-Sight database on the Arcadis company intranet site for more information.

It is your responsibility to notify your supervisor or Project Manager, as appropriate, of any incident as quickly as possible. Your Supervisor, Project Manager or designee will then make the necessary calls to the appropriate corporate services groups, based on the incident. (Refer to the Arcadis Incident Reporting Health and Safety Standard for more information and see descriptions below.) If you are unable to make the call, then a coworker must do it as soon as possible.

In the event of a non-emergency injury, call WorkCare (1 888 449 7787) and then contact your field supervisor and project manager, who will notify Corporate H&S. In an emergency, another worker will make the necessary calls if the injured worker is unable to do so.

Did You Know? Arcadis Standard ARC HSMS010 “Incident Reporting and Investigation” includes guidance on Arcadis’ incident notification and investigation process.

2.7 Stop-Work Authority

All Arcadis workers are empowered to stop work if they feel their safety or the safety of their coworkers, clients, subcontractors, or the public is compromised.

STOP WORK if you feel unsafe or suspect that something is not safe. Throughout the day (at work and home), step back and use TRACK to assess your work. Look around. Is there anything that could hurt you or someone else? If so, STOP and address the issue. If you don't know how to make a situation safe, seek help from others including the Site Supervisor, the project manager, or Arcadis H&S.

Arcadis Stories

Arcadis Resilience Environment East employee, Sarah Sexton (Matteson), was assisting a project team with the advancement of soil borings in a remote part of a client property. Sarah, who is a Geologist, didn't have a good feeling with the three lines of evidence and voiced concerned with the project team. The project team initially felt, based on the history of the site, previous site work and surrounding land usage, utilities were not located in the area they were working. However, the team recognized the concern and Sarah conducted a walk around the area as an additional line of evidence. While searching for utilities, Sarah identified a gas line marker. A 3rd party utility contractor later determined one of the proposed borings was very close to or perhaps directly above a high-pressure gas line. Sarah's use of stop work may have saved lives. She received a health and safety award for her actions.

2.8 Short-Service Worker Program

Workers new to Arcadis, work locations, and projects are considered short-service workers (SSWs) for a period of one year. The requirements also apply to any existing Arcadis worker who is inexperienced in the task being completed outside of any office setting. SSWs may be at greater risk because they are unfamiliar with tasks, the location, and safety or security procedures. These employees will be provided mentoring, coaching, or paired with other staff until they can work safely on their own. Based on established procedures, SSW H&S Standard (ARC HSGE019), or client requirements, SSWs may be assigned a field mentor along with other minimum requirements to assist them to understand safety considerations for project tasks and procedure implementation.

As required, Arcadis will comply with client-specific SSW requirements including identification/ designation markings, work-alone limitations, and work-team SSW maximum head-count requirements. Refer to the site-specific HASP and/or client-specific H&S requirements for additional details.

Did You Know? Arcadis Standard ARC HSGE019" includes guidance on implementing Arcadis' Short-Service Workers Program.

2.9 Workplace Violence and Harassment

Threats or acts of violence are strictly prohibited. Workers must not engage in intimidation, threats or hostile behaviors, physical abuse, vandalism, arson, sabotage, use of weapons, carrying weapons onto Company property, or any other act, which, in management's opinion, is inappropriate for the workplace. In addition, workers must refrain from making bizarre or offensive comments regarding violent events and/or behavior. Workers are expected to report any prohibited conduct to management. Workers should directly contact proper law enforcement authorities if they believe there is a serious threat to the health and safety of themselves or others. Refer to the Arcadis Human Resources Policies Handbook and the Arcadis Weapons in the Workplace H&S Standard (ARC HSGE025) for more information.

The Company strives to maintain a work environment free of harassment. In doing so, the Company prohibits harassment because of race, color, religion, sex, genetic information, national origin, ancestry, marital status, veteran status, age, sexual orientation, physical or mental disability, or any other basis prohibited by law. Unlawful harassment includes verbal or physical conduct that has the purpose or effect of substantially interfering with an individual's work performance or creating an intimidating, hostile, or offensive work environment. Actions based on an individual's race, color, national origin, religion, disability, or any other legally protected characteristic will not be tolerated. Prohibited behavior includes, but is not limited to, the following:

- Written form, such as cartoons, email, posters, drawings, or photographs;
- Verbal conduct, such as epithets, derogatory comments, slurs, or jokes; and,
- Physical conduct, such as assault, or blocking an individual's movements

Any worker who believes that they have been the subject of harassment is responsible for reporting the alleged act immediately to the HR director or worker relations staff in the HR department. There will be no discrimination or recrimination against any worker for making a report of harassment. All reports of harassment will be thoroughly investigated Refer to the Arcadis HR Policies Handbook for more information.

2.10 Weapons in the Workplace

All company workers and subcontractors are prohibited from carrying a weapon while performing their work for the company, whether they are on company property, and regardless of whether they are licensed to carry a weapon or firearm. Workers may not carry a weapon covered by this policy while performing any task on the company's behalf. The only exceptions to this policy will be persons who have been given written consent by the company i.e. by the company President, Vice President (Operations), or Director of Health & Safety to carry a weapon while performing specific tasks on the company's behalf (e.g. a wildlife monitor). Such exception request shall be made in writing and indicate the basis for the exception.

Arcadis clients may have weapons in the workplace policies that are more stringent than the Arcadis requirements. When working for these clients, Arcadis staff (including contract and temporary workers) must comply with the client-specific requirements.

Did You Know? Arcadis Standard ARC HSGE025 "Weapons in the Workplace" includes weapon prohibitions in Arcadis workplaces and Client Sites.

2.11 Drug and Alcohol Awareness

The following information is from the HR Policies Handbook. (For most current requirements, always refer to the most recent version of the HR Policies Handbook.)

Arcadis is committed to providing a safe environment for all workers, contractors and visitors. This alcohol and drug policy is intended to prevent incidents/accidents due to impaired performance arising from prescription drugs, nonprescription drugs and / or alcohol use. The company will take every reasonable precaution for the protection of its workers, subcontractors and visitors. All Workers must be fit to safely perform their duties free from impairment when working or scheduled to work.

As part of its health & safety program, Arcadis implements drug and alcohol testing in the following circumstances:

- where the company has reasonable cause to believe that an worker or subcontractor worker is impaired from using prescription/ nonprescription drugs or alcohol in the workplace ("Reasonable Cause");
- when an worker, or subcontractor worker is involved in a significant work-related incident to investigate whether the incident was caused in whole or in part by impairment by prescription/ nonprescription drugs or alcohol ("Post-Incident");

- as part of an overall safety program, when an worker is in a safety sensitive role (Bona Fide Occupational Requirement);
- as a follow-up to a worker's treatment for prescription/ nonprescription drugs or alcohol addiction, in accordance with applicable law ("Return to Work").

The entire HR Drug and Alcohol Policy is available in the Arcadis HR Policies Handbook posted on the ANA intranet site. Violation of this policy may result in discipline up to and including termination.

If you experience someone at an office or project site who appears to be under the influence of drugs or alcohol, please do the following:

- Use your stop work authority and get you both to a safe and private place;
- Share your observations with the person, ask them any applicable questions: are they ok, are they under the influence of drugs or alcohol, do they need immediate medical attention;
- Remember, some medical conditions can seem like a person is intoxicated, such as a diabetic with low blood sugar. These can also be signs of exhaustion. It's important not to make assumptions.
- Reach out to Employee Relations (employeerelations.ana@arcadis.com) and copy your People Business Partner, your Region Director, and the employees line manager (or your line manager, if you are the employees line manager). Employee Relations will assist you from there (after hours reach out to your Health & Safety Manager on duty.)
- Record your observations: did you see them drink, do you smell alcohol, did they say they were drinking, other indications like: low inhibition, uncoordinated, slurred speech, glassy eyes, slow reaction. Record any witnesses to these observations.
- Next steps may include: sending the employee for medical help, drug and alcohol testing, sending the employee home, etc.
- Drive the employee to the medical facility, testing facility, and/or home (or to their hotel).

2.12 Emergency Action Planning

Every Arcadis project must include an Emergency Action Plan that addresses prevention and response procedures for each type of anticipated emergency and must address:

- The types of emergencies that could reasonably occur
- Methods of prevention as applicable
- Evacuation routes
- Site contact numbers
- Location of all emergency telephone numbers, alarms, and response equipment, as applicable

- Procedures to be followed in the event of an emergency.

Prior to the start of daily operations, Site Supervisors will evaluate the work area and project site for potential for the development of emergency situations. These situations may include, but are not limited to, fire, spills, weather events, or other natural disasters.

Did You Know? Arcadis Standard ARC HSMS008 “Emergency Response and Fire Safety” includes requirements and recommendations relating to emergency planning and fire safety.

2.13 WorkCare

WorkCare must be called for ALL non-emergency injuries. For emergency-type injuries (e.g., severe bleeding, unconsciousness, not breathing, obvious fracture), a call to WorkCare is not required.

WorkCare is available 24 hours a day, 365 days a year. This service provides professional medical assistance over the telephone for nonemergency injuries or illnesses. The WorkCare nurse or doctor assesses the injury or symptoms, advises the worker on the appropriate care, and assists in identifying a medical facility, if a clinic visit is deemed necessary.

WorkCare
1 888 449 7787 (US)
***NOTE**: Seek emergency medical treatment when needed.*

2.14 Subcontractors

All Arcadis subcontractors are responsible for assigning specific work tasks to their workers; providing qualified workers; allocating enough time, materials, and equipment to safely complete assigned tasks; and equipping their workers with any required PPE.

Arcadis considers subcontractors to be experts in all aspects of the work operations which they are tasked to provide. Each subcontractor is responsible for complying with any regulatory requirements that are applicable to the services being provided. Subcontractors must develop JSAs in consultation with the Arcadis Site Supervisor or follow the Arcadis JSA specific to the services they are providing.

Arcadis workers must continue to be vigilant in H&S requirements onsite and to exercise appropriate STOP WORK authority with our subcontractors when warranted

If a subcontractor's procedures/requirements conflict with requirements specified by Arcadis, they will adopt the more stringent guidance after discussion and agreement between the subcontractor and Arcadis project H&S workers. Revised procedures must be formally recorded in project health and safety documents.

Subcontractors are responsible for the H&S of their workers at all times and have the authority to stop work if unsafe situations arise. All Arcadis workers have the authority to stop the Arcadis subcontractor's operations. The PM or Site Supervisor have the authority to remove the subcontractor or subcontractor worker from the site for failure to comply with established H&S procedures or for operating in an unsafe manner.

2.15 Regulatory Inspections

If a compliance officer from a regulatory agency arrives at an Arcadis project site, the Site Supervisor at the site will, as soon as possible, contact Arcadis H&S for guidance and advice on following Arcadis procedures for managing these events.

The Regulatory Agency Inspections Standard provides guidance on the process for appropriately managing a H&S inspection by a regulatory agency (e.g., Occupational Safety and Health Administration [OSHA], Department of Transportation [DOT], Federal Aviation Administration [FAA], or similar agency) of Arcadis or at a site on which Arcadis is working.

Did You Know? Arcadis Standard ARC HSGE013 "OSHA and Other Regulatory Agency Inspections" includes requirements for managing a regulatory inspection.

2.16 Recordkeeping and Postings

Arcadis offices and projects with field offices will maintain required Arcadis and OSHA Regulatory postings and records. State OSHA and workers compensation requirements may also require postings. Field office must post:

- Occupational Health and Safety Legislation and Regulations;
- Joint Health and Safety Members lists;
- Joint Health and Safety Meeting Minutes;
- Arcadis Global H&S Vision and H&S Policy poster;
- Workplace Violence and Harassment Policy (Respect in the Workplace)
- H&S Commitment Poster and the Six Fundamental H&S Principles;

- OSHA Job Safety and Health : It's the Law poster;
- OSHA 300A log, as directed by the Corporate H&S, from February to March of each year;
- List of Designated First Aid Trained Workers;
- Any state required postings;
- Arcadis TRACK poster;
- Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDSs) applicable to the site;
- Incident Reporting Process;
- Emergency Action Plan.
- Emergency phone numbers and other information required by the project HASP or JSA; and,
- Arcadis STOP WORK Authority poster.

The project HASP and relevant JSAs must be readily available on-site. Likewise, other H&S forms such as tailgate meeting minutes, specialized checklists, incident and near miss investigations, and work permits, also must be available on-site. Other project H&S records, such as training documentation, must be available for review. Depending on the project, training records may be kept on site or be immediately accessible from project management, HR, or worker files when requested.

3 General Field Health and Safety Requirements

NOTE: *Most of the regulatory agencies referenced in this handbook are U.S. based (e.g., OSHA, FAA, American National Standards Institute [ANSI], National Fire Protection Association [NFPA], National Institute for Occupational Safety and Health [NIOSH], United States Environmental Protection Agency [USEPA]). Work in Canada will be required to follow, as a minimum, those requirements as outlined by provincial occupational H&S regulations. For Arcadis work, governmental requirements to the country where the work is performed are always the minimum standards to follow. Where this handbook or the project HASP specifies more stringent requirements, those requirements must be followed.*

3.1 Daily Safety Meetings/Tailgates

Arcadis requires that the Site Supervisor conduct at least one (1) safety meeting (tailgate meeting) daily before work begins for the day. A second tailgate meeting is recommended after lunch. Tailgate meetings should cover the work to be accomplished, the anticipated hazards, the PPE, measures and procedures required to minimize those hazards, and site emergency procedures. The pre-work shift tailgate meeting is mandatory.

Daily safety meetings are an integral part of identifying and communicating site hazards and managing risk.

Did You Know? Arcadis Standard ARC HSGE001 “Daily Tailgate Meeting” includes requirements and recommendations for completing an effective daily safety meeting.

No one may begin working before the daily tailgate meeting. If new tasks or new hazards arise, the Site Supervisor must hold another tailgate meeting that day. Workers and, when applicable, visitors that arrive at

project sites after the daily safety meeting, must be briefed on elements of the meeting applicable to their work or visit. The process for conducting these meetings follows the TRACK process and must include use of the Arcadis tailgate meeting form unless the client's work requirements require the use of a different form. The Arcadis tailgate meeting minute form includes important elements that are required for regulatory compliance, such as a prompt to specify required PPE and to inspect it prior to use.

Fulcrum is an app that allows Arcadis to create digital forms that be completed and synchronized while in the field. A popular app within Fulcrum is the H&S Tailgate Meeting Form (Tier 1).

3.2 Respiratory Protection

Arcadis workers occasionally work in environments requiring respiratory protection. Respirators will be provided by Arcadis to any worker who will or may be exposed to harmful vapors, dusts or oxygen-deficient atmospheres as part of their work duties at no cost to the worker. Respirator selection and use must comply with the Arcadis Respiratory Protection Standard. Prior to beginning tasks that require respirator use, a Level C Supplement must be completed and incorporated in the project HASP.

Did You Know? Arcadis Standard ARC HSGE017 "Respiratory Protection" includes requirements and recommendations for wearing a respirator.

3.2.1 Qualifications to Wear a Respirator

3.2.1.1 Training

Training will be provided prior to using the respirator the first time, when changes in the workplace or the respirator make the training obsolete, when inadequacies are found in the worker's knowledge or use of their respirator, or any other situation in which retraining appears necessary, and generally every two (2) years. Training records will be kept by the individual worker with copies of such certificates forwarded to Arcadis HR Operations for retention of the worker's training records.

3.2.1.2 Medical Clearance

Employees must have received an initial and annual medical examination in accordance with the Arcadis Medical Surveillance Program HSS (ARC HSGE010) prior to fit testing. Evidence of medical clearance to wear respiratory protection or physician authorization must be provided for review to the individual conducting the fit test (fit test administrator). Any medical examination required as part of the fit testing process will be in accordance with the Medical Surveillance Program HSS. The evaluation will be confidential, convenient, understandable, conducted during normal working hours, and at no cost to the employee. The employee will be given a chance to discuss the results with the examining physician or another licensed healthcare professional.

Results of medical surveillance examinations will be maintained by WorkCare, the designated medical provider, in compliance with 29 CFR 1910.1020 (Access to employee exposure and medical records).

3.2.1.3 Fit Testing

A respirator fit test will be completed on all workers that wear or may wear a respirator to ensure the respirator provides a seal against the worker's face and provides adequate respiratory protection.

Fit tests must be completed annually by a qualified fit tester. Each respirator that a worker is expected to use (e.g., half-faced, full faced, supplied air, etc.) must be fit tested separately.
Fit Test Administrators are responsible for conducting qualitative fit testing for employees in their locations unless the location elects to use WorkCare to coordinate testing at a clinic or Corporate H&S.

Fit test records will be maintained by the employee who is fit tested per 29 CFR 1910.134 (m)(2)(11) and, where utilized, the designated medical provider. In addition, records for those employees fit tested by a Fit Test Administrator will be sent to the Arcadis Corporate H&S Department (anacorphs@arcadis.com) and kept electronically in a central and confidential location. In accordance with 29 CFR 1910.134(m)(2)(ii), OSHA requires that Arcadis retain the fit test records for respirator users until the next fit test is administered.

3.3 Transportation Safety

3.3.1 Dangerous Goods Shipping and Transportation

Dangerous goods are materials having a safety concern when shipped or transported by ground, air or on water. These materials include, but are not limited to, explosives, compressed or liquefied gases, flammable liquids and solids, oxidizers and organic peroxides, toxic liquids or solids, corrosive liquids or solids, and miscellaneous items such as batteries, hazardous wastes, dry ice, etc.

Shipping determinations are required whenever transporting dangerous goods. Dangerous goods shipments (including those transported by Arcadis) must be packaged and transported in accordance with all federal,

provincial, territorial and carrier requirements. To ensure safety and compliance, Arcadis requires all samples (hazardous or not), liquids, powders, gases, biohazard materials, batteries, and equipment containing radioactive or magnetic materials to be evaluated for dangerous goods classification using the Arcadis shipping determination process.

Workers performing or approving shipping determinations, preparing/reviewing/approving waste profiles, collecting materials described above, preparing containers, selecting packaging, preparing packaging, marking and labeling the package, and preparing shipping papers for the transportation of dangerous goods (TDG) must be properly trained in accordance with Arcadis TDG requirements. This requirement applies to all sample collection activities whether the samples collected are considered to be dangerous goods.

3.3.2 Commercial Motor Vehicles

A commercial motor vehicle (CMV) is any vehicle alone or in combination (has a trailer attached) with a gross vehicle weight rating (GVWR) of 10,001 lbs. or more or any vehicle transporting placard able quantities of dangerous goods Arcadis requires any worker operating a truck or a truck and trailer combination greater than or equal to 10,001 lbs. to be enrolled and actively participate in the Arcadis CMV Program.

3.3.3 Remotely Piloted Aircraft Systems (RPAS) / Drones

There are special requirements associated with the operation of unmanned aerial vehicles (also referred to as drones). Only Federal Aviation Administration (FAA) licensed operators are permitted to operate a drone for occupational purposes. Contact the Arcadis Director of Transportation Safety or consult the Transportation Safety Program Standard ARC DOT-501, “Drone System Safety” for more information.

3.3.4 Temporary Traffic Safety Planning

If project work will be conducted in the public right-of-way (ROW) or parking lot, a Traffic Safety Plan (TSP) developed in accordance with applicable provincial or territorial regulations is required. The Arcadis Traffic Safety Handbook details typical temporary work zone scenarios and includes information relating to completion of the TSP. The Traffic Safety Handbook can be accessed through the Arcadis Health and Safety SharePoint site under the Transportation Safety Program. It should be noted that where there are differences between the guidance provided in the Arcadis Traffic Safety Handbook and the regulations, the requirements of the regulations shall prevail. The TSP may be prepared using an Arcadis TSP template or an alternate format as approved by an Engineer. The only requirements for TSPs are they:

- Must be written (text, pictures, drawings, pictograms either alone or in combination)

- Must be provided to the field staff expected to implement and/or work in the ROW, or other areas with recognized vehicular traffic hazard
- Be approved by an engineer when required by the Arcadis Traffic Safety Handbook - DOT Fact drawing “M1” note or by the TSP Plan Template
- It is recommended that the implementation of TSPs within public ROWs be subcontracted to traffic control specialty contractors who will have the required signage, barricades and crash trucks to properly implement the TSP.

For work involving on-site traffic and/or pedestrian controls, [i.e. not within the public ROW] a TSP is still required. Preparation of a Non-ROW TSP is similar to ROW TSP preparation. However, a non-ROW TSP may be approved by a HASP Reviewer instead of an engineer.

The Arcadis TSP template is designed to accommodate both ROW and non-ROW elements. Please refer to the Traffic Safety Handbook, accessed through the Arcadis Health and Safety SharePoint site under the Transportation Safety Program.

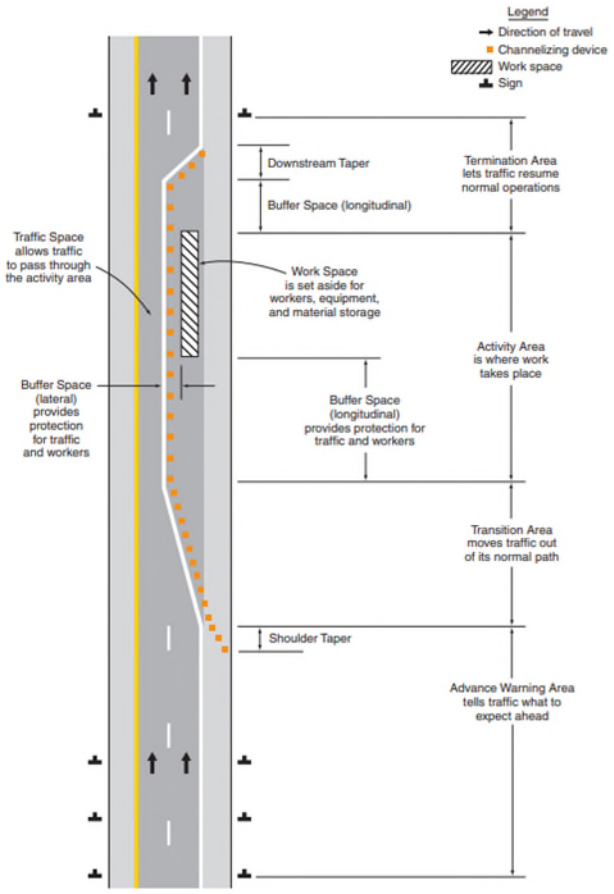


Figure 3-1 Example traffic safety diagram

3.4 Motor Vehicle Safety

This section contains information for transportation and vehicle safety on public and private ROWs and off-road.

Did You Know? Arcadis Standard ARC HSGE024 “Motor Vehicle Safety” includes requirements and recommendations for operating motor vehicles.

3.4.1 Vehicle Safety Inspection

All company owned, leased or rented vehicles will be maintained in safe operating condition. To ensure vehicles are properly maintained, a daily pre-trip visual inspection must be completed prior to operating the vehicle. The pre-trip inspection should include, but is not limited to:

- Seat belts
- Doors and door locks
- Lights
- Mirrors
- Horn
- Back up alarms, if equipped
- Parking brake
- Instrument panel
- Steering
- Window
- Windshield wipers
- Tires
- Emergency equipment

A more comprehensive documented weekly inspection (daily if required by the client, or if vehicle is operated in harsh environments) is also required. Rental vehicles operated by Arcadis for more than one week must use the documented weekly inspection process. Inspections are required to be documented on the Weekly Vehicle Inspection Checklist, in Arcadis approved software, or through a client approved equivalent form or software.

Motor vehicle inspections for vehicles identified as a CMV in the Arcadis CMV Program will be inspected in accordance with the relevant Federal, Provincial, and Territorial requirements for CMV inspections.

Verizon Reveal Driver is an app that is part of the Verizon Telematics system utilized by Arcadis. Operators of fleet vehicles and long-term rentals have the ability to access their driver scorecard utilizing the app.

3.4.2 Driving

All Arcadis workers, temporary agency workers, and contract workers driving for Arcadis business shall:

- Wear seat belts always
- Operate and license the vehicle in accordance with applicable laws
- Drive defensively as learned through training, education, and experience
- Exercise caution when taking any prescription or over-the-counter medication that may cause drowsiness or altered mental state
- Have headlights on at all times, even during daylight hours
- Not use controlled substances, illegal drugs, or alcohol while driving for Arcadis business
- Not drive in a manner that could be deemed reckless or aggressive by other drivers
- Not use radar detectors; and
- Remember and continually utilize the Smith System® Driving Keys®:
  - Aim High in Steering®
  - Get the Big Picture®
  - Keep Eyes Moving®
  - Leave Yourself an Out®
  - Make Sure They See You®

Arcadis drivers should avoid distractions while they operate motor vehicles, and the vehicle is moving. These distractions include such things as eating, drinking, reading maps or other information, operating and adjusting the radio.

The Arcadis Motor Vehicle Safety Program H&S Standard (ARC HSGE024) presents policies concerning the use of cell phones and other electronic devices while operating a motor vehicle. This H&S standard prohibits use of cellular phones and other devices, including when in hands-free mode, while driving any vehicle for Arcadis. Phones used as a GPS device or actual GPS devices may be used but must be mounted in the vehicle either permanently or with a temporary mount. Several navigation apps provide user-reported traffic hazards and allow for vehicle operators to update others based on current conditions. Arcadis expects drivers to remain focused on driving and avoiding interacting with navigation apps while the vehicle is in motion.

Waze is a popular navigation app that provides driving directions, anticipated delays based on historical and current traffic congestion. It also provides user-reported traffic hazards. Navigation apps are tremendously useful but please read the important message above.

3.4.2.1 Driving Off Road

When operating a vehicle off-road, the following information provides some techniques for safe driving:

- When approaching a hill, survey the hill for obstacles and the safest route prior to attempting to climb the hill in a vehicle.
- When climbing a hill, use as high a gear as the vehicle will "pull" comfortably. If the gear selected is too low, the tires may spin. If the gear is too high, there may not be enough power to climb the hill. (The general rule of thumb is 3rd gear up and 1st gear down with an automatic transmission; 2nd gear up and 1st gear down with a manual transmission; all in low range. If this doesn't work, high range is recommended.)
- Line up your vehicle so it has a straight approach to a hill. If possible, try to keep the vehicle parallel with the slope of the hill, so the vehicle's weight is equally distributed, providing equal traction to all four wheels. Apply power at the bottom of the hill, and ease off the throttle when you go over the top to keep the vehicle under control.
- If parking on a hill, turn off the engine, leave it in gear with a manual transmission (or in park with an automatic transmission and while maintaining application of the brakes, apply the emergency brake). Place chocks, rocks, or logs under the wheels to provide additional braking assistance.
- If the vehicle stalls going uphill, the following is recommended for safe descent down the hill:
    - Apply the brakes
    - Put the vehicle in reverse
    - Release the clutch (if applicable) and brake pedal gently and simultaneously to fully engage the reverse gear; and,
    - Descend back down the hill using only the engine to keep the descent slow. Remember that visibility is limited when braking downhill, steering is much quicker, and steering kickback is more violent. Do not attempt to turn around on a steep hill, as the vehicle may roll.

Recommendations for hidden obstacles:

- Always check water, snow, high grass, and mud crossings for hidden obstacles, such as logs, rocks, and holes.
- When approaching obstacles, such as a ditch, stop and inspect the ditch to identify an appropriate route to cross, preferably at an angle, so that only one tire enters the ditch at a time when crossing. This leaves the other three tires on solid ground to provide traction. Avoid entering a ditch squarely because the entire axle could lose traction, and this may also cause difficulty when attempting to exit the ditch.
- Before driving over large objects, consider whether a ramp in front of and behind any rock is needed to reduce potential of vehicle grounding out; and
- Because the underside of the vehicle has many fragile and vital components (e.g., differentials, drive shafts, transmission, transfer case, oil pan, exhaust, gas tank), it's best to drive over an obstacle by placing one tire on it, then gently driving over it, rather than trying to take it down the center.

Driving in Deep Sand, Snow, or Mud

- When driving through deep sand, snow, or mud, deflate your tires slightly to increase the tire's footprint and provide better traction. However, remember that deflated tires will decrease your ground clearance.
- Remember to inflate your tires before going on-road again.
- Use a steady momentum to carry you through. Keep your speed up and use higher gears. Do not spin your tires and do not stop until the vehicle is out of the deep sand, snow or mud. If your wheels start to spin, ease off the throttle just a bit and allow the tires to slow down and regain traction. If you lose traction and the vehicle is barely moving, turn the steering wheel quickly from side to side in short strokes to allow the front tire walls to find extra grip.
- If muddy conditions force you to drive in the ruts, know where your front wheels are always pointed. Your vehicle will follow the ruts, even with the wheels turned to the right or left. If you encounter a dry spot with the wheels turned, then the front wheels can regain traction and suddenly throw the vehicle out of the ruts, resulting in a loss of control and possible damage.
- Remember that hard snow crossed in the early morning can be impassably soft in the afternoon when temperatures may be higher. The same is true for frozen soil environments during cold weather where afternoon thawing of frost may make soil soft and impassable.

Rules for Off-Road Driving

1. Only four-wheel drive or all-wheel drive vehicles should be taken off-road
2. Steering should be precise.
3. The brakes should be used as little as possible.
4. Apply the throttle smoothly and release it slowly to keep the tires from spinning on acceleration and from locking on deceleration.
5. Each obstacle along the route should be attempted as slowly as possible but as fast as necessary.
6. Remember to put the vehicle in 4-wheel drive before needing it and shift to low range early to reduce the strain on the vehicle.
7. When unsure of the surface, select low range.
8. Never change gears in the middle of a water crossing, hills (ascent or descent), or sand crossing.
9. Do not drive with your thumbs on the inside of the steering wheel, as the rough terrain could result in serious bruising or dislocation of your thumbs.

Crossing Water

1. Determine how deep the water is and how smooth the bed of the crossing will be before entering the water body
2. Do not attempt to cross floodwaters. The depth of the water is not always obvious. Moving water has tremendous power. Six inches of moving water has the potential to knock you off your feet, and a foot of water can sweep a vehicle—even a large SUV—off of the road. Visit the National Weather Service (NWS) Turn Around Don't Drown® program for more information.
3. If your vehicle is trapped in rapidly moving water, stay in the vehicle.
4. If water is moving at a high velocity and is rapidly rising in the vehicle, exit the vehicle immediately, seek refuge on the roof of the vehicle, and signal for help.
5. If your vehicle stalls, leave it immediately (unless water is moving at a high velocity) and move to higher ground. Rapidly rising water can engulf the vehicle and its occupants, sweeping them away.
6. The U.S. Bureau of Reclamation calculated flood danger to passengers in vehicles as varying combinations of flood water depth and velocity. According to their calculations, flood water depths of 3 feet and 0 (zero) flood water velocity pose a high danger to nearly all passenger vehicles. If flood water velocity is 9 feet per second, then flood water depths of approximately 2 feet pose a high danger, and if flood water velocity is 16 feet per second, then flood water depths of slightly more than 1 foot can pose a high danger.
7. Water weighs 62.4 pounds/cubic foot and typically flows downstream at 6 – 12 miles per hour. Furthermore, 2 feet of water is sufficient to float a standard automobile and 500 pounds of lateral force are applied to a car for each foot the water rises.

3.4.3 Trailer Safety

The use of a trailer to haul vehicles, machinery, or equipment is a necessary component of many Arcadis projects. These articulated vehicles are helpful due to the flexibility of the moving parts, time in which it takes to couple and uncouple the parts, and the smaller turning radius allowing tighter turns and better maneuverability. Care needs to be taken when operating this equipment as property, personal safety, and the safety of others are at stake. Proper maintenance of the equipment and correct loading and unloading procedures will provide for the safety of workers using the equipment, avoid costly repairs for damages, and prolong the life of the equipment.

3.4.3.1 Trailer Use

There are four (4) types of trailer hitches that are commonly used:

- Receiver type hitches using a conventional ball and hitch coupler;
- A fifth wheel type hitch;
- A gooseneck ball type hitch; and,
- A pintle type hitch.

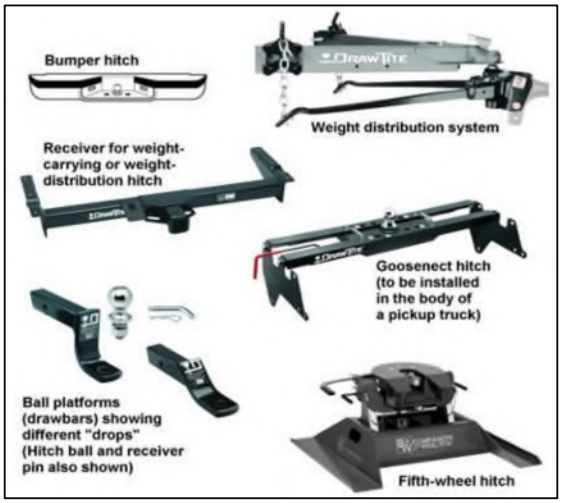


Figure 3-2 Types of Trailer Hitches

Arcadis vehicles are typically equipped to tow conventional ball and hitch trailers.

Before loading a trailer, know the gross vehicle weight rating GVWR and gross axle weight rating (GAWR) of the trailer. The latter is the maximum load-bearing capacity of the trailer's axles. The weight of the load should not exceed the GVWR or GAWR. The GVWR and GAWR can be found on the trailer certification label, which is usually near the front of the trailer.

Loading

Loading is a critical time when weight-bearing objects are added onto the trailer. Before this occurs, the trailer should be firmly fastened to the truck hitch using the following steps:

Hitching Trailer

1. Provide ample lighting for night-time operations.

2. Verify hitch, receiver, and ball are appropriately sized and rated for the loaded weight of the trailer.
3. Elevate the trailer tongue so the ball coupler will clear the towing vehicle's ball;
4. Using a spotter, back up the truck until the ball coupler is directly over the ball of the towing vehicle, taking caution not to back the truck into the trailer;
5. Put the vehicle in park and engage the parking brake of the vehicle;
6. Make sure the coupler latch is in the unlocked position and ready to engage;
7. Confirm that the hitch coupler is free of obstructions to allow proper engagement to the ball;
8. Lower the tongue of the trailer onto the truck hitch making sure it is fully seated onto the hitch ball;
9. Depress the coupler latch so it is securely seated and insert the safety pin; and,
10. Cross and attach the two safety chains from the trailer onto the truck and firmly shake the trailer to confirm proper connection.

***Note**: Use of a spotter when backing is recommended.*

Loading Trailer

Loading is a critical time when weight-bearing objects are added onto the trailer. Before this occurs, the trailer should be firmly fastened to the towing vehicle using the steps above. Once the trailer has is confirmed to be properly fastened to the towing vehicle, following steps:

1. Properly align the trailer with the towing vehicle, preferably on flat solid ground;
1. Trailer should be positioned in a straight manner directly behind towing vehicle to avoid stress to the coupling.
2. Be sure the load is evenly distributed throughout the trailer with 60% of the load in front of or over the trailer axles. Do not rear-load the trailer with the majority of the weight near the rear.
3. Avoid overloading the trailer. Know the weight limits of the vehicle and understand how to calculate the weight of material that is being loaded.
4. Tie down your load on using tie-down locations, on the load and on the trailer; and,
5. Be sure the tailgate of the trailer is securely in place and fastened with a strap or rope to prevent tailgate loss.

Unloading Trailer

1. Maneuver the vehicle and trailer fully out of right-of-way and preferably on flat ground;
2. If necessary, rearrange or clear areas to provide easy access to unloading areas and to provide a flat and safe place to unload;
3. Unstrap the tailgate of the trailer and place the ramp squarely against the back of the trailer, confirming that the ramp is fully seated against the back of the trailer;

4. Unhook the load and clear straps from underneath the load and trailer so that nothing gets caught on the load while unloading.
5. Provide ample lighting for night-time operations.

Maintenance

Proper maintenance of the trailer and its accessories will prolong the operational life of the equipment and provide for the safety of workers using the trailer. Take simple steps (summarized below) before, during, and after you use the trailer to safely transport the trailer and the load.

Before departure, perform a six-point inspection to confirm that:

1. Load is secure, not projecting over the edge of the trailer, and there are no flapping accessories;
2. Tie downs are not frayed, hooks are in place, and straps are tight;
3. There is adequate tire pressure for the load and a spare tire is available;
4. The cup of the trailer is fastened down on the trailer hitch, the latch is fully depressed with a safety pin installed, and safety chains are crossed and hooked;
5. The electrical attachment for taillights/brake lights is firmly in place; and,
6. The breakaway braking mechanism is properly functioning (when equipped).

***NOTE**: Double check items 4 through 6 above*

During Use:

- While enroute to destination, confirm that the load is secure when entering or exiting dirt roads. Based on conditions of the dirt road, you should stop frequently and check load security;
- When backing, performing 3-point turns, or turning tight corners with the trailer, be sure the inside angle of the trailer to the truck does not become less than 40 degrees. Angles that become overly acute will cause the trailer to jackknife against the truck, possibly causing equipment damage and trailer and/or hitch failure;
- In the event of a flat tire on the truck or trailer, minimize the weight of the load on the vehicle or trailer by off-loading, if possible. By reducing the weight in the vehicle or trailer, it will minimize the stress placed on the jack during changing of the tire.
- If a flat occurs to the truck with no load while towing a loaded trailer, simply unhitch the trailer, place chocks or blocks under the wheels of the trailer to prevent run-away and change the truck tire according to manufacturer guidelines.

After Use:

- To prevent trailer run away, always chock/block the tires when the trailer is not in use;
- Inspect and repair axle and wheel damage;
- Lubricate pins, bearings and bushings for smooth operation;
- Inspect and repair hitch and clamp components if damaged or worn;
- Confirm that cup of hitch is free of obstructions to allow proper engagement to the ball.

3.4.3.2 Safety Tips for Driving with a Trailer

Take time to practice before driving on main roads and never allow anyone to ride in or on the trailer. Before leaving, remember to check routes and restrictions on bridges and tunnels. Consider the safety tips listed below each time you drive with a trailer.

General Handling:

- Use the driving gear that the manufacturer recommends for towing;
- Drive at moderate speeds. This will place less strain on the tow vehicle and trailer. Trailer instability (sway) is more likely to occur as speed increases;
- Avoid sudden stops and starts that can cause skidding, sliding, or jackknifing;
- Avoid sudden steering maneuvers that might create sway or undue side force on the trailer;
- Slow down when travelling over bumpy roads, railroad crossings, and ditches;
- Make wider turns at curves and corners because the trailer's wheels are closer to the inside of a turn than the wheels of your tow vehicle, they are more likely to hit or ride up over curbs; and,
- To control swaying caused by air pressure changes and wind buffeting when larger vehicles pass from either direction, release the accelerator pedal to slow down, and keep a firm grip on the steering wheel.

Braking:

- Always use early braking and allow considerably more distance for gradual stopping;
- If equipped with an electric trailer brake controller and excessive sway occurs, activate the trailer brake controller by hand. Do not attempt to control trailer sway by applying the tow vehicle brakes because this will generally worsen sway; and,
- Always anticipate the need to slow down. To reduce speed, shift to a lower gear and press the brakes lightly.

Acceleration and Passing:

- When passing a slower vehicle or during lane changes, signal well in advance and provide extra distance to clear the vehicle before pulling back into the lane;
- Pass on level terrain with plenty of clearance. Avoid passing on steep upgrades or downgrades;
- If necessary, downshift for improved acceleration or speed maintenance; and,
- When passing on narrow roads, be careful not to go onto a soft shoulder. This could cause the trailer to jackknife or go out of control.

Downgrades and Upgrades:

- Downshift to assist with braking on downgrades and to add power for climbing hills;
- On long downgrades, apply brakes at intervals to keep speed in check. Never leave brakes on for extended periods of time as they may overheat; and,
- Some tow vehicles have specifically calibrated transmission tow-modes. Be sure to use the tow-mode recommended by the manufacturer.

Backing Up:

- Place hand at the bottom of the steering wheel. To turn left, move your hand left. To turn right, move your hand right. Back up slowly. Because mirror visibility is limited when backing up, use a spotter, whenever possible.
- Use slight movements of the steering wheel to adjust direction. Exaggerated movements will cause greater movement of the trailer. If having trouble during backing, pull forward and realign the tow vehicle and trailer, and start again.

Parking:

- Avoid parking on grades. If possible, use a spotter during parking activities. Once stopped, but before shifting into park, have someone place chocks or blocks on the downhill side of the trailer wheels. Apply the parking brake, shift into park, and then remove your foot from the brake pedal. Following this parking sequence is important to make sure your vehicle does not become locked in park because of extra load on the transmission. For manual transmissions, apply the parking brake and then turn the vehicle off in either first or reverse gear.
- When uncoupling a trailer, place chocks or blocks at the front and rear of the trailer tires so the trailer does not roll away when the coupling is released.

- When parking with a trailer in an off-road situation, plan the egress route prior to parking so the truck and trailer with any added load while parked can safely egress the location. Always consider ground conditions and slope when planning the egress route.

3.4.4 Specialty Vehicle Operation (ATVs, UTVs, and Snowmobiles)

Specialty vehicles include, but are not limited to, all-terrain vehicles (ATVs), utility task vehicles (UTVs), and snowmobiles. Arcadis defines specialty vehicles as follows:

- An ATV is a motorized, off-highway vehicle designed to travel on four low-pressure tires, having a seat designed to be straddled by the operator, and handlebars for steering control. ATVs are subdivided into two types, as designated by the manufacturer: Type I ATVs are intended by the manufacturer for use by a single operator and no passenger; Type II ATVs are intended by the manufacturer for use by an operator and a passenger and are equipped with a designated seating position behind the operator.
- A UTV is a vehicle with four or more wheels, a steering wheel, non-straddle seating (has side-by-side seating for passengers), maximum speeds between 40 km/hr and 80 km/hr (25 mph and 50 mph), foot controls for throttle and braking, occupant restraints, rollover protective structures, and typically a bed or other type of cargo storage area. UTVs include recreational off-road vehicles (ROVs) and multipurpose off-highway utility vehicles (MOHUVs). For the purposes of this standard, the term also includes small “snowcat” vehicles (designed for one to four occupants), golf carts, and “Cushman” type carts used in manufacturing facilities.
- A snowmobile is an open vehicle manufactured for travel on snow for one or two persons with steerable skis on the front and an endless belt at the rear.

Did You Know? Arcadis Standard ARC HSFS001 “Specialty Vehicle (ATV, UTV, etc.)” includes requirements and recommendations for operating specialty vehicles on project sites.

3.4.4.1 General Operating Requirements

The following applies to the use and operation of specialty vehicles:

- Operators must be trained in the operation of the specialty vehicle that they are operating;
- Operators must operate the specialty vehicle in a manner consistent with the following:
  - Manufacturer’s recommendations. Confirm the presence of the instruction/operator’s manual;
  - At a speed safe for the conditions in which the specialty vehicle will be operated. If speed conditions appropriate for the environment cannot be reasonably ascertained, the following default maximum speed limits will be used:

  - 10 mph for traffic, pedestrian-congested areas, or off-road use; and
  - 15 mph for all other areas;
  - Will not use the specialty vehicle in a manner consistent with recreational use. Stunt driving and horseplay with specialty vehicles is strictly prohibited;
  - Will wear personal protective equipment consistent with this Handbook, the project HASP, or relevant JSA;
  - Will wear occupant restraints (seatbelts) while the vehicle is in motion, if the vehicle is equipped with occupant restraints; and,
  - Not operate the specialty vehicle on a public roadway unless equipped with equipment required for roadway use (e.g., headlights, taillights, brake lights) and operation is permitted by local jurisdiction. The project team operating the specialty vehicle on a public roadway will verify and obtain, with assistance from Arcadis Procurement, any required titling, registration, and/or insurance necessary to operate the vehicle.

- Non-Arcadis workers working in the interest of Arcadis may operate a specialty vehicle owned, leased, or rented by Arcadis with the written approval of the Arcadis project manager (email communication is acceptable). Non-Arcadis workers operating a specialty vehicle owned, rented, or leased by Arcadis must adhere to the requirements of this Handbook.
- Only Arcadis workers are permitted to ride as passengers in a specialty vehicle operated by an Arcadis driver, except in certain situations. If approved by the project manager, an authorized client, temporary agency worker, government agency representative, property owner, or contractor may ride as a passenger in a specialty vehicle operated by an Arcadis driver.
- Occupants will only ride in a manufacturer approved seat and will wear any seatbelts or other restraining device with which the vehicle is equipped; and,
- The operator will confirm the presence of the instruction/operation manual.

3.4.4.2 Specialty Vehicle Inspection and Maintenance

Operators of specialty vehicles are responsible for conducting inspections of the specialty vehicle prior to use. Inspections must be documented on the Arcadis ATV/UTV Inspection Form or equivalent.

Routine maintenance requiring the use of a vendor will be arranged by the project team. All routine maintenance will follow the manufacturer's recommended service schedule. All maintenance activities must be documented in the vehicle's maintenance log.

If a deficiency is identified that is beyond the control of the operator to correctly repair, the vehicle will be taken out of use and visible tagged on the steering mechanism near the ignition switch of the vehicle. The repair of the specialty vehicle will be arranged by the project team. Costs associated with maintenance or repair of specialty vehicles will be assigned to the project where the vehicle is assigned/operated or to the business unit overhead.

3.4.4.3 Personal Protective Equipment

PPE for Off-Road Operation

Operators of specialty vehicles (also includes operators of UTV's, ATVs and snowmobiles in on-road applications) must wear required personal protective equipment (PPE). At a minimum, specialty vehicles used in off-road applications require the following PPE:

- DOT-approved helmet with face shield (use ANSI-approved goggles if face shield is not integrated with the helmet);
- Long pants;
- Long-sleeved shirt;
- Steel- or composite-toed protective boots, and
- Protective gloves.

Additional PPE may be required for use in extreme off-road operation or when driving through heavy vegetation. This additional PPE may include leg, torso, and arm protection. Specific PPE requirements for specialty vehicle operation must be detailed in the project-specific HASP or JSA.
Approved helmets must meet one or more of the following specifications:

- DOT: conformance with the Federal Motor Vehicle Safety Standard No. 218; Motorcycle helmets (United States of America);
- Snell M2005, M2010 or M2015: certification in accordance with the Snell Memorial Foundation 2005, 2010 or 2015 Standard for Protective Headgear for Use with Motorcycles and Other Motorized Vehicle;
- ECE: approved in accordance with the United Nations Economic Commission for Europe (ECE) Regulation No. 22; and,
- British Standards Institute and shall have affixed thereto the certificate of the British Standards Institute.

PPE for On-Road Operation

Minimum PPE requirements for on-road specialty vehicle use are generally the same as for off-road use. Some jurisdictions offer exceptions to the requirement for helmet use where the vehicle is equipped with occupant roll-over protection and seatbelt assemblies and occupants are using the seatbelts. Check the legislation for the jurisdiction in which the specialty vehicle will be used to determine if helmets are required.

3.4.4.4 Operation of Specialty Vehicles in Special Conditions

Night Operation

Specialty vehicles operated at night must be equipped with functioning headlights and taillights. The specialty vehicle must also have all manufacturer supplied marking lights, reflectors, and/or retroreflective tape in good condition.

Operation in Vicinity of Heavy Equipment

All specially vehicles used in a construction setting must be equipment with an amber warning light. Low-profile specialty vehicles used in construction applications must be equipped with at least one orange flag with a minimum height of 2 m to increase visibility to operators of heavy equipment.

3.4.5 Backing Safety

Always avoid backing by your vehicle by using pull-through parking when permitted by law and the parking area is configured in a manner that permits pull-through parking. Backing a vehicle on project sites and in parking lots can be risky. As with the Smith System®, Five Keys® for driving forward, there are Five Keys for backing:

- Key 1 AIM HIGH IN STEERING®
  - Avoid backing situations (use pull through parking when available and permitted);
  - Identify relevant objects; and,
  - Plan backing and parking activities
- Key 2 GET THE BIG PICTURE®
  - Use GOAL (Get Out and Look);
  - Never guess or assume the backing area is clear;
  - Evaluate conditions in all directions (horizontally and vertically); and,
  - Use a spotter, if available
- Key 3 KEEP YOUR EYES MOVING®
  - Keep eyes moving (checking mirrors, rear windows, blind spots); and,
  - Keep speed appropriate to maintain visual surveillance of surroundings (2 to 5 km per hour)
- Key 4 LEAVE YOURSELF AN OUT®
  - Select locations with the fewest backing hazards;
  - Maintain space cushion (1 m minimum) while driving at slow speeds (backing, parking, around stationary objects, etc.); and,
  - Back no further than you must
- Key 5 MAKE SURE THEY SEE YOU®
  - Establish eye contact with other drivers and pedestrians when parking;
  - Use horn in a positive manner to communicate; and,
  - Use flashers or other communication method when backing

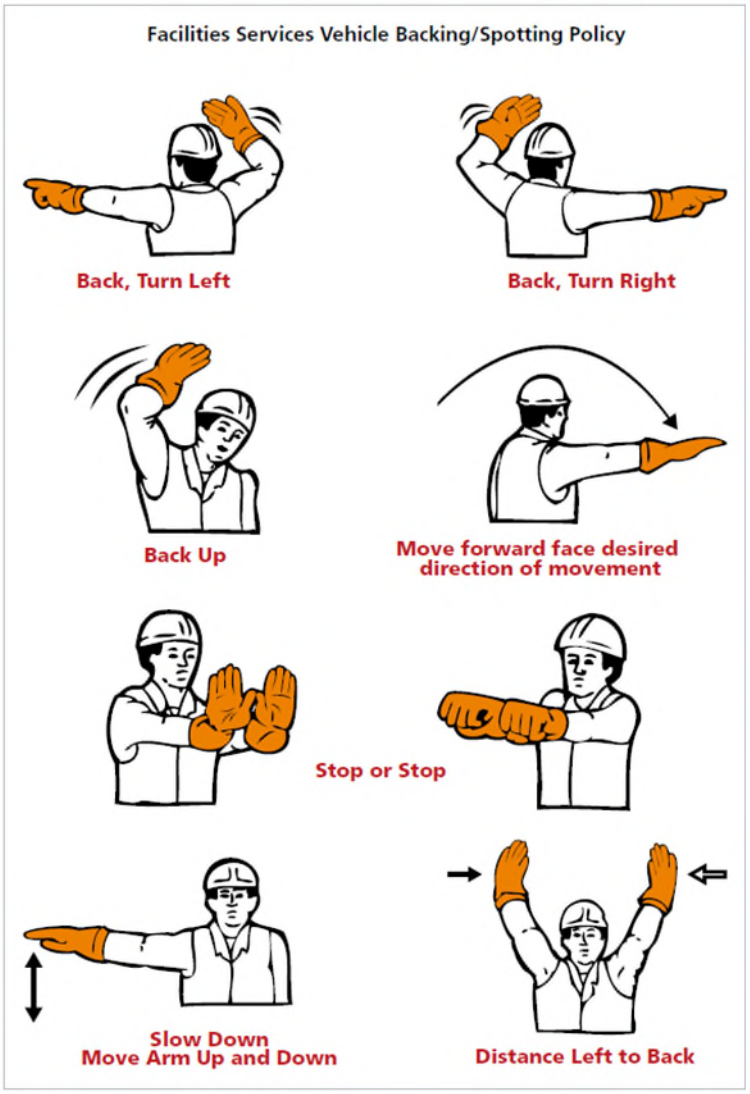


Figure 3-3 Backing Safety Hand Signals

If using technology to facilitate backing (e.g., backup camera), do not fixate on the backing screen and maintain 360 degrees of awareness, paying attention to the front of the vehicle when backing and turning simultaneously.

3.4.5.1 The Spotter's Responsibilities

- The spotter is there to direct the driver while backing up the vehicle;
- The spotter needs to be constantly aware of the surroundings while performing this function;
- The spotter needs to be constantly looking and listening for other vehicles and people that may enter the path of the vehicle that is backing up;
- The spotter must either stop the oncoming hazard or stop the vehicle being backed up;
- The spotter must be aware of objects and direct the driver safely around them;
- The spotter must not only look at ground level for obstructions, but also LOOK UP for overhead hazards (e.g., tree branches, wires, signs, canopies, ladders);
- The spotter shall always maintain visual contact with the driver;
- The spotter always needs to be in the line of sight of the mirrors of the vehicle being backed up;
- At night, the spotter should use a flashlight to help the driver see him/her. DO NOT point the flashlight directly in the mirror of the driver;
- The spotter shall use hand signals to direct the driver. These hand signals should be somewhat exaggerated so that the driver can be clear as to what the spotter is signaling in the mirror;
- Voice communication between the spotter and driver is also good, but the driver may not hear the spotter over the noise of the vehicle and other background noise;
- The use of portable radios to communicate between the spotter and driver may prove beneficial in certain circumstances;
- In congested or tight areas, more than one spotter may be necessary;
- In congested or tight areas, one spotter may be needed at the rear and one at the front of the vehicle being moved either forward or backward; and,
- Spotters should also be used when going forward in tight areas to avoid hitting any objects. Especially during the winter when snowbanks tend to push parked cars farther into already narrow streets.

3.4.5.2 Driver Responsibilities

- Bring the vehicle to a complete stop;

- Roll window down completely;
- Make visual and verbal contact with the spotter. If you cannot see or hear the spotter, do not backup!;
- Driver and spotter must always maintain and eye contact using vehicle mirror(s);
- Drivers must have a thorough knowledge of spotter hand signals;
- The spotter must signal to the driver indicating it is safe to begin backing; and,
- The driver must give a two-blast warning on the horn just prior to backing.

3.5 Travel Safety–Domestic and International

3.5.1 Prevention Strategies During Travel

The following strategies may prevent or mitigate the potential for encountering dangerous situations when traveling:

- Identify your route prior to leaving;
- Inspect the vehicle before leaving;
- Carry a cell phone;
- Avoid traveling after dark, when possible;
- Avoid poorly lit streets at night;
- Always keep vehicle doors locked and windows up;
- Park only in well-lit, high-visibility areas;
- Avoid parking near dumpsters, retaining walls, and other such structures;
- Park in attended lots, if possible;
- Park away from intersections and under streetlights if parking on the street;
- Always have your keys ready when getting into the vehicle;
- In unfamiliar areas, if unsure of destination of in need of directions, stop at the most populated areas for assistance;
- Scan surroundings prior to getting out of the vehicle for potentially threatening conditions;
- Avoid having valuables in the vehicle or make sure valuables are hidden or covered in the vehicle;

- Always try to stay in the aisles of parking lots or garages and avoid walking in between cars; and,
- Report all threatening situations to the office, H&S Coordinator or the police, if necessary.

3.5.2 Prevention Strategies for Automatic Teller Machines

3.5.2.1 Walk-up ATMs

When using walk-up automatic teller machines (ATMs), the following strategies may reduce the potential for being victimized:

- Only use ATMs during daylight hours;
- Use ATMs in high-visibility areas;
- Have your ATM card ready when you approach the machine;
- Have coworkers with you when withdrawing money.

3.5.2.2 Drive-up ATMs

When using drive-up ATMs, the following strategies may reduce the potential for being victimized:

- Use drive-up ATMs in locations as described for walkup ATMs;
- Keep vehicle doors locked;
- Pull as close to the ATM as possible;
- Keep the vehicle running;
- Place your vehicle in park (or neutral with parking break on) while operating the ATM;
- Be aware of your surroundings; and,
- Immediately drive off if a potentially threatening situation exists.

3.5.3 Hotel and Motel Safety Considerations

When selecting hotels and motels, consider the following:

- Stay in an interior room (e.g., no direct outside access) or a room as close to the office as possible;
- Stay on the lower floors, particularly below the 7th floor, when possible. Most 100' aerial fire trucks will reach the 7th floor.
- Stay at facilities that have electronic room locks;

- Stay at facilities with double locks (one a dead bolt) and a peephole;
- Stay at facilities equipped with fire sprinklers and smoke detectors in the rooms and hallways;
- Secure locks on windows and adjoining doors;
- Stay at facilities with well-lit hallways, stairwells, parking structures, and grounds;
- Stay at facilities that limit access to only facility guests;
- Stay at facilities that have a reception/concierge desk near the front entrance and/or elevators;
- Stay at facilities that keep doors to the outside locked from the outside;
- Stay at facilities where access to/from the parking garage is limited to the lobby;
- Stay at facilities where security is available for escorts to rooms and auto;
- Stay at facilities which are located in a safe areas (not a high-crime-rate area);
- Use only monitored exercise areas;
- Park in well lit areas and try to park in a location monitored by security cameras;
- Do not leave valuables in vehicles;
- If desk clerk audibly gives your room number, request a new room; and,
- Consult with the local Arcadis office for suggested hotels.

Crime and Place is an app that identifies crime risk for your current location or searched location based on historical personal and property crime data. You can program it to alert you when you are entering a high crime area.

3.5.4 Air Travel Guidelines

- Arrive early for your flight. Plan to arrive at least 2 hours before domestic flights and 3 hours before international flights;
- Report directly to the gate inside the security area after checking luggage;
- Listen to all safety briefings while on the aircraft and be aware of all emergency exit locations;
- While in flight, keep seat belt fastened to mitigate injury resulting from unexpected turbulence;

- Wear casual, unrestrictive, natural fiber, loose-fitting clothing to allow for less restricted movement;
- Place sensitive or valuable materials in carry-on luggage and use sturdy luggage with covered tags (preferably with a business address but no company name or logo);
- After deplaning, leave the airport as soon as possible. Disturbances are more likely to occur in a public airport;
- Minimize time spent in the airport; do not sit or stand near supporting columns or glass windows; and,
- Do not engage strangers in conversation.

3.5.5 International Travel

3.5.5.1 International Project Go/No Go

When a potential international opportunity occurs (including client development, prospecting, and project activities), please enter this opportunity into the International Opportunity Portal to initiate the opportunity pursuit approval process. Complete as much information as you can in the International Opportunity Form. Upon submittal of the form, the worker, worker's supervisor, the market sector leader and the International Opportunity Review Team will receive a confirmation email to kick off the review process. The International Review Team will reach out to workers via email if any additional clarification is needed.

Once reviewed, the International Team will approve/disapprove the request which will trigger a final email to the worker notifying them of the decision made.

3.5.5.2 International Travel

All international business travel must be booked through an Arcadis-authorized Travel Management Company (TMC). Arcadis maintains a partnership with International SOS, the world's leading medical and travel security risks services company to provide medical and travel security information and expertise before your trip and while traveling (internationally and domestically) to help safeguard your personal health and security.

International SOS is a travel safety app that focuses on essential information relative to security and health alerts. It is particularly beneficial to international travelers, however, information regarding many US cities is included. The Arcadis portal ID is: 11BYCA679423.

International SOS offers Arcadis:

- A presence in 1,000 locations in 92 countries across 5 continents.

- 27 Assistance Centers positioned globally;
- More than 11,000 workers and 92 offices;
- 99 languages supported;
- Access to 1,400 doctors;
- 56 international clinics;
- 200 full-time security specialists; and,
- 5 Regional Security Control Centers.

Did You Know? Arcadis Standard ARC HSGE022 “International Travel Safety” includes requirements and recommendations for completing international travel.

3.5.5.2.1 Pre-trip Advisory

For international travel booked through an authorized TMC, the traveler will receive an automated Pre-trip Advisory (PTA) email. This PTA contains useful health, safety, and security information about the intended international destination, such as specific location intelligence, global travel tips to keep you safe, and links to other online tools commonly used by travelers. The PTA also contains links related to your travel, such as a link to the Arcadis Portal of the International SOS website, information on the International SOS Mobile app, and a pretravel checklist to help you fully prepare for your travel.

Included in the PTA is relevant information and advice, for example:

- Security concerns, such as terrorism or civil unrest;
- Health topics covering medical care, vaccination requirements, and the quality of food and water; and,
- Logistical matters ranging from transportation to cultural issues

The PTA also lists your itinerary and – most importantly – contact details for assistance. If an event unfolds which may affect you, either close to or during your trip, you will be kept informed by email alerts relevant for your trip. As an international traveler, you will also receive “Alerts” relevant to your travel, which will be sent to you before and during your travel, as well as health alerts that are sent during your travel and, in some instances, for up to 30 days after your return.

3.5.5.2.2 International SOS Assistance App

Medical and travel security information, advice available in one click through the International SOS Mobile app. The International SOS Mobile app allows you to:

- Obtain essential medical and security information before departure or while travelling
- Call instantly the closest International SOS Assistance center for immediate support; and,
- Receive alerts for countries of your choice

You are strongly encouraged to download the International SOS app that is accessible to all staff and (available in IOS, Android, Windows Phone, and Blackberry) via the Arcadis Portal. You will use the email that you provided for your travel booking to download the app. If your email does not work, use the Arcadis International SOS membership number: 11BYCA679423.

Download the International SOS app onto your smart phone or device using your personal Arcadis email that is used to book your travel. Here are examples of some of the situations for which you would call the International SOS Assistance Center through your app:

- People are rioting outside of your hotel;
- There has just been an earthquake or other natural disaster where you are travelling;
- A colleague you are travelling with is missing;
- You are overseas and have lost your passport;
- Your laptop has been stolen; and,
- You have sustained an injury and need medical attention.

3.5.5.2.3 Check-in Feature

The Check-in Feature on the app allows you to “check in” so International SOS can more easily find you in an emergency. Use the check-in feature at points along your route to improve the accuracy of your location. To use the Check-in Feature, click on the “Check-In” icon, then click “Check-In.” When using the function for the first time, you will be asked to enter your contact details.

3.5.5.2.4 Live Chat

The International SOS app offers English-speaking travelers the option to Live Chat directly with a medical and security specialist any time of the day or night. Live Chat allows you to connect to the Assistance Center over Wi-Fi and maintains your privacy in public. You can send photos and images over Live Chat, and you can source answers to questions in seconds. Once you have downloaded the International SOS app on your smart phone,

the icon for Live Chat will appear. When you touch the Live Chat link, you will be asked to create a PIN and then you can start chatting.

3.6 First Aid

First-aid information in this handbook outlines commonly accepted practices associated with typical injuries and may not be applicable for every situation. It is the policy of Arcadis to comply with OSHA's Medical Services and First Aid Standard as it relates to the work we do. Accordingly, Arcadis will confirm the "ready availability of medical personnel," but how this is implemented is dependent on the circumstances of each place of work.

The Medical Services and First Aid Standard applies to all Arcadis offices that designate or expect employee(s) to act as First-Aid Responders at the office location and/or a job site. Employees who are not designated or expected to act as a First-Aid Responder may render first aid voluntarily if they are trained in first aid, but their actions are not covered under the OSHA standard. If the office or job site is in near proximity to medical services, employees do not need to be designated or expect to act as First-Aid Responders unless required to do so by an OSHA standard or client requirement. However, if the office or job site is not in near proximity to medical services, at least one person will be designated and trained to render first aid/ cardiopulmonary resuscitation (CPR).

Red Cross First Aid is an app that provides basic steps for rendering first aid based on injury type. Includes videos as a learning tool

OSHA has long interpreted the term "near proximity" to mean that emergency care must be available within no more than 3-4 minutes from the workplace. When interpreting "near proximity" OSHA recognizes that a somewhat longer response time of up to 15 minutes may be reasonable in workplaces, such as offices, where the possibility of such serious work-related injuries is more remote. In addition, each site shall maintain adequate first-aid supplies to treat personnel. The size and number of first-aid kit is available in the project HASP. Depending on proximity to a treatment facility (local work vs. remote or wilderness work), the site's H&S supervisor will determine transport options before the start of field work and document such in the Emergency Action Planning section of the HASP. If moving an injured person from the scene of the incident will aggravate the injury and he/ she is not in an area of imminent hazard, avoid moving the injured person until professional help arrives, but provide first aid and/or CPR as appropriate, consistent with your training. For non-life-threatening injuries, use the following guidance to provide first aid.

Did You Know? Arcadis Standard ARC HSGE004 “First Aid/CPR” includes requirements and recommendations when administering first aid and CPR.

3.6.1 General First-Aid Guidance

In the event of a serious or life-threatening emergency, call 911. For all other injuries and illnesses, call WorkCare (1 888 449 7787) for guidance. The information herein is to assist in determining the severity of the incident and basic care if EMS is unavailable. First aid for exposure to chemicals is found in Section 4 – First-Aid Measures of the chemical Safety Data Sheets (SDS).

If an accident occurs in the field, the project team is responsible for handling the situation by considering the following actions:

- Decide if the patient needs care beyond first aid at a medical facility. If so, call 911 if adequate transportation cannot be provided by project team. If necessary, contact WorkCare to help with this decision;
- Remain calm and provide the patient with quiet, efficient first-aid treatment;
- Keep the patient warm and lying down. Do not move an injured person until you have discovered the extent of their injuries;
- Call 911 immediately if the injured person is not breathing. Begin chest compressions if you are trained to do so;
- Stop any bleeding;
- Watch carefully for signs of shock;
- Check for cuts, fractures, and breaks
- If the head, neck, or spine are suspected to be injured, call 911;
- Do not allow people to crowd the injured person; and,
- Do not remove clothing unless it is imperative.

3.6.1.1 Inhalation First Aid

Remove any workers complaining of symptoms of chemical overexposure from the project site and transport them to the designated medical facility for examination and treatment, if necessary, or as directed by WorkCare. If available, refer to Section 4 of the chemical’s SDS for treatment information.

3.6.1.2 Ingestion First Aid

Call Emergency Medical Services (EMS) and consult a poison control center for advice. If available, refer to Section 4 of the SDS for treatment information. If victims are unconscious, keep them on their side and clear their airway if vomiting occurs.

3.6.1.3 Skin Contact First Aid

Project workers who have had skin contact with contaminants will, unless the contact is severe, proceed to the wash area. Workers will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. (Refer to Section 4 - First Aid Measures of the SDS for treatment information.) Unless the contact results in a severe reaction, call and follow the advice of WorkCare.

If workers are working around injurious corrosive materials, a portable or fixed emergency shower or drench hose may be required based on the potential for injury. Contact Corporate Health and Safety for guidance.

3.6.1.4 Eye Contact First Aid

Project workers who have had contaminants splashed in their eyes, or who experience eye irritation, must immediately proceed to the portable or fixed eyewash station. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing or equipment is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes or as specified in Section 4 of the chemical's SDS. Arrange prompt transport to the designated medical facility, upon advice from WorkCare.

If workers are working around injurious corrosive materials, a portable or fixed eyewash station may be required based on the potential for injury. Eyewash bottles may suffice in some situations. Contact Corporate Health and Safety for guidance.

3.6.1.5 Shock

Shock is a depression of all body processes and may follow any injury, no matter how minor. Factors, such as hemorrhage, cold, and pain, will increase the likelihood and severity of shock, the patient will feel weak and may faint. The skin becomes cold and clammy, and the pulse becomes weak and rapid. Shock can be more serious than the injury itself.

If you suspect the injured person is in shock, you must call emergency services (911) or other numbers as required by the site.

To prevent and control shock, follow these recommendations:

1. When treating injuries:

a. restore breathing;

b. stop bleeding;

c. treat breaks and fractures;

2. If there are no head or chest injuries, place the patient on his or her back with the head and chest lower than the legs. This will help blood circulate to the brain, heart, lungs, and other major organs;
3. If severe head and chest injuries are present, elevate the upper body. If chest injuries are present, elevate the injured side to help the functioning of the uninjured lung;
4. If the injured person becomes unconscious, place him or her in a face-down position to prevent choking on blood, vomit, or the tongue; and,
5. Keep your patient warm and under shelter.

3.6.1.6 Stopped Breathing

If the injured person has stopped breathing, begin cardiopulmonary resuscitation. Place the patient on his or her back and follow these steps:

1. Call 911 or instruct someone nearby to call 911.
2. Give 30 compressions at a rate of at least 100 to 120 per minute and a depth of at least 2 inches. Let the chest come back to its normal position.
3. Open the airway by tilting the head back and lifting the chin.
4. While holding the airway open, pinch the nose closed.
5. Place your mouth completely around the victim's mouth and blow, giving two breaths and watching for chest expansion.
6. Repeat sets of 30 compressions and two breaths until medical attention arrives.

3.6.1.7 Bleeding

To control bleeding, elevate the wounded area above the heart and apply pressure using gauze, or a clean cloth. If the bleeding doesn't stop, continue to apply pressure.

After bleeding has been controlled, wash the wounded area with disinfectant and apply a dressing and bandages.

3.6.1.8 Fractures

There are two types of fractures: simple (closed) or compound (open). The following are signs of a possible fracture:

- There is pain in the affected area;
- The area may be deformed;
- The victim is unable to place weight on the area without experiencing pain; and,
- You or the patient feel or hear a grating sensation or sound during any motion of the injured area.

If a fractured bone is suspected, call 911. If EMS is not available, the following treatment is advised:

1. If in doubt, treat the injury as a fracture.
2. Splint joints above and below the fracture.
3. If the fracture may penetrate the skin, cover with a clean, moist dressing only.
4. Pad the splint(s).
5. Check splint ties frequently to be sure they do not hinder circulation.
6. Cover an open wound with a clean dressing before splinting.

3.6.1.9 Dislocation

Dislocation happens when the ligaments near a joint tear, allowing movement of the bone from its socket. It is unwise to treat a dislocation unless you are a trained professional, as permanent damage may occur. Support the affected extremity with a sling or other device and seek medical attention.

3.6.1.10 Sprains

Treat sprains by applying cold to the area for the first 24 hours. When swelling has subsided, let the sprain sit for a day. Apply heat the following day to aid in the healing process. Splint the sprain to make it immobile until the pain has completely disappeared.

3.6.1.11 Concussions

Concussion symptoms may include convulsions, unresponsiveness of the pupils, or headache and vomiting. All injured parties with head injuries must see a physician immediately.

3.6.1.12 Burns

Chemical Burns

Call 911 or other designated emergency number and seek medical aid as soon as possible, following guidance in the chemical SDS for appropriate emergency care.

Electrical Burns

1. Care for life-threatening emergencies first;
2. Call 911 and/or seek medical aid;
3. Cover burns loosely with clean, dry cloth; and,
4. Expect shock and treat for it accordingly.

Heat Burns

1. If a significant burn injury occurs, call 911 or other applicable emergency number per the client site and location and seek medical aid as soon as possible;
2. Stop the burning process by whatever means are available. If possible, apply large amounts of water to cool the burn;
3. Bandage with a clean, dry dressing; and,
4. Do not break a blister if one forms. DO NOT use ointments or remove embedded clothing.

3.6.1.13 Choking

If the victim can speak or cough forcefully and is getting enough air, do not interfere with their attempts to cough an obstruction out of the airway. If the victim cannot speak or is not getting enough air, instruct someone to call 911 while you perform abdominal thrusts, as follows:

1. Stand behind the victim and wrap your arms around the waist;
2. Make a fist with one of your hands and place it just above the victim’s navel and below the ribs, with the thumb and forefinger side toward you; and,
3. Grab this fist with your other hand and pull it quickly toward you and slightly upward. Repeat until the victim can breathe or becomes unconscious.

If the victim is unconscious or becomes unconscious, do the following:

1. Lay the victim on his or her back;

2. Check for objects in the victim's mouth. Try to sweep any obstruction out of the victim's throat;
3. Even if you are not successful, tip the head back and attempt rescue breathing;
4. If rescue breathing is not working due to the obstruction, sit straddling the victim's thighs and give the victim up to five abdominal thrusts (i.e., pushing into the victim with the heel of the hand just above the belly button); and,
5. Repeat the steps above, as needed, until you clear the obstruction.

3.6.1.14 Convulsions/Seizures

Signs of convulsions or seizures include jerking movements, bluish face and lips, rolled-back eyes, clenched teeth, and frothing at the mouth. Convulsions usually end safely in less than 30 seconds, after which the victim enters a phase of unconsciousness or drowsiness. If an individual experiences a convulsion, take the following measures:

1. Try to keep the victim from hurting himself or herself during the convulsion, but do not restrain the victim;
2. Do not place any object between the victim's teeth;
3. Do not give the victim anything to eat or drink;
4. If the victim stops breathing, administer CPR and rescue breathing;
5. After the convulsion, place the victim on his or her side in the recovery position and monitor breathing; and,
6. Call 911 or seek medical aid as soon as possible.

3.6.1.15 Drowning

1. If possible, use a long pole, ring buoy, or boat to rescue the victim. Never attempt a swimming rescue unless you are trained to do so;
2. If the victim has a pulse but is not breathing, begin rescue breathing;
3. If the victim is not breathing and has no pulse, begin CPR;
4. Call 911 or other appropriate number for the site or seek medical aid as soon as possible; and,
5. Take steps to prevent shock.

3.6.1.16 Fainting

1. Fainting typically victims regain consciousness almost immediately;

2. Lay the victim down on his or her back and provide plenty of fresh air;
3. Call 911;
4. Reassure the victim and apply a cold compress to his or her face; and,
5. If the victim vomits, roll to his or her side and keep the victim's airway clear.

3.6.1.17 Poisoning

Swallowed

1. Look for open bottles, a poisonous smell on the breath and symptoms, such as pain in the throat or stomach, drowsiness, vomiting, and unconsciousness;
2. Call the Poison Control Centre or 911;
3. Follow the exact directions of the Poison Control Centre;
4. Keep the suspected poison and/or a sample of any vomit with you; and,
5. Do not give the victim anything by mouth unless directed by the Poison Control Centre.

Inhaled

1. Get the victim to fresh air, preferably outdoors. Be careful not to breathe in fumes yourself;
2. If the victim has a pulse but is not breathing, begin rescue breathing;
3. If the victim is not breathing and has no pulse, begin CPR; and,
4. Call the Poison Control Centre or 911 as soon as possible.

3.7 Bloodborne Pathogens

Unless you take proper precautions, an injured individual can transmit viruses and bacteria to you when you provide first aid, especially if there is severe bleeding. Other bodily fluids may also be infected, so avoid contact with all fluids. Infected blood and body fluids may contain human immunodeficiency virus (HIV), hepatitis B virus (HBV), and others. The following program will help reduce the risks associated with transmission of these blood-borne pathogens. Workers will employ universal precautions when handing these substances, such as:

- Persons trained in first aid/CPR will also be trained in blood-borne pathogens management;
- Prior to rendering first aid, don PPE to prevent direct contact of skin or mucous membrane to bodily fluids. PPE will include, at a minimum, new gloves (latex or nitrile) and safety glasses;

- If rescue breathing/CPR is performed, use a protective mask or other protective barrier designed for mouth-to-mouth resuscitation;
- Clean any object or surface contaminated with bodily fluids. Decontaminate the affected surface by cleaning the area with a commercially available disinfectant or a mixture of household (5%-6%) bleach and water at a ratio of 1:10;
- If cleaning materials, PPE, or other objects cannot be decontaminated, place in a closed leak-proof container, clearly marked “BIOHAZARD” for later disposal, in accordance with local, state, and federal regulations;
- Upon completion of first-aid activities, if skin and/or mucous membranes are contaminated with bodily fluids, immediately clean exposed areas with soap and water and with a disinfectant. In addition, clean your hands, forearms, and face even if these areas were covered by PPE;
- The bloodborne pathogens standard defines regulated waste as liquid or semi-liquid blood or other potentially infectious material (OPIM); contaminated items that would release blood or OPIM in a liquid or semi-liquid state if compressed; items that are caked with dried blood or OPIM and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or OPIM [29 CFR 1910.1030(b)]. A Band-Aid or wound dressing that has visible dried blood on it may not meet the definition of a regulated waste. When in doubt, contact Arcadis Corporate Health and Safety.

Did You Know? Arcadis Standard ARC HSGE005 “Bloodborne Pathogens” includes requirements and recommendations for preventing exposure to bloodborne pathogens.

3.7.1 Hypodermic Needles

Used hypodermic needles are occasionally observed at project sites, typically lying on the ground. When a single hypodermic needle is identified, it is best to Stop Work and place cones or similar materials around the needle (being careful to not make contact with the needle). If the needle is on public property, local governments may have a needle removal service. Contact the local municipality to determine if this is an option. Additionally, companies that specialize in needle/sharps removal may be contracted if the needle(s) must be removed. Contact Corporate H&S for information on companies that provide needle removal services.

Keep in mind that specialized PPE, tools and receptacles are needed to safely remove and dispose of needles.

3.8 General H&S Rules and Safe Work Permits

General safety rules for site activities include, but are not limited to, the following:

- A copy of this handbook, along with any applicable HASPs, JSAs, Traffic Safety Plans (TSPs) – Right of Way (ROW) and Non-Right of Way (NROW), or other project H&S documents, must be present onsite and readily available for review by each worker;
- All project workers will review applicable portions of this handbook and other project H&S documents prior to the morning tailgate meeting;
- Food, beverages, chewing gum, and tobacco products will be consumed only in clean area;.
- Workers must wash their hands before eating, drinking, smoking, or using toilet facilities;
- Workers will wear all PPE as required, use STOP WORK, and replace damaged PPE immediately;
- When applicable, workers will secure disposable coveralls, boots, and gloves at the wrists and legs, and confirm closure of the suit around the neck;
- Workers will report all injuries, illnesses, near misses, property damage, utility strikes, and other incidents or unsafe conditions or work practices to the Site Supervisor as soon as possible;
- Workers must obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so;
- Workers will use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer's directions;
- Maintain the integrity of all safety devices;
- Workers will use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer's directions;
- Workers will perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained;
- The presence or consumption of alcoholic beverages or illicit drugs during the workday is strictly prohibited. Workers will not take prescription or over-the-counter drugs may impair judgement or have side effects that create an unsafe work condition;
- Workers will remain upwind of site contaminants or waste during site activities whenever possible;
- Upon skin contact with materials that may be impacted by constituents of potential concern (COPCs), remove contaminated clothing, wash the affected area immediately and don clean clothing (if appropriate).

Immediately report any skin contact with materials potentially impacted by COPCs to the Site Supervisor. If needed, seek medical attention and/or call WorkCare;

- Workers will practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COPCs, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination;
- Remove PPE as required to limit the spread of contaminated materials;
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles;
- Do not remove soil containing site COPCs from protective clothing or equipment using compressed air, by shaking, or by any other means that disperses contaminants into the air;
- Inspect all non-disposable PPE for contamination in the contamination-reduction zone (CRZ). Any contaminated PPE must be decontaminated or disposed of properly;
- Workers will recognize emergency signals (e.g. evacuation, injury, fire);
- Mobile devices, laptops, cameras, and other commercially available electronic devices may not be allowed at hazardous locations. Staff must know the locations where these devices are not permitted at the project site. Work with the client to identify these locations, and obtain necessary client permits or equipment to maintain communication in the event of emergency in these hazardous locations;
- Workers will use the “buddy system” during all operations requiring Level C PPE or higher, and, when appropriate, during Modified Level D operations. Field workers must inform their partners or fellow crew members if they are experiencing symptoms of exposure to toxic materials. The symptoms of such exposure may include, but are not limited to:
  - Headaches;
  - Dizziness;
  - Nausea;
  - Blurred Vision;
  - Cramps;
  - Irritation of eyes, skin, or respiratory tract;
- If PPE or noise levels impair communications, pre-arranged hand signals must be used for communication. Workers must stay within line of site of another team member; and,
- Headphones or ear buds are that are not required for project activity (i.e., radio communication) are not allowed to be worn on any project site.

OSHA Safety is an app that includes all OSHA regulations in an easy to read, searchable format. General industry, construction, agriculture, and maritime regulations are included.

3.8.1 Safe Work Permits

A Safe Work Permit may be required for high-hazard work, such as confined space entry, working at heights, excavation, and trenching, energized electrical work and for other hazardous activities. Safe Work Permits are designed to address specific activity hazards and to provide a written record that authorizes specific work, at a specific location, for a specific period. The permit itemizes correct procedural sequences and necessary controls so that all foreseeable hazards have been considered and that appropriate precautions are defined before work commences. Safe Work Permits may be issued by Arcadis or the client. This may vary by site.

The Safe Work Permit is an agreement between the permit issuer (designated by Arcadis) and the permit receiver (workers) and identifies the following:

- All potential hazards associated with the job (including adjacent work areas) and the measures taken to control or eliminate the hazards;
- Conditions (e.g. equipment preparation, atmospheric testing, waste disposal) under which work can proceed;
- Required safety equipment (e.g. PPE, rescue equipment, self-contained breathing apparatus) to complete the work safely; and,
- Names of all workers assigned to complete the job.

The Safe Work Permit will aid in identifying and controlling hazards at the project site, but it will not by itself make the job safer.

Examples of circumstances where Safe Work Permits are issued are presented below:

- Lockout/Tagout: Permits work involving the control of hazardous energy sources;
- Hot Work: Permits work involving open flames, sparks, or other sources of ignition that could create a fire or explosion hazard;
- Vessel Entry/Confined Space Entry: Permits entry into spaces with restricted access or egress, or meets the definition of confined space (see **Section 3.23**; e.g., fuel tanks, pipelines, pumping stations, process vessels, septic tanks, sewage digesters, manholes, vats, and pits);
- Ground Disturbance: Permits excavations and other ground disturbance activities;

- Maintenance Work: Permits work for general maintenance on equipment or facilities where potential hazards may exist (e.g. energized electrical equipment, hydrogen sulfide, or pressure);
- Vehicle Entry: Permits and controls the access of vehicles and heavy equipment into hazardous locations. This permit can also be issued in combination with the above Safe Work Permits;
- Non-intrinsically Safe Equipment: Ask the SS if use of nonhazardous-location-rated electronic equipment (e.g. cellular phones, cameras, defibrillators, pagers, flashlights, laptops, mobile devices, remote starters) is permitted; and,
- Refer to Arcadis H&S Standards (e.g. Work at Heights, Confined Space, etc.) for task-specific work permit requirements.

3.9 General Housekeeping, Personal Hygiene and Field Sanitation

Workers will be made aware of the appropriate method to dispose of waste and will observe good housekeeping practices at Arcadis offices and project sites. Such practices include, but are not limited to, the following:

- Maintain project sites in an orderly fashion and clean up after each job has been completed and at the end of a worker's shift. Equipment, tools, extension cords, materials, and supplies must be stored in a safe and orderly manner;
- Keep project sites clean and free of oil, grease, mud, and other slippery materials to prevent slip, trip and fall hazards; post signs to warn others of slippery floors;
- Make sure that aisles and walkways, entrances and exits, and access to firefighting and first-aid equipment are kept clear of obstructions;
- Secure equipment and vehicles if left unattended or overnight at a project or work location;
- Cover, demarcate, or barricade, as appropriate, any excavations, pits, or other hazards;
- Collect and properly dispose of hazardous wastes, according to Arcadis waste control practices and regulatory and client requirements;
- Avoid placing monitoring equipment on a potentially contaminated surface, including the ground surface;
- Keep building entrances, exits, platforms and stairwells free of snow and ice;
- Never set tools or materials on raised areas where they might fall and strike another worker;
- Remove all sharp objects when noticed, including scrap metal, broken glass, nails in wood, scrap welding rods, reinforcing steel, and tin;

- Leave washing and toilet facilities in good sanitary condition for others;
- Report any safety hazards that cannot be quickly remedied.

During site activities, workers will regularly observe project sites to identify excess trash and unnecessary debris. Workers will collect excess debris and trash and store it in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Additionally, project equipment and supplies will be kept in an orderly manner to avoid creating a trip hazard.

3.9.1 Personal Hygiene

Proper personal hygiene practices are extremely important when handling or working near hazardous materials. Arcadis workers will use the following personal hygiene practices to minimize or eliminate exposures:

- Always wash hands, face, and exposed skin surfaces with soap and water after working with chemicals or hazardous materials. Always wash before eating, drinking, chewing, smoking, or when using toilet facilities, even if you have been wearing gloves. Washing must be repeated at the end of the shift. The use of hand sanitizers or wipes is not a substitute for washing with soap and water;
- If facilities are available and it is practical, the workers will consider changing clothes before leaving work to avoid bringing hazards home;
- Wash work clothes regularly and clean boots daily;
- Never eat, drink, or smoke in restricted or hazardous work areas;
- Practice good housekeeping habits and leave the washroom and toilet facilities in a condition that is acceptable for use by other workers;
- Regularly inspect and maintain PPE that has been exposed to chemicals.

3.9.2 Sanitation

Site sanitation will be maintained according to appropriate provincial, territorial, federal, and local requirements and the guidance provided below:

- Break Area: Breaks must be taken in approved areas away from the active work area. The client may specify areas where breaks may be taken, or the Arcadis Site Supervisor may specify break locations;
- Potable Water: The following rules apply to all field operations:

- Provide an adequate supply of potable water at each project site. Potable water must be kept away from hazardous materials or media, and contaminated clothing or equipment;
- To dispense drinking water, use only portable containers that can be tightly closed, and equipped with a tap dispenser. Water will not be consumed directly from the container (drinking from the tap is prohibited) and may not be removed from the container by dipping;
- Clean and sanitize portable water dispensers/containers weekly;
- Clearly mark containers used for drinking water and use these containers for drinking water only;
- If individual serving containers are not used, provide disposable drinking cups. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required;

- Sanitary Facilities: Access to facilities for washing before eating, drinking, or smoking, or alternate methods, such as waterless hand cleaner and paper towels, will be provided; and,
- Lavatory: If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

This requirement does not apply to mobile crews or to normally unattended site locations if workers at these locations have transportation immediately available to nearby toilet and hygiene facilities.

3.10 Site Security, Work Zones and Decontamination for HAZWOPER Sites

3.10.1 General Site Requirements

Workers must properly secure project sites against theft, acts of vandalism, or entry by wildlife, livestock, or unauthorized persons and vehicles. Entry onto project sites must be arranged prior to field activity by contacting the property owner or representative.

Did You Know? Arcadis Standard ARC HSFS012 “Hazardous Waste Operations and Emergency Response (Hazwoper)” includes requirements and recommendations when completing tasks defined under OSHA 29 CFR 1910.120 regulations.

3.10.2 Work Zones and Decontamination for Contaminated Sites Work

For contaminated sites work, the Site Supervisor will establish work zones to accommodate work operations. The work zones shall be clearly communicated to all project workers.

A site map should be developed with enough detail included to adequately identify the zones in relation to other site features. The work zones are defined as:

- Exclusion Zone (EZ) is an area where contaminated materials exist;
- Contamination Reduction Zone (CRZ) is an area where decontamination procedures are performed; and,
- Support Zone (SZ) is an uncontaminated area designated with Access Control Points for entry/exit into and out of work operations.

The hotline is the line of demarcation where the EZ ends and the CRZ begins. The area that lies outside of the CRZ is the SZ and is considered uncontaminated for the purposes of workers performing support duties there. The Site Supervisor will determine the extent of each zone and will communicate that information to workers during tailgate briefings. Physical demarcation of work zones onsite will be determined by the Site Supervisor using a variety of methods including, but not limited to, signs, tape, and flags.

3.10.3 Work Zones

3.10.3.1 Authorization to Enter

Only workers with the appropriate training will be allowed to work at the project site. The Site Supervisor will maintain a list of authorized persons; only workers on the authorized persons list will be allowed to enter the project site.

3.10.3.2 Site Orientation and Hazard Briefing

No person will be allowed at the project site during site operations without first completing a site orientation and hazard briefing. This orientation will be presented by the Site Supervisor and will include a review of the HASP. This review must cover the chemical, physical, and biological hazards; protective equipment; safe work procedures; and emergency procedures for the project. Following this initial meeting, tailgate safety meetings will be held each day before work begins. All people entering the project site, including visitors, must be briefed on the contents of the project HASP, review the daily tailgate safety meeting minutes, and document their understanding of these documents by signing them in the appropriate locations.

3.10.3.3 Certification Documents

Training records and where required, medical clearance records/certification, will be readily available and accessible for every project. Specialty training, such as first-aid/CPR certificates, as well as current medical clearances for all project field workers required to wear respirators, will be readily accessible, and ideally maintained on the project site. All Arcadis and subcontractor workers must provide required training and medical documentation to the Site Supervisor prior to starting work, if requested.

3.10.3.4 Entry Log

The Site Supervisor will maintain a log-in/log-out sheet at the site. Workers must sign in and out on the log sheet as they enter and leave the project site, and the Site Supervisor may document entry and exit in the field notebook. The tailgate meeting acknowledgement form may be a substitute for this sheet.

3.10.3.5 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed at any Arcadis project site unless they are wearing the minimum required PPE which includes work boots, high visibility shirt/jacket, protective eyewear, gloves suited to the task.

3.10.3.6 Emergency Entry and Exit

The Site Supervisor will notify emergency response workers who must enter the project site of any hazards present in the area. All activities will cease in the event of an emergency. People exiting the project site because of an emergency will gather in a designated safe area for a head count. In the event of an emergency, the Site Supervisor will confirm that all people who entered the project site have exited.

3.10.3.7 Exclusion Zone (EZ)

An EZ may consist of a specific work area or may be the entire area of potential contamination. This is typically the area with actual or potential contamination and the highest potential for exposure to hazardous substances. All workers entering an EZ must use the required PPE and must have appropriate training and where required, medical clearance (e.g. respirator clearance) Cones, caution tape, or a site diagram will identify the location of each EZ.

3.10.3.8 Contamination Reduction Zone (CRZ)

CRZs are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas. The CRZ or transition area will be established, if necessary, to perform decontamination of workers and equipment. All workers entering or leaving the EZ will pass through this area to prevent

contamination spread. Tools, equipment, and machinery will be decontaminated in a specific location as required. All workers will be decontaminated onsite, as required. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

3.10.3.9 Support Zone (SZ)

The Support Zone is the area of the site that is free from contamination (at least at surface) and that may be safely used as a planning and staging area. Smoking may be permitted in the SZ, subject to site requirements.

3.10.3.10 Posting

Work areas will be prominently marked and delineated. This may be completed using cones, caution tape, delineators, signs, etc.

3.10.4 Workers Decontamination

On contaminated sites, all workers wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The workers decontamination area will consist of the following stations at a minimum:

- Station 1: Workers leaving the contaminated zone will remove gross contamination from their outer clothing and boots;
- Station 2: Workers will remove their outer garment and gloves and dispose of them in properly labelled containers. Workers will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution and will carry these items to the next station; and,
- Station 3: Workers will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and placed in a clean plastic bag. Example CRZ setups and decontamination steps are provided in **Figure 3-3.**

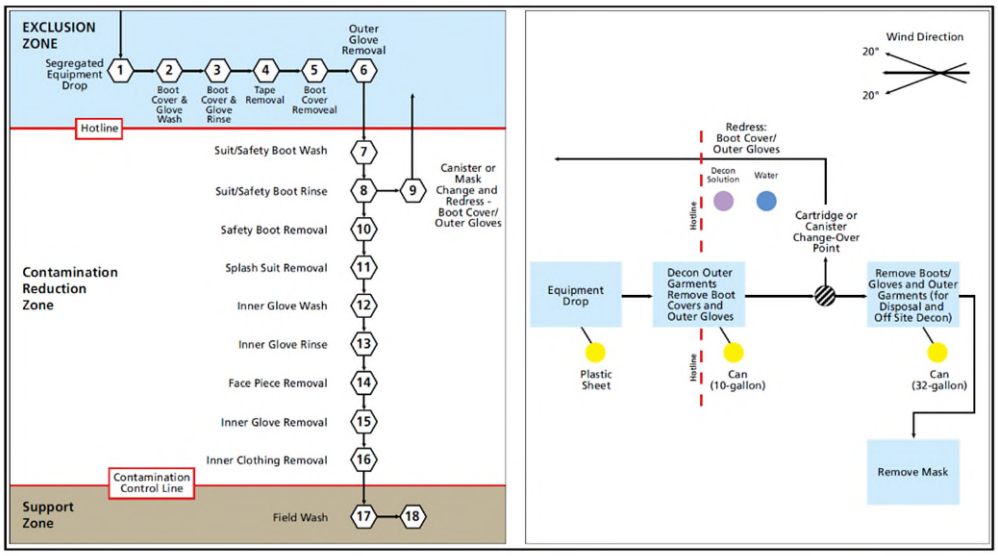


Figure 3-4 Contaminated Sites Control Zones

3.10.4.1 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning, or pressure washing of vehicles and equipment may be required. The contaminated wash and rinse solutions will be managed as appropriate.

3.10.4.2 PPE Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labelled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The reinstate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift.

When the cleaner used does not contain a disinfecting agent and the respirator is not individually assigned, the respirator components should be immersed for two minutes in one of the following:

- Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter (mL) of household bleach to one liter (L) of water at 43º C (110º F); or,

- Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 (mL) of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cm^3 of 45 percent alcohol) to 1 L of water at 43º C (110º F); or,
- Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer;
- Rinse components thoroughly in clean, warm (43º C [110º F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed;
- Components should be hand-dried with a clean lint-free cloth or air-dried;
- Reassemble face piece, replacing filters, cartridges, and canisters where necessary;
- Test the respirator to make sure that all components work properly.

3.11 Personal Safety and Other Unique Site Conditions

If personal safety issues exist at a project site, resources, such as the client, local law enforcement officials, Park or Wildlife Service, and Animal Control, will be used, as necessary, to provide the safest possible work environment. Some general guidelines are provided here, but each situation is different, and actions must be taken based on the specifics of each situation.

If a project site is in an area where an workers' personal safety may be at risk from potential criminal acts, the PM or Site Supervisor will work with the client and local law enforcement officials to evaluate the risk and determine what steps can be taken to minimize the risk. For example, can local law enforcement be present or make frequent visits while the work is being conducted? Should outside security (e.g., private security or paid duty officer) be hired? Should work only occur during certain times of the day? Or should work not proceed at all?

When risks to personal safety are identified at a project site, workers will not work alone and will have the ability to communicate with local law enforcement and the PM through cell phones or 2-way radios. Project teams will check in with the PM (or other specific individual) at predetermined times throughout each workday, and if project teams do not call in, the PM will attempt to contact the team. If unsuccessful, the PM will notify local law enforcement.

If, while on the project site and despite precautions set forth above, an worker feels their personal safety is at risk from potential criminal acts, the worker should leave the site immediately.

3.11.1 Project Site in Isolated Area and Workers Working Alone

At no time, will workers work alone in high hazard/dangerous situations, described as situations where the risk from falling, burning, loss of consciousness, fire, electrocution, intoxication, suffocation, personal security issues, and serious injury.

- Whenever possible, workers will use the buddy system in isolated areas. If the isolated area involves hiking/walking into areas that are unmarked or if there is potential to become directionally disoriented (e.g., no trails, unmarked trails, forested, or highly vegetated areas), workers will be trained on the use of a compass and/or global positioning system (GPS) and trail/topography maps, and, if necessary, will take wilderness safety training. The PM or Site Supervisor will work with the local park/Wildlife Service on what emergency planning is necessary (e.g., unexpected weather, animal attack, and search/rescue).
- Where workers will work alone, a communication plan will be established prior to initiating work that will specify that workers will check in with the PM (or other specific individual) at predetermined times throughout each workday and if workers do not call in, the PM will attempt to contact the team. If unsuccessful, the PM will notify the appropriate authorities and, where international travel is involved, International SOS. If communication is not possible during the day, the workers will check in with the PM at the start and end of each workday. A Lone Worker Plan template is available in the Arcadis HASP.
- Communication through cell phones or 2-way radios will be used whenever possible. Where a cellular network is not available, and radio communication is not possible, a satellite phone may be a preferred option. A transponder or GPS locator device can also be carried as a means to locate a lost worker; and,
- If workers will be travelling within isolated areas, a schedule and route should be established identifying:
  - Start and finish locations for each day;
  - Start and finish times for each day; and,
  - Routes that will be followed throughout each day.

Workers will not deviate from this schedule without first contacting the PM. It may also be appropriate and necessary to notify the client, law enforcement, or local Park/Wildlife Service officials of these schedules.

3.11.2 Work in Public Areas

Two primary H&S issues are associated with working within public areas, including parking lots: traffic-related and personal safety.

Workers using parking lots at any Arcadis location should:

- Watch for pedestrians;

- Not cut through empty spaces and lanes. Be watchful of other motorists who may do this;
- Obey pavement directional arrows, crosswalk markings, posted speed limits and “yield” or “stop” signs;
- Drive slowly and use turn signals;
- Use seat belts;
- Pull through parking spaces where possible to increase visibility upon leaving; and,
- Not occupy more than one space.

For personal safety, all Arcadis workers are encouraged to:

- Watch for cars cutting diagonally across lots;
- Display proper body language to show awareness of any suspicious situations and people;
- Always hide valuables and do not leave personal information displayed in the vehicle;
- Park in well-lit areas. Report an inadequately lit parking lot to the facility or lot manager;
- Ask a fellow worker (that is known) or security (if available) to walk them to their car if they do not feel safe;
- Walk in groups;
- Close all car windows and lock car doors;
- Always have keys ready when approaching your car and check the back seat before getting in;
- When entering your car, lock all the doors and turn on headlights. This will allow the driver to see anyone outside in the dark;
- Start the vehicle and drive to another location that is well lit before making any necessary phone calls. Limit the amount of time spent idle in the car;
- If you think you are being followed, drive, walk or run quickly to a lighted store, police station, fire station or where crowds of people can offer help. Know where to go for help (e.g., police station, fire station) and do not go home;
- If approached or if you feel threatened, do something to draw attention (e.g., scream, yell, blow a whistle, honk the car horn).

3.11.3 Hunter Awareness

During certain times of the year, hunters may be present in or around project sites. During hunting season, in applicable areas, workers will wear high-visibility, hunter orange vests and hats and, if appropriate, other high-

visibility clothing. During low light conditions, work may be restricted or planned as appropriate. Workers should talk loudly or carry a noise maker (air horn, broadcast radio, whistle, etc.) so they are not mistaken for an animal. During certain times of the year, there may be hunters in areas adjacent to the site or trespassing onsite. A telltale sign of hunters is an empty vehicle parked along the side of the road. Team members should verify the current hunting season at the time of site activity. If shots are heard that appear to have been fired from a nearby location, shout in the direction of the gunfire to let hunters know of your presence. Immediately return to your vehicles and stop work until the area is clear of the hunters. Workers will immediately report to the Site Supervisor any on-site evidence of hunters (e.g., spent shell casings, tree stands, trails that have not been established by Arcadis, animal feeding stations, salt licks, etc.).

3.11.4 Workers Working Late/Early Hours

Whenever possible, workers will not work before dawn or after dusk, and work will be completed before dark. If this is not possible, workers will wear appropriate reflective apparel and have appropriate lighting, such as portable lights, flashlights, or headlamps, as appropriate for the activity being conducted. Personal security will be assessed, and measures taken as discussed above, if appropriate.

Often, travel to/from Arcadis work sites takes place early in the morning and in the evening during low light conditions. Extra vigilance is required during low light conditions as it is at these times that wild animals are frequently found on and adjacent to roadways. Furthermore, drivers are prone to drowsiness at these hours. Ensure you are well rested and fit to drive before setting out on your journey.

3.11.5 No or Limited Cell Phone Service

The PM will assess if any other type of communication, such as 2-way radios, is appropriate for the area. The project team must plan start and estimated finish times and require check-ins, as appropriate. If employees are unable to check in daily because of project location and 2-way radios do not work, a transponder or GPS locator device may be used to locate the team if necessary.

If employees will be moving from area to area within a day or over several days, each time the crew moves, the team will:

- Establish beginning and ending locations,
- Plan start and estimated finish times, and
- Plan routes that will be followed throughout the period.

Employees will not deviate from the schedule or planned route without first contacting the PM. It may also be appropriate and necessary to notify the client, law enforcement, or local Park/Wildlife Service officials of these schedules and routes.

3.11.6 Potentially Dangerous Wildlife

The project team will identify any potentially dangerous wildlife that may reside in or around the project site. All workers working at wilderness or rural sites should have bear/wildlife awareness training. The most common dangerous animals that may be encountered include black, grizzly, and polar bears, cougars, moose and deer. Racoons, fox, rats and other rodents, while not predatory to humans, can carry rabies and other diseases and should be avoided. Other smaller animals such as wolves, coyotes, badgers, wolverines, and lynx, can also pose a hazard but are rarely encountered. Venomous snakes and spiders such as rattlesnakes, black widow spiders, and brown recluse spiders can also be encountered in much of the United States. Where contact with dangerous wildlife is likely, the project HASP should provide recommendations for avoiding contact and if contact is made, how to react appropriately. If the chance for contact with predatory wildlife such as bears or cougars is high, it may be necessary to arrange for a wildlife monitor to be present onsite while work is being performed, and/or to have workers receive additional training on avoiding and reacting to the particular animal(s). Wildlife monitors should be considered when working in known grizzly, cougar, or polar bear habitat. Non-lethal protection from wildlife can be offered by protection devices like bear bangers, bear bells, pepper spray, etc.

3.11.7 Guard or Wild Dogs

Domesticated dogs include animals used as guard dogs as well as pets. If the client or dog owner has guard dogs at the site or residence, the PM or Site Supervisor will work with the client each site visit to make sure that the dogs are unable to gain access to any area in which Arcadis workers will or could be working. For stray or wild dogs, see **Section 3.17 - Biological Hazards**.

3.12 Severe Weather

During threatening weather, the Site Supervisor will monitor radio weather forecasts and heed any warnings. In addition, in the event of lightning in the vicinity of the site, the Site Supervisor will stop all activities and have site workers take cover. Other severe weather, such as high winds, hail, or heavy rain, will be evaluated by the Site Supervisor and TM to determine how site activities should proceed.

3.12.1 Heavy Rain and Flooding

During JSA/HASP development, the project work area should be evaluated for the potential of flash flooding or rapid water rise during rain events. The Site Supervisor will monitor weather forecasts from the internet, weather

radio, commercial radio or client provided weather information for the advent of severe weather. Project work will generally be suspended during periods of heavy rain. The Site Supervisor will make the determination to suspend work and will designate the assembly area for site workers during heavy rain or flooding events. If weather forecasts indicate heavy rain, work in flood-prone areas should be suspended or delayed until the Site Supervisor determines the area is safe for work to be conducted. The Site Supervisor should also consider delayed effects of flooding in certain situations (work along riverbanks, etc.) before resuming work.

In heavy rain/potential flooding situations, in general, the following rules apply:

- Immediately evacuate to higher ground if a flood warning is issued for the area;
- Do not attempt to cross streams or flowing water that is over ankle deep;
- Do not attempt to drive over flooded roads; and,
- Immediately evacuate a vehicle stalled by water and seek higher ground.

Thunder is caused by lightning. NOAA advises that nowhere outside is safe when thunderstorms are in your area.

NOAA recommends: "When you Hear It Roar, Get Indoors". Their campaign for lightning safety is to shelter any time you hear thunder and to remain there 30 minutes since last.

3.12.2 Lightning

Lightning is a dangerous natural force, and results in death and serious (often permanent) injury in startling numbers around the world. Arcadis recognizes lightning as an occupational hazard and requires that precautions be taken to prevent worker exposure to lightning. Workers whose jobs involve working outdoors in open spaces, on elevated surfaces (e.g. ladders, platforms, scaffolding, rooftops, etc.), or near elevated structures have significant risk for lightning exposure.

Lightning is unpredictable and can strike outside rainfall areas from as far as 10 miles away. Many lightning victims are caught outside during a storm because they did not act promptly to get to a safe place, or they go back outside too soon after a storm has passed. Lightning hazards must be considered in job planning and included in the Job Safety Analysis of project Health and Safety Plans.

Arcadis requires the following for workers whose jobs involve working outdoors on elevated platforms, open fields, or any other outdoor activities:

- Include a written lightning safety protocol for outdoor workers in the HASP. Check NOAA (or similar) weather reports (including radar) prior to beginning field work, and frequently during work if hazardous weather is forecasted;
- Consider rescheduling jobs if it is likely that workers will be caught outside during hazardous weather conditions;

- When working outdoors, supervisors and workers should be on watch for hazardous weather conditions: Watch for darkening clouds and increasing windspeeds which can indicate developing thunderstorms. Also consider downloading weather apps with audible alarms for the development of severe weather and thunderstorms;
- Prior to the start of work, identify and communicate to the site workers the location of safe shelters for hazardous weather. Preferably this is a fully enclosed building with electrical wiring and plumbing, but it can also be a vehicle or trailer for less hazardous weather situations;
- Identify the mode of communication for lightning alerts and stop work situations;
- Determine response times necessary for all workers to reach safe shelters.
- If thunder is heard (even a distant rumble), elevated and outdoor work should cease immediately. Workers should shut down all equipment and seek shelter in designated locations; and,
- Work will not resume until weather radar indicates that there is no hazardous weather within 10 miles of the work area, and 30 minutes has passed since after the last thunder was heard.

Weather Bug is an app that provides an excellent lighting strike interface known as “Spark.” The app be set up to notify you of an approaching lightning storm that is beyond our range of hearing.

The above precautions are preemptive and should always be considered during the planning and startup of work. These measures should allow workers to avoid being caught outdoors in hazardous weather. However, if you find yourself in a situation where you are caught outdoors during a thunderstorm with no access to shelter, the following recommendations can decrease the risk of being struck:

Vehicles as Shelter: If safe building structures are not accessible, employers should guide workers to hard-topped metal vehicles with rolled up windows. Remain in the vehicle for at least **30 minutes** after hearing the last sound of thunder.

- Lightning is likely to strike the tallest objects in a given area—you should not be the tallest object;
- Avoid isolated tall trees, hilltops, utility poles, cell phone towers, cranes, large equipment, ladders, scaffolding, or rooftops;
- Avoid open areas, such as fields. Never lie flat on the ground;
- Retreat to dense areas of smaller trees that are surrounded by larger trees, or retreat to low-lying areas (e.g., valleys, ditches) but watch for flooding;
- Avoid water, and immediately get out of and away from bodies of water (e.g., pools, lakes). Water does not attract lightning, but it is an excellent conductor of electricity;
- Avoid wiring, plumbing, and fencing. Lightning can travel long distances through metal, which is an excellent conductor of electricity. Stay away from all metal objects, equipment, and surfaces that can conduct electricity;
- Do not shelter in sheds, pavilions, tents, or covered porches as they do not provide adequate protection from lightning;
- If you feel your skin tingle or your hair stands on end, squat low to the ground on the balls of your feet. Place your hands on your knees with your head between them. Make yourself the smallest target possible and minimize contact with the ground; and,
- If in a boat, get to land and find shelter.

3.12.3 High Wind and Tornadoes

Work should be suspended during periods of high winds. The Site Supervisor will determine the need to suspend work and evacuate to the designated shelter based on site observations and weather forecasts. The Site Supervisor will also determine when work should be resumed after high winds have diminished.

Tornado activity can occur during any month of the year. All work will be suspended, and site workers will immediately evacuate to the designated shelter, when a tornado warning is issued for the area. The Site Supervisor will determine where the designated shelter is located unless specified by the client.

Learn and know the difference between a tornado watch and a tornado warning:

Tornado Watch: Tornadoes are possible in and near the watch area. Review and discuss your emergency plans and check supplies in your shelter. Be ready to act quickly if a warning is issued or you suspect that a tornado is approaching. Watches are issued by the NOAA for counties where tornadoes may occur. The watch area is typically large, covering numerous counties or regional areas.

Tornado Warning: A tornado has been sighted or indicated by weather radar. There is imminent danger to life and property. Move to an interior room on the lowest floor of a sturdy building. Avoid windows. If in a mobile office, a vehicle, or outdoors, move to the closest substantial shelter and protect yourself from flying debris. Warnings are issued by your local forecast office. Warnings typically encompass a much smaller area (around the size of a city or county) that may be impacted by a tornado identified by a forecaster on radar or trained spotter/law enforcement who are watching the storm.

3.12.4 Heavy Snow or Ice

Project work will be suspended during periods of heavy snow or sleet as necessary. The SSO will make the determination to suspend work. The SSO will also monitor weather forecasts from weather radio, commercial radio, or client-provided weather information for the advent of severe snow or ice. If weather forecasts indicate heavy snow or ice, work should be suspended or delayed until the SSO determines the area is safe for work to be conducted. The SSO should also factor mobilization to and from the work site in evaluating whether to suspend work. Generally, if local highway patrol or police recommend keeping off roads due to snow or ice, work should be suspended or postponed until roadways are clear for safe driving.

3.13 Fire Prevention

Fire protection is a critical part of safe operations. Good housekeeping is essential in preventing fires. Fires can start anywhere and at any time; therefore, it is important to know which fire extinguisher to use and how to use it. Always keep fire extinguishers visible and easy to get at. Fire extinguishers should be inspected regularly.

Ting Fire is an app that continuously monitors your home for wiring issues, power surges and outages and notifies you. The app connects to a device that plugs in any outlet and is available for free from many insurance companies. Electrical issues result in over 50,000 residential fires each year.

Fire extinguishers must be properly maintained to do their job. Where temperature is a factor, take care to select the right extinguisher. You must receive training on the use of a particular type of fire extinguisher before you can use it. This training is required only if you are required to use the device.

3.13.1 Classification of Fires and Fire Extinguisher Use

Most common fires are classified as A, B, C and D. The following section identifies the fire class and appropriate extinguishing methods.

3.13.1.1 Classification of Fires & Extinguishing Agents

Class A Fires:

- Ordinary combustibles (e.g., wood, cloth, paper, and other organic materials).
- Extinguishing agent: most common is water or multipurpose dry chemical.

Class B Fires:

- Flammable liquids (e.g., petroleum products, paints, and varnishes) or substances that liquefy upon being heated (tars and some plastics).
- Extinguishing agent: dry chemical, carbon dioxide, or dense foam. Do not use water except to cool workers or equipment.

Class C Fires:

- Electrical fires in and around equipment (e.g., transformers, motors, generators, switch panels). A Class C fire may also become a Class A fire if surrounding material becomes ignited.
- Extinguishing agent: carbon dioxide or dry chemical. Do not use water.

Class D Fires:

- Combustible metals (e.g., magnesium, titanium, sodium, potassium).

- Extinguishing agent: cover with dry chemical (or sand) using a shovel. Do not use type A, B, or C fire extinguishing equipment.

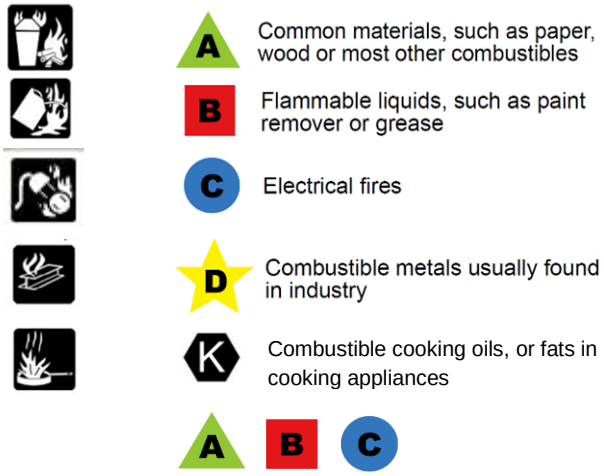
Class K Fires:

- Fires involving combustible cooking oils, or fats in cooking appliances; and,
- Extinguishing agent: wet chemical.

3.13.1.2 Identification of Fire Extinguishers

As presented below, fire extinguishers are marked to indicate the class of fires on which they may be used, for example:

- Black A on green square: Class A fires
- Black B on red square: Class B fires
- Black C on blue circle: Class C fires
- Black D on yellow star: Class D fires
- White K on black hexagon: Class K fires
- Fire extinguishers identified as multipurpose



3.13.1.3 Operating a Fire Extinguisher

Portable fire extinguishers are not designed to fight large or spreading fires. Fire extinguishers are useful under certain conditions but extreme care must be taken when attempting to extinguish any fire. Staff are not required to use a fire extinguisher. Escape or evacuation should be considered first before attempting to use a fire extinguisher. Only choose to stay and use an extinguisher if the fire is small and it is safe to do so. All fire extinguishers are required to be visually inspected monthly and evaluated by a licensed inspector yearly.

Avoid opening the hood of a motor vehicle if the engine compartment is one fire. These types of fire are particularly dangerous due to the potential for rupturing fuel or fluid lines, which have the potential to erupt violently.

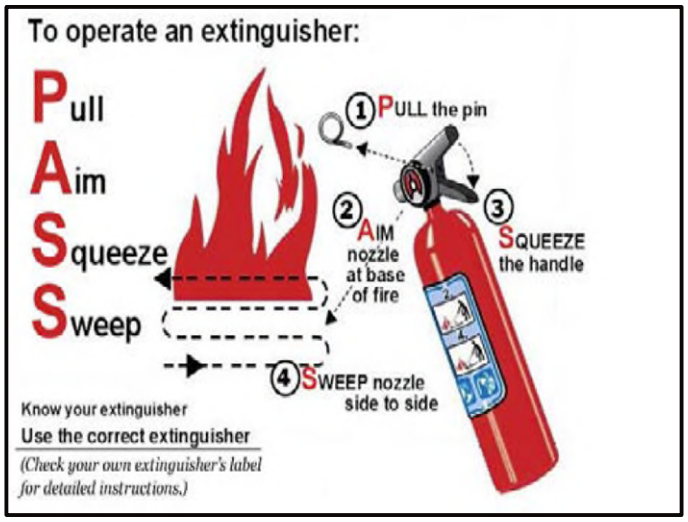


Figure 3-5 Operating a Fire Extinguisher

3.14 Hazard Communication

All site workers must have completed Workplace Hazardous Materials Information System (WHMIS) training within the previous two (2) years. All project-required chemicals will be handled in accordance with the WHMIS requirements of the state, municipality or authority having jurisdiction over the project site. The Site Supervisor will maintain a list of hazardous chemicals kept onsite together with the safety data sheets (SDS) for each chemical. SDSs will be maintained onsite and all workers working onsite will be informed of their location. It is acceptable to store SDSs electronically provided they are accessible to all workers. Provision of a computer that may be used by site workers to access the SDSs is acceptable. The Site Supervisor will communicate the location of the SDSs and will review the hazards associated with on-site chemicals with all site workers during daily tailgate meetings, as required. Only those chemicals to be used or encountered that day will be discussed at the tailgate meeting. The hazards associated with any new chemical will be discussed and its SDS will be obtained prior to use on-site.

The Site Supervisor will confirm that all containers of chemicals (e.g. drums, bags, pails, tanks, vessels) delivered to the site are properly labelled with WHMIS supplier labels containing the following information:

1. Product Identifier – the brand name, chemical name, common name, generic name or trade name of the hazardous product;
2. Initial Supplier Identifier – the name, address and telephone number of either the manufacturer or the importer*;
3. Pictogram(s) – hazard symbol within a red "square set on one of its points" that indicates the hazards associated with the product;

4. Signal Word – a word used to alert the reader to the most significant hazard and to indicate the severity of the hazard – there are two (2) signal words including Danger and Warning. Danger is used for high risk hazards. Warning is used for less severe hazards;
5. Hazard Statement(s) – standardized phrases which describe the nature of the hazard posed by a hazardous product;
6. Precautionary statement(s) – One or more standardized phrases that describe measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product or resulting from improper handling or storage of a hazardous product;
7. Supplemental Label Information – some supplemental label information is required based on the classification of the product. For example, the label for a mixture containing ingredients with unknown toxicity in amounts higher than or equal to 1% must include a statement indicating the percent of the ingredient or ingredients with unknown toxicity. Labels may also include supplementary information about precautionary actions, hazards not yet included in the GHS, physical state, or route of exposure. This information must not contradict or detract from the standardized information.

Chemicals that are not properly labelled will not be accepted or allowed on site.

The Site Supervisor will confirm that:

- All project workers have received WHMIS training;
- The PPE necessary for working with on-site hazardous materials is available; and,
- The project worker have been trained in its use. The PM will confirm that all project personnel have received Hazard Communication training as required in OSHA 29 Code of Federal Regulations (CFR) 1910.1200 (h).

If transferred to a secondary container, the new container will be labelled with a Workplace Label. Workplace labels require the following information:

- Product name (matching the SDS product name);
- Safe handling precautions, may include pictograms or other supplier label information;
- A reference to the SDS (if available).

Did You Know? Arcadis Standard ARC HSGE007 “Hazard Communication” includes requirements and recommendations for hazard communication, including the labeling of chemical containers and availability of Safety Data Sheets.

3.15 Noise

***NOTE**: This section of the handbook is not meant to replace requirements provided by the Arcadis hearing conservation health and safety standard (ARC HSIH008). This section of the handbook is meant as a quick reference only. The following information is applicable to U.S. and Canada operations only.*

A noise exposure assessment will be conducted if a worker is or is likely to be exposed to noise at a workplace in excess of 85 dBA as an 8-hour time-weighted average (TWA). Hearing protection devices will be available for staff to wear when exposed to noise levels that exceed an 8-hour TWA of 85 dBA or to a peak sound pressure level of 130 dBC for any amount of time. Hearing protection should have a noise reduction rating (NRR) of at least 19, when noise levels exceed 85 dBA for any exposure time. If an worker is exposed to noise at 85 dBA or higher for an 8-hr TWA, they may request to have audiometric testing. Audiometric tests will be scheduled by the third-party administrator for the Arcadis medical surveillance program (currently WorkCare).
As a general rule of thumb, if you must increase your voice (yell) to talk to someone, then the area is in excess of 85 dBA. In general, working around heavy equipment (e.g., drill rigs, generators) will require the use of hearing protective devices.

Did You Know? Arcadis Standard ARC HSIH008 “Hearing Conservation” includes requirements and recommendations for working in noisy environments.

Where work area noise levels exceed 85 dBA and it is feasible to do so, Arcadis shall require that noise hazard signs be posted. When noise levels exceed 105 dBA as an 8-hour TWA, it is recommended that staff use both ear plugs and earmuffs. Workers must not have “unprotected exposures” to noise levels in excess of 115 dBA.

The NIOSH Sound Level Meter app provides a sound level meter that can be used to assist workers in identifying areas where hearing protection might be required. It does not replace a stand-along sound level meter and is to be considered a reference tool.

3.16 Heat and Cold Stress

Exposure to heat during the summer and cold during the winter can result in stress to the body that, if not managed, can result in serious health effects. The guidelines outlined below are recommended best work practices that will help workers manage heat and cold stress on the job.

3.16.1 Heat Stress (Heat-Related Illness)

For more detailed information on how to prevent Heat Stress, refer to the Arcadis Heat Stress Prevention Health and Safety Standard (ARC HSIH013).

In general, an environment is “hot” if it is very humid and/or above 26.3 degrees Celsius [°C] (80 degrees Fahrenheit [°F]). Environmental factors of temperature, humidity, and air movement affect the body’s ability to dissipate heat. Combined with human factors (such as clothing, fitness, and body weight) and job factors (such as heat generation from work activity or types of required PPE), this can result in a heat imbalance thereby elevating the body’s core temperature and causing heat stress.

Did You Know? Arcadis Standard ARC HSIH013 “Heat Stress Prevention” includes requirements and recommendations for use when working in hot conditions..

3.16.1.1 Heat Stress Safety Precautions

The following actions can be taken to reduce the occurrence of heat stress:

- Avoid working in the heat when possible – this can be accomplished by avoiding work during the hottest parts of the day, working in cooled enclosures, or having cooling units provided in the work area. Severe heat conditions can be cause for stopping or not starting work;
- Workers should acclimate to working in a hot environment by following a graduated work schedule, increasing the duration of working in the heat each day;
- Drink plenty of fluids to replenish the fluids lost through perspiration and evaporation from the skin. Maintain hydration by drinking water and supplementing with electrolyte replacement drinks or "sports drinks" at a ratio of 3:1 water to sports drink. Avoid caffeine, alcohol, large amounts of sugar, and very cold drinks because these can cause cramps;
- Eat prior to work and then during the work rotation;

- Take rest/cooling breaks as appropriate for the work being done. If a worker is feeling faint, experiencing cramping, or becoming fatigued, the body is warning of potential heat stress. The worker must move to a cool area to rest (work/rest cycle);
- If workers will be working in an enclosed or confined area without natural air movement, provide specific personal equipment such as cooling vests or towels, and/or obtain fans or other means of ventilating the work area to provide cooling;
- Workers should recognize the following potential physical disorders possible from exposure to heat:
  - **Heat stroke:** total shutdown or failure of the body's thermal regulatory system (life threatening – red, hot, dry skin; sweating has stopped);
  - **Exertional heat stroke:** sweating is occurring but is unable to cool the body sufficiently, resulting in the core body temperature reaching 41.1°C (106°F);
  - **Heat syncope:** loss of consciousness due to overheating;
  - **Heat exhaustion:** excessive sweating, cool clammy skin, loss of salt from the body, and water imbalance;
  - **Heat cramps:** cramping, pain, or muscle spasms that most often occur in the abdomen, legs, and arms;
  - **Heat rash**: clusters of red bumps on the skin. Usually occurring on the neck, upper chest, groin, elbow creases, and under breasts;
  - **Heat stress** monitoring and work-rest cycle implementation for unacclimated workers should commence when the ambient temperature adjusted for humidity (i.e. the adjusted humidex temperature) exceeds 26.3°C (80 °F) for unacclimated workers in North America.

Screening criteria for heat stress exposure are described in **Table 3-1** and examples of activities within metabolic rate categories are provided in **Table 3-2**.

NOTE: *The following tables are recommended guidelines as prescribed in the current version of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value Booklet. These tables are developed and presented as guidelines to assist in the control of health hazards resulting from working in hot conditions. The potential health hazards from work in hot environments (and work while wearing impermeable PPE) depends strongly on level of worker acclimation. Detecting, assessing and monitoring for heat stress is critical.*

The OSHA-NIOSH Heat Safety Tool is a useful resource for planning outdoor work activities based on how hot it feels throughout the day. It has a real-time heat index and hourly forecasts specific to your location. It also provides occupational safety and health recommendations from OSHA and NIOSH.

The NOAA Heat Index chart (Table 3-3) and OSHA's summary table of Risk Levels and Associated Protective Measures (Table 3-4) provide additional information to help prevent heat-related illnesses.

Table 3-1 Heat Stress and Rest Levels

	Acclimated				Unacclimated			
Work Demands	**Light**	**Moderate**	**Heavy**	**Very Heavy**	**Light**	**Moderate**	**Heavy**	**Very Heavy**
100% work	87.8ºF (31ºC)	82.4ºF (28ºC)			82.4ºF (28ºC)	77ºF (25ºC)		
75% work / 25% rest	87.8ºF (31ºC)	84.2ºF (29ºC)	81.5ºF (27.5ºC)		83.3ºF (28.5ºC)	78.8ºF (26ºC)	75.2ºF (24ºC)	
50% work / 50% rest	89.6ºF (32ºC)	86ºF (20ºC)	84.2ºF (29ºC)	82.4ºF (28ºC)	85ºF (29.5ºC)	80.6ºF (27ºC)	77.9ºF (25.5ºC)	76.1ºF (24.5ºC)
25% work / 75% rest	90.5ºF (32.5ºC)	88.7ºF (31.5ºC)	86.9ºF (30.5ºC)	86ºF (30ºCvf)	86ºF (30ºC)	84.2ºF (29ºC)	82.4ºF (28ºC)	80.6ºF (27ºC)

***Note**: Temperatures in the acclimatized and unacclimated sections are based upon wet globe bulb test (WBGT) testing results*

Table 3-2 Examples of Activities Within Metabolic Rate Categories

Categories	Examples
Resting	• Sitting quietly • Sitting with moderate arm movements
Light	• Sitting with moderate arm and leg movements • Standing with light work at machine or bench while using mostly arms • Using a table saw • Standing with light or moderate work at machine or bench and some walking about
Moderate	• Scrubbing in a standing position • Walking about with moderate lifting or pushing • Walking on a level at 6 km/hr (3.7 mph) while carrying 3 kg (6.6 lbs) weight load
Heavy	• Carpenter sawing by hand • Shovelling dry sand • Heavy assembly work on a noncontinuous basis • Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	• Shoveling wet sand

Table 3-3 NOAA Heat Index

***Note**: When working in direct sunlight, add 10ºF to the heat index rating.*

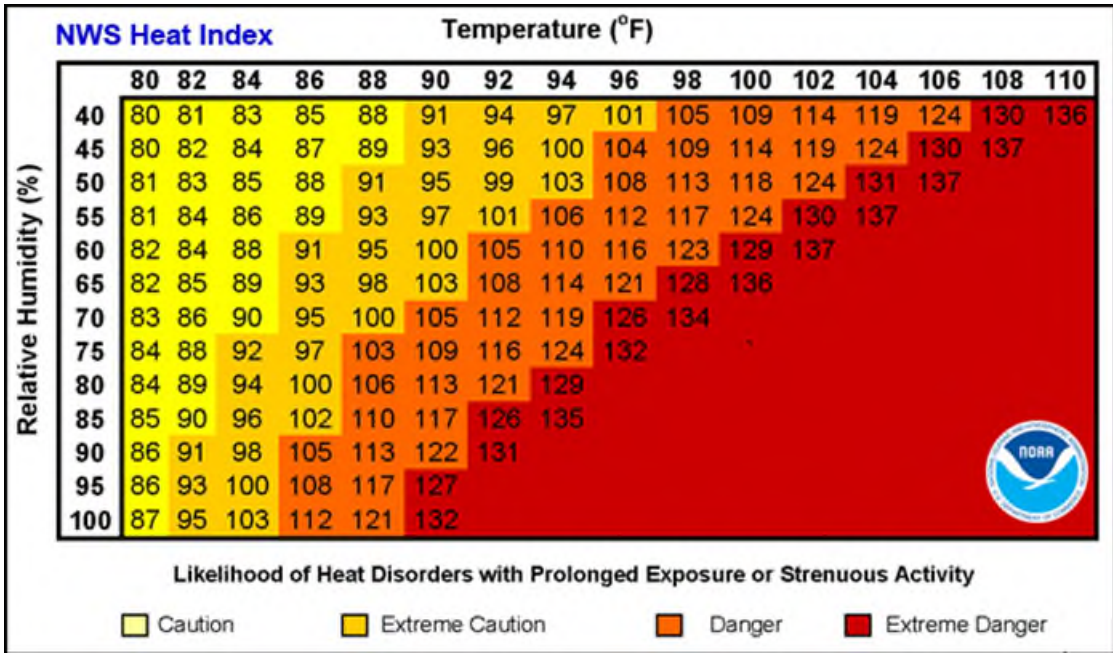


Table 3-4 presents the risk level and recommended mitigation measures for a range of adjusted humidex temperatures.

Table 3-4 Risk Levels and Associated Protective Measures

Adjusted Humidex Temperature	Risk Level	Recommended Mitigation Measures
<32.7 ºC (<91 ºF)	Lower (Caution)	• Provide drinking water (1 L / hour; 250 mL every 15 minutes) • Confirm that adequate medical services are available • Worker heat safety training • Encourage workers to wear sunscreen • If workers must wear heavy protective clothing, perform strenuous activity, or work in the direct sun, additional precautions are recommended to protect workers from heat-related illness.*
32.7 °C to 39.4 °C (91 °F to 103ºF)	Moderate	In addition to the steps listed above: • Instruct workers to drink water at a rate of four (4) 250 mL cups per hour and supplement with electrolyte replacement drinks (3:1)**. • Review heat-related illness with workers: how to recognize heat stress, how to prevent it, and what to do if someone gets sick • Schedule frequent breaks in cool, shaded area • Acclimate workers • Set up buddy system/instruct supervisors to watch workers for signs of heat-related illness **If workers must wear heavy protective clothing, perform strenuous activity, or work in the direct sun, additional precautions are recommended to protect workers from heat-related illness. *** • Schedule activities at a time when the heat is lower • Monitor workers closely
39.4 °C to 46.1 °C (103 ºF to 115 ºF)	High	In addition to the steps listed above: • Alert workers of high-risk conditions • Limit physical exertion (e.g. use mechanical lifts) • Review work/rest schedules and increase frequency and duration of breaks • Adjust work activities (e.g., reschedule work, pace/rotate jobs) • Use cooling techniques • Watch/communicate with workers at all times **When possible, reschedule activities to a time when temperature is lower.**

Table 3-4 Risk Levels and Associated Protective Measures

Adjusted Humidex Temperature	Risk Level	Recommended Mitigation Measures
>46.5 °C (>115 ºF)	Very High to Extreme	**Reschedule non-essential activity for days when heat is lower** **Move essential work tasks to the coolest part of the work shift; consider earlier start times, split shifts, or evening and night shifts.** **Strenuous work tasks and those requiring the use of heavy or non-breathable clothing or impermeable chemical protective clothing should not be conducted when the humidex adjusted temperature is at or above 46.5** °C (**115 °F).** If essential work must be done, in addition to the steps listed above: • Alert workers of extreme heat hazards • Conduct physiological monitoring (e.g., pulse, temperature, etc.) • Stop work if essential control methods are inadequate or unavailable

*The humidex is a simple tool and a useful guide for employers making decisions about protecting workers in hot weather. It does not account for certain conditions that contribute to additional risk, such as physical exertion. Consider taking the steps at the next highest risk level to protect workers from the added risks posed by:

- Working in the direct sun can add up to 7.2 °C(13 °F) to the humidex adjusted temperature
- Wearing heavy clothing or protective gear (add 1 °C for Tyvek; 3 °C for heavy clothing; 11 °C for impermeable clothing)

**Under most circumstances, fluid intake should not exceed 6 x 250 mL per hour or 12 L per day. This makes it particularly important to reduce work rates, reschedule work, or enforce work/rest schedules.

3.16.1.2 First Aid for Heat-Related Illness – Heat Stroke/Heat Exhaustion

Heat stroke is life threatening. Heat stroke in the elderly and in individuals that are in hot environments and not hydrating sufficiently manifest with dry, hot, flushed skin; rapid pulse; unconsciousness; and lack of perspiration. However, workers who are completing strenuous activity in a hot environment may have a rapid increase in core body temperature because sweating is not effectively cooling the body. This is also heat stroke. In the latter scenario, the victim's skin feels unusually hot and they are often confused, irritable, combative, or unconscious. If these symptoms are present in a worker, take the following actions immediately:

- Get medical attention immediately – call 911. While waiting for medical services to arrive, get the victim out of the heat and into a cooler place;
- Use any means to cool the person: spray with a water hose, sponge with cold water, place ice packs or wet towels on the neck, armpits and groin.

Heat exhaustion signals include nearly normal body temperature; pale, clammy, cool skin; weakness; headache; nausea; dizziness; thirst; and cramps.

- Move the person out of the heat and in to cooler place.
- Lay the person down and elevate the legs and feet slightly.
- Remove tight or heavy clothing.
- If the victim is fully conscious and can tolerate it, give 125mL of water to drink every 15 minutes.

3.16.2 Cold Stress

In a cold environment, body heat must be conserved to maintain a core temperature at normal levels and to provide adequate blood flow to the brain and extremities. Environmental factors affecting conservation of body heat are temperature and wind chill. These environmental factors, combined with human factors (such as protective layers of clothing) and job factors (such as work activity), determine whether one is adequately protected from the extremes of cold weather.

Did You Know? Arcadis Standard ARC HSIH014 “Cold Stress Prevention” includes requirements and recommendations for use when working in cold conditions.

3.16.2.1 Cold Stress Safety Precautions

The following actions can be taken to reduce cold stress:

- Workers must adapt to working in the cold by pacing themselves until they become adequately acclimatized to the cold environment;
- Prior to working outside (including operating a snowmobile) or in unheated buildings, determine the wind chill index and check the weather forecast for possible changes;
- Confirm that a means of communication is available when working in a wind chill below -22°F, so that a rescue can be conducted in case of an accident;
- Plan work so that a heated location, such as building or vehicle, is available for warming up, if needed;
- Schedule rest breaks regularly so workers can warm up and replenish their fluids;
- Provide thermal cushioned insulation on tool handles;
- Workers should recognize the following potential health problems from working in cold environments:

  - Frostbite: freezing of the skin; loss of sensation; cold, pale, and waxy skin Trench foot/immersion foot: intense pain in the foot, with swelling. Discoloration of the skin may be caused by long immersion in cold water. Water temperature does not need to be near freezing to cause trench foot;
  - Hypothermia: cold extremities, which are numb and clumsy; severe shivering along with reduced mental alertness with irritability and lack of concentration. The normal shivering process stops in severe hypothermia;
- Personal protective approaches that can reduce cold stress include:
  - Use mittens and gloves with removable insulated liners. Liners that cannot be removed and dried every day will gradually absorb moisture, which will speed up the loss of body heat.
  - Wear insulated boots and or wool socks – avoid cotton socks. Wool fibers are hollow and insulating, providing a thin barrier of warm air between the foot and surface of the boot, which will be cold. Looser fitting boots with thicker wool socks is preferred in the cold temperatures.
  - Wear a cold-weather mask or woolen toque and scarf (secure loose ends to prevent entanglement with equipment) during severe wind chill conditions; check facial skin frequently for frostbite.
  - Have a spare change of clothing available during cold weather. Clothing that has become wet from perspiration or precipitation must be changed as soon as possible. If the worker has perspired heavily, the worker must exercise caution before removing outer clothing (while resting outdoors) to prevent chilling and possible hypothermia.
- A minimum of three (3) layers of clothing should be used for cold stress prevention:
  - A base layer, preferably made from silk, wool or synthetic materials (polypropylene) is best;
  - An insulating layer, which keeps a layer of air trapped around the body. Use wool, synthetic insulation, or down for thermal insulation;
  - The third layer protects the previous layers from dust, dirt, wind, and moisture. Although nylon and/or other synthetics are also suitable for thermal use, they can develop electrostatic charge and, therefore, fire-retardant outwear (Nomex) may still be required; and,
  - The potential for accidental exposure to severe cold must be included in plans to control exposures. If a worker complains of symptoms of cold stress, they must be removed from the exposure and assessed by appropriate medical workers.

The Wind Chill Index is an adjusted ambient temperature accounting for wind speed and the resulting advective heat loss. Strong winds will cause more heat loss to occur at a given ambient temperature than if there was no wind. **Table 3-5** presents the adjusted wind chill index temperature for a range of temperatures and wind speeds.

Generally, when planning for cold weather work, it is the adjusted wind chill index temperature that should be used.

Table 3-5 Windchill Factor

Wind Speed (in mph)	Actual Temperature Reading (ºF)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperatures (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70		
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67				
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63					
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69					
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within 1 minute.			GREAT DANGER Flesh may freeze within 30 seconds.				

***Note**: Trench foot and immersion foot may occur at any point on this chart.*

3.16.2.2 First Aid for Frost Bite

- Move the person to a warm dry area. Do not leave the person alone;
- Remove any wet or tight clothing that may cut off blood flow to the affected area;
- Do not rub the affected area. Rubbing causes damage to the skin and tissue;
- It should be noted that experts advise rewarming in the field only when emergency help will take more than two hours to arrive and refreezing can be prevented;
- Do not rewarm the skin until you can keep it warm. Warming and then re-exposing the frostbitten area to cold air can cause worse damage;
- First line of rewarming should include bundling the affected area in warm dry clothing and blankets to utilize body heat to treat the affected area;

- Should the affected area not respond to body heat only, gently place the affected area into a luke warm water bath and slowly and gradually increase temperature, but do not exceed 40°C. Monitor the water temperature to slowly warm the tissue. Do not pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25 to 40 minutes;
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm;
- Discuss with WorkCare whether blisters should be debrided (cleaned by removing foreign material) or simply covered with a dressing.
- Discuss with WorkCare whether the patient should be given over the counter medication to combat inflammation;
- The key to prehospital treatment is to avoid partial thawing and refreezing, which releases more inflammatory mediators and makes the injury substantially worse. If there is a chance the affected area may get cold again, do not warm the skin;
- In the case of severe frost bite, seek medical attention as soon as possible.

3.16.2.3 First Aid for Hypothermia

When the temperature of your body falls to a level at which your vital organs can no longer function, you are experiencing hypothermia or exposure sickness. Hypothermia will develop rapidly and is caused by cold, wet, and/or windy weather that chills the body at a rate faster than the body can produce heat. A lack of energy-producing food and proper clothing will heighten the speed at which hypothermia will affect you. Always bring extra food and clothing. Work at the pace of the slowest member of your party, take frequent breaks, and keep a close watch for members experiencing signs of fatigue. Hypothermia generally occurs at temperatures of less than 10 °C (50 °F).

Early symptoms of hypothermia are easily recognizable and can rapidly progress to more severe symptoms. Treating hypothermia as soon as possible after the initial on-set is critical to avoid progression to what can be a life-threatening condition. Symptoms of hypothermia include, in the normal order of presentation:

- Feeling cold and constantly exercising to keep warm;
- Uncontrollable shivering and numbness;
- Violent shivers. Your mind becomes slow and starts to wander;
- Violent shivering ceases and muscles begin to stiffen and become uncoordinated. Exposed skin becomes blue and thoughts are foggy. Victim usually lacks the capability of realizing how serious the situation is;
- Pulse and respiration slow;
- Victim will not respond and becomes unconscious;

- The section of the brain controlling the heart and lungs ceases functioning;

Treatment for hypothermia must be quick and efficient. Once shivering has ceased, other symptoms will progress quickly and result in a life threatening situation.

- While attending to the victim, contact WorkCare to help you assess whether medical attention is required;
- Move the victim to a sheltered warm area, out of the elements;
- Remove wet clothing and replace with dry clothes and, if possible, a blanket;
- Prevent the victim from losing consciousness by talking to them and jostling them;
- Give the victim a warm, nonalcoholic drink;
- Allow another person in the blanket to share body heat; and,
- Exhale warm air near the vicinity of the patient's mouth and nose.

3.17 Biological Hazards

Working in the field has the potential to expose workers to a variety of biological hazards, such as, but not limited to, poisonous or physically damaging plants; biting/stinging/poisonous insects and arachnids; snakes (venomous and nonvenomous); feral animals; and other aggressive animals. This section discusses the elemental recognition of H&S hazards and provides basic precautions and first-aid techniques. Any concerns related to non-life-threatening illnesses or injuries sustained from these biological hazards should be discussed with WorkCare.

3.17.1 Dogs

Dogs may be a serious concern when working on residential or farm properties. Domesticated dogs include animals used as guard dogs as well as pets. The following recommendations may be used to avoid being bitten by dogs:

Arcadis employees occasionally work in areas where dogs are seen roaming or have escape confinement. Report dog sightings to the Project Manager and always Stop Work if a dog or any animal poses a threat.

- If the client or property owner has guard dogs at the site or residence, the PM or Site Supervisor will work with the client/owner to ensure that the dog(s) is secured indoors and unable to gain access to any area in which Arcadis workers will or could be working.
- Do not approach strange dogs, especially dogs that are tied up or confined behind fences.
- Do not pet a dog unfamiliar with you or attempt to pet a dog familiar with you without the dog seeing and sniffing you first.

- Never turn and run away from dogs.
- Do not disturb dogs that are sleeping, eating, chewing on toys, or caring for puppies.

If approached by an aggressive or unknown dog, implement the following actions to avoid or reduce severity of attack:

- Use motor vehicle as a shield or shelter between you and the animal.
- Never yell, scream, or run.
- If you do not have a shield or place of safety, remain motionless, hands at your sides and avoid eye contact with the dog.
- Once the dog loses interest in you, slowly back away until the dog is out of sight.
- If attacked, “feed” the dog outer clothing like jackets, field equipment, field books, or anything else that may be used to place between you and the dog.
- If you fall or are knocked down to the ground, curl into a ball with your hands over your ears and remain motionless to the extent possible. Do not scream.

If bitten by an animal, thoroughly clean the bite area with soap and water and control bleeding. Do not scrub the wound. Lightly cover the wound, but do not tighten with tape or butterfly bandages. Call WorkCare and seek medical attention if so advised. Avoidance and alertness to surroundings are the best defense to biting animal hazards.

3.17.2 Ticks

Information in this FHSHB is limited to the hard ticks found in the U.S. and Canada. Ticks favor tall grass and brushy environments. Ideal nesting locations are area moist leaf piles located out of direct sunlight and strong wind. Ticks are primarily active during summer months but may be active any time of the year. Eighty percent of a tick’s life is spent dormant or not actively seeking food. The following should help reduce exposure to tick bites:

Figure 3-6 Common Ticks in the U.S. and Canada

- Avoid unnecessary entry into tall grass and brushy areas;
- When possible, clear around monitoring wells or other work areas, creating a buffer of at least 20 feet of short vegetation;
- Wear clothing that has been pre-treated with permethrin;
- Wear bug repellant containing Deet. DEET cannot be used on flame-resistant clothing;
- Minimize exposed skin and tuck pants into socks or boots.
- Tape your pant and sleeve cuffs to prevent ticks crawling in under your clothing;
- Wrap duct tape around the bottom of your legs, sticky side facing out, to capture ticks as they attempt to climb up your leg;
- Wear light-colored clothing so crawling ticks can be easily identified;
- Inspect yourself frequently during the day and at the end of work; and,
- In known or likely tick infested areas, wear light-colored, protective coveralls (i.e. Tyvek) or protective pants to provide a barrier between ticks and the skin and allow for easy identification of ticks against the light colored material. Boot covers attached to the coveralls are preferred, however, taping the cuff to the boot can be effective as well.

Figure 3-7 Relative Sizes of Common Ticks

Adult American Dog Tick and Lonestar Ticks are often approximately the size of an apple seed. Adult deer ticks are approximately the size of a sesame seed. Tick nymphs, or juvenile ticks, are approximately the size of a poppy seed.

If ticks cannot be avoided, chemical pesticides may be used in limited quantities (similar volume and frequency as a household consumer). Commercial or broad insecticides may only be applied by a licensed exterminator.

3.17.2.1 Tick Checks on Clothing and Body

Regularly check your clothing for ticks. Ticks may be carried inside on clothing. Any ticks that are found should be removed. Prior to washing, place dry clothing in a dryer on high heat for 10 minutes to kill ticks. If the clothes are damp, additional time may be needed. If the clothes require washing first, hot water (130 degrees F) is recommended, as cold or medium water may not kill ticks. See Section 3.17.6 Chemical Protection for Flying Insects and Ticks.

Check your body for ticks after being outdoors. Conduct a full body check upon return from potentially tick-infested areas. Use a hand-held or full-length mirror to view all parts of your body. Common areas of tick attachment include:

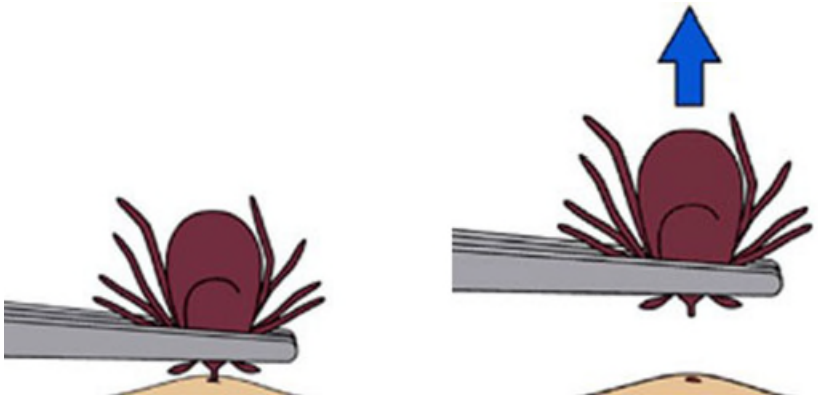
- Under the arms;
- In and around the ears;
- Inside the belly button;

- Back of the knees;
- In and around the hair;
- Between the legs; and,
- Around the waist

Shower soon after being outdoors. Showering within 2 hours of coming indoors has been shown to reduce your risk of getting Lyme disease. Showering may help wash off unattached ticks and it is a good opportunity to complete a tick check. While showering, use fingertips to feel the skin for small bumps that may reveal a crawling or imbedded tick.

If a tick is attached to the body, call WorkCare for proper removal, cleaning, and follow-up bite site monitoring. If tapered-tip tweezers are available, the following is the removal procedure:

1. If using narrow-tipped tweezers, grasp the tick as close to the skin as possible. Gently pull the tick strait up and out without twisting;
2. During removal, be careful not to squeeze the tick's body and grasp the tick where its mouth enters the skin.
3. After removal, inspect the tick to see if its head was removed;
4. Once the tick has been removed, wash the area with soap and water and apply antiseptic or antibiotic ointment to prevent infection;
5. Keep a close watch over the bite area and keep the tick in a small jar or bag for reference by a physician, if needed; and,
6. If parts of the tick stay in the skin, or if unexplained symptoms develop (severe headaches, fever, or rash within 10 days of the bite), call WorkCare.



To safely remove an imbedded tick, grasp the tick as close to the skin as possible with narrow tweezers and gently pull up with steady pressure. Avoid squeezing the body of the tick.

Figure 3-8 Removing a tick safely

Larval stage ticks (also known as “seed ticks”) are prevalent during August and September. During this period, the larvae accumulate in masses on vegetation and infest a host upon contact (brushing up against the infested vegetation), resulting in numerous tick bites. If infested with “seed ticks,” call WorkCare for removal procedures, cleaning, and monitoring of the bite area(s).

3.17.2.2 Washing and Drying Permethrin Treated Clothing

Permethrin applied to clothing is one of the most effective ways to reduce exposure to ticks. Human perspiration and exposure to water does not significantly deteriorate its effectiveness. However, agitation by a washing machine does deteriorate the permethrin application as it knocks the molecules loose from the fabric. For best results, hand washing and air drying is recommended for permethrin treated clothing. When using a conventional washer and dryer, use the gentle wash and dry cycles. Loss due to the dryer is limited compared to the detergent and washer agitation. Dry cleaning will also remove the permethrin from the fabric. Clothing that has been commercially treated with permethrin will stay effective for up to 70 launderings.

3.17.2.3 Lyme Disease and Ehrlichiosis

Lyme disease results from a tick-borne infection. Ticks that are removed within 24 hours of attachment typically do not result in lyme disease exposure. If lyme disease is transmitted, a red papule appears at the site of the tick bite. This infection tends to expand over a period of 3 to 4 days and may reach 6 inches (15 centimetres) in diameter. Other symptoms of the disease include influenza-like symptoms, such as chills, headache, and aching muscles. If you suspect that you have contracted Lyme disease, call WorkCare and seek medical attention.

Ehrlichiosis also commonly occurs in summer and is transmitted by the bite of infected ticks. Symptoms include muscle and joint aches and flu-like symptoms, but there is typically no skin rash. If you believe you have contracted Ehrlichiosis, call WorkCare and seek medical attention.

3.17.2.4 Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever is transmitted by infected ticks but can be very difficult to diagnose at its early stages, even by experienced physicians who are familiar with the disease. Patients infected with *R. rickettsii* (the bacteria that causes Rocky Mountain Spotted Fever) generally visit a physician in the first week of their illness, following an incubation period of 5 to 10 days after a tick bite. The early clinical presentation of Rocky Mountain Spotted Fever is nonspecific and may resemble a variety of other infectious and noninfectious diseases.

The classic symptoms for this disease are fever, rash, and history of tick bite. However, this combination is not always detected when the patient initially presents for care.

Initial Signs and Symptoms: Initial symptoms may include fever, nausea, vomiting, severe headache, muscle pain, and lack of appetite. The rash first appears 2 to 5 days after the onset of fever but is often not present or

may be very subtle when the patient is initially seen by a physician. Younger patients usually develop the rash earlier than older patients. Most often it begins as small, flat, pink, spots (macules) on the wrists, forearms, and ankles that typically do not itch. These spots turn pale when pressure is applied and eventually become raised on the skin.

Later Signs and Symptoms: Later signs and symptoms include rash, abdominal pain, joint pain, and diarrhea. The characteristic red, spotted (petechial) rash of Rocky Mountain Spotted Fever is usually not seen until the sixth day or later after onset of symptoms, and this type of rash occurs in only 35 to 60 percent of patients. The rash involves the palms or soles in as many as 50 to 80 percent of patients; however, this distribution may not occur until later in the course of the disease. As many as 10 to 15 percent of patients may never develop a rash.

3.17.3 Stinging Insects (Bees, Wasps, Hornets, and Yellow Jackets)

Care will be taken by all site workers to avoid stinging or biting insects. These insects include, but are not limited to, bees, wasps, hornets, and yellow jackets. The following will help reduce exposure to these types of insects:

- Yellow jackets nest in the ground or rotting logs. They are often aggressive;
- Avoid wearing brightly colored or patterned clothing;
- Avoid wearing perfume or cologne or using scented soaps;
- Inspect food and drinks prior to consumption;
- Wasps favor habitats provided by monitoring wells with stick-up completions. Exercise caution and take care to look for stinging insects before and during opening of protective monitoring well casings; and,
- Do not attempt to remove, destroy or apply insecticide to a nest unless necessary (i.e. wasp nest located in a building in close proximity to workers). Environmentally friendly wasp and hornet spray, made from plant and peppermint oils, may be used in environmentally sensitive locations. Consult the product manufacturer and your Arcadis Project Manager before proceeding with localized application.

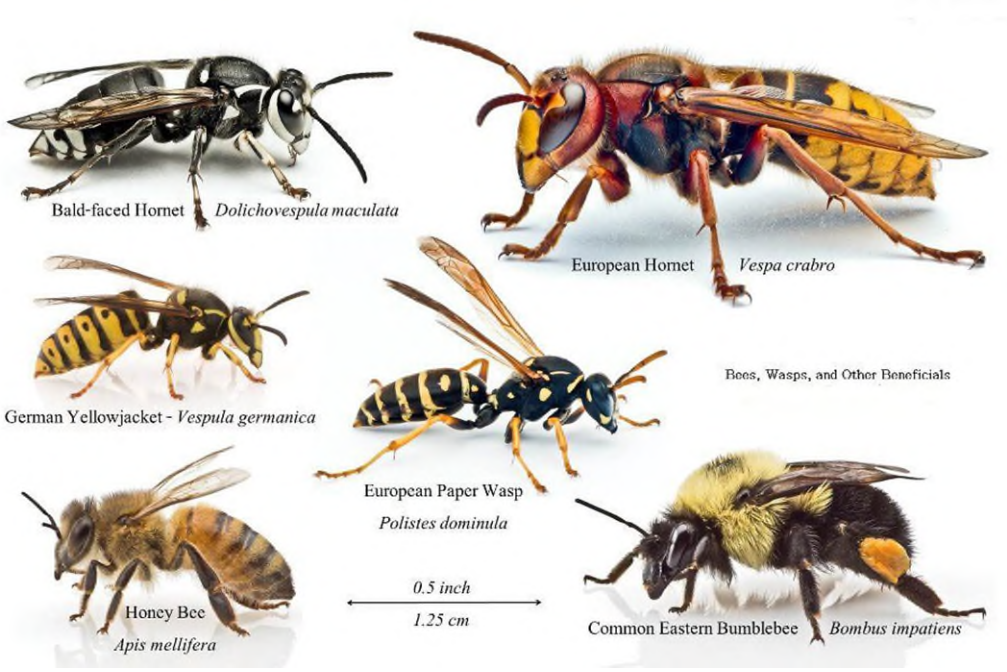


Figure 3-9 Common stinging insects

Of the common insects, hornets and yellow jackets are considered aggressive and may sting without provocation. Wasps and bees are less aggressive unless protecting a nest. Avoid swatting at bees as they release pheromones to signal other bees of a threat. All the insects pictured above are capable of stinging and injecting venom capable of producing an allergic reaction in some people.

3.17.3.1 First Aid for Stings

1. Call WorkCare for treatment, removal, and cleaning of the sting area.
2. Remain with the victim to be sure that they do not have an allergic reaction.
3. Remove the stinger using a 4- x 4-inch gauze pad wiped over the area or by scraping a fingernail over the area. Never squeeze the stinger or use tweezers.
4. Wash the site with soap and water.
5. Do not scratch the sting site. This will cause the site to swell and itch more and increase the chance of infection.

3.17.3.2 Allergic Reactions to Stings

Allergic reactions to stings can be deadly. People with known allergies to insect stings should always carry an insect sting allergy kit and wear a medical ID bracelet or necklace stating their allergy and should alert coworkers onsite. There are several signs of an allergic reaction to stings. Look for swelling that moves to other parts of the body, especially the face or neck. Check for difficulty in breathing, wheezing, dizziness or a drop in blood pressure. Get the person immediate medical care if any of these signs are present. It is normal for the area that has been stung to hurt; have a hard, swollen lump; get red; and itch. Kits are available to reduce the pain of an insect sting. They are a valuable addition to a first-aid kit.

3.17.4 Rodents

Hantavirus is a rare but serious (can be fatal) illness. Deer mice are the main carriers of Hantavirus, although it is possible that other rodent species, such as field mice, voles, and rats, may carry the disease. Hantavirus can cause a serious lung infection called Hantavirus Pulmonary Syndrome.

Good housekeeping (eliminating food sources) and eliminating or reducing access points to structures are important in controlling rodent populations.

Exposure to the virus may occur through the inhalation of dust contaminated with dried mouse droppings, and urine and saliva from infected rodents. Other possible means of infection include contact with the eyes, contact with open wounds, rodent bites, and eating or drinking contaminated food. There is no evidence that household pets or infected humans can transmit the disease. First stage symptoms include fever, fatigue, weakness, chills, muscle aches (lower back and thighs), abdominal pain, headaches, nausea, mild diarrhea, and possible cough. The second stage starts with shortness of breath. This is due to the collection of fluid in the lungs. Do not delay medical treatment if you experience the above symptoms. If you have had recent contact with rodents or their droppings, make sure the doctor is aware of exposure history.

3.17.4.1 Controls

The first and foremost precaution and preventive measure against Hantavirus is to avoid dermal contact with rodent droppings and inhalation of dust that is contaminated with the droppings. Special precautions are required

for working in and around areas of heavy rodent infestations. A rodent infestation is considered heavy if piles of feces or numerous nests or dead rodents are observed.

If rodents cannot be avoided, baits and chemical controls may be used in limited quantities (similar volume and frequency as a household consumer). Commercial or broad rodenticide applications may only be completed by a licensed and permitted professional. Be sure to understand federal, provincial, territorial and local laws regulating such applications before purchasing or using them. To treat a large area for rodents, subcontract a professional pest control service.

3.17.4.2 In Buildings

If the building has been closed and unoccupied for a long period (weeks or months), ventilate the building by opening doors and windows for at least 30 minutes before beginning any work. Use cross ventilation if possible. Leave the area during the airing-out period.

3.17.4.3 Clean Up of Rodent Urine and Droppings and Contaminated Surfaces

Areas with evidence of rodent activity (e.g., dead rodents and rodent excreta) should be thoroughly cleaned to reduce the likelihood of exposure to Hantavirus-infected materials. Cleanup procedures must be performed in a manner that limits the potential for dirt or dust from contaminated surfaces to become airborne. Persons involved in the cleanup should wear Tyvek® coveralls; rubber boots or disposable shoe covers; rubber, latex, vinyl, or nitrile gloves; protective goggles; and appropriate respiratory protection (e.g. full-face HEPA cartridge-equipped respirator). If respirators are required, workers must follow the Respiratory Protection Standard.

Spray rodent urine and droppings with a disinfectant or bleach solution until thoroughly soaked (see Disinfecting Solutions below). To avoid generating potentially infectious aerosols, do not vacuum or sweep rodent urine, droppings, nesting materials, or contaminated surfaces until they have been disinfected. Use a paper towel (while wearing gloves) to pick up the urine and droppings. Place the paper towel in the garbage.

After the rodent droppings and urine have been removed, disinfect items that might have been contaminated by rodents or their urine and droppings as follows:

- Mop floors with a disinfectant or bleach solution;
- Disinfect countertops, cabinets, drawers, and other durable surfaces with a disinfectant or bleach solution. Spray dirt floors with a disinfectant or bleach solution;
- Disinfect carpets with a disinfectant or commercial-grade steam cleaner or shampoo;
- Steam clean or shampoo rugs and upholstered furniture;

- Launder potentially contaminated clothing with hot water and detergent. Use rubber, latex, vinyl, or nitrile gloves when handling contaminated laundry. Machine-dry laundry on a high setting or hang it to air dry in the sun;
- Leave books, papers, and other items that cannot be cleaned with a liquid disinfectant or thrown away outdoors in the sunlight for several hours, or in an indoor area free of rodents for approximately 1 week before cleanup. After that time, the virus should no longer be infectious;
- Wear rubber, latex, vinyl, or nitrile gloves and wipe items with a cloth moistened with disinfectant; and,

Disinfect gloves with disinfectant or soap and water before removing them. After removing the gloves, thoroughly wash bare hands with soap and warm water

3.17.4.4 Clean up of Dead Rodents and Rodent Nests

Use the following procedure to clean up dead rodents and/or rodent nests:

- Wear rubber, latex, vinyl, or nitrile gloves;
- Use insect repellent (containing DEET) on clothing, shoes, and hands to reduce the risk of flea bites;
- Spray dead rodents and rodent nests with a disinfectant or bleach solution, soaking them thoroughly (see Disinfecting Solutions below); and,
- Place the dead rodent or nest in a plastic bag or remove the dead rodent from the trap and place it in a plastic bag. When cleanup is complete (or when the bag is full), seal the bag, place it into a second plastic bag, and seal the second bag. Dispose of the material in the double bag by discarding them in a covered trash can that is regularly emptied.

3.17.4.5 Disinfecting Solutions

Two types of disinfecting solutions are recommended to clean up rodent-contaminated materials:

- General-purpose household disinfectant. Prepare according to the label. Almost any agent commercially available is sufficient as long as the label states that it is a disinfectant. Effective agents include those based on phenols, quaternary ammonium compounds, and,
- Hypochlorite (bleach) solution. A chlorine solution, freshly prepared by mixing 100 mL of household bleach in 900 mL of water (or a 1:10 solution), can be used in place of a commercial disinfectant. Bleach solutions should be prepared fresh daily.

3.17.5 Mosquitos

Mosquitoes are blood-sucking insects that can spread several diseases, including malaria, West Nile Virus (WNV), Zika virus, and viral encephalitis. Some general precautions to take to avoid exposure to mosquito-borne diseases include:

- If possible, eliminate sources of standing water at the project site because mosquito breeding takes place in standing water;
- Use insect repellent containing DEET and apply to exposed, unbroken skin according to the manufacturer's instructions. Note, the use of DEET when sampling water or ground water may result in cross contamination of samples. When sampling water for low contaminant concentrations, DEET should not be used;
- Wear light-colored, long-sleeved shirts, long trousers, and socks; and,
- Conditions may warrant wearing bug hats/jackets or wearing two layers of clothing.

If mosquitoes cannot be avoided, baits and chemical controls may be used in limited quantities (similar volume and frequency as a household consumer). Commercial or broad insecticide applications may only be completed by a licensed and permitted professional. Be sure to understand federal, local, and state laws regulating such applications before purchasing or using. To treat a large area for mosquitoes, subcontract a professional pest control service.

3.17.6 Chemical Protection for Flying Insects and Ticks

Both DEET and picaridin are proven to be effective at fending off mosquitoes—and are superior to other repellents when it comes to protection time. However, DEET has shown to be protective against ticks as well, a common biological hazard encountered by Arcadis employees.

DEET: Developed by the U.S. Army in 1946, DEET (N,N-diethyl-m-toluamide) is a synthetic chemical that provides one to six-plus hours of complete protection against mosquitoes, depending on its concentration. DEET has been used billions of times by hundreds of millions of people (including an estimated 30 percent of the U.S. population each year). When properly applied, it has virtually no proven adverse health effects, though in rare cases a contact skin rash can result from exposure. The EPA has completed several comprehensive assessments of DEET over the years (most recently in 1998) and concludes that repellents containing DEET do not present a health concern as long as consumers follow label directions.

DEET has some notable drawbacks. It imparts a greasy feel to the skin upon application. It emits a distinctive—and to many, unpleasant—odor and it has the ability to dissolve certain plastics and some synthetic materials, including rayon, spandex, and vinyl. This is a particular hazard for sunglasses and plastic eyeglass lenses. (It has no effect on nylon, wool, or cotton.) DEET cannot be used on flame-resistant clothing.

Picardin: Created by Bayer in the 1980s, picaridin (pronounced pih-CARE-a-den) is a synthetic compound developed from a plant extract from the genus Piper, the same plant genus that produces table pepper. Picaridin has been available since 1998 in Europe and Australia—where it is the best-selling insect repellent—but was approved for sale in the United States only in 2005. (You may see it listed as KBR 3023, Bayrepel, or icaridin.) As with DEET, the EPA has concluded that the normal use of picaridin does not present a health concern.

Studies have shown picaridin to be as effective as DEET in repelling mosquitoes. Unlike DEET, however, picaridin is odorless, non-greasy, and does not dissolve plastics or other synthetics. The one possible concern with picaridin is its relative newness. Insufficient time has passed for long-term health risks (should they exist) to manifest themselves. A limited, but growing, number of repellents contain picaridin, including Cutter Advanced, Sawyer Premium, and Repel Smart Spray.

Concentrations of DEET and/or Picardin: The percentage of DEET or picaridin in a repellent determines its protection time, with higher concentrations offering longer protection. DEET is available in concentrations from 4 percent to 100 percent; picaridin levels range from 7 to 20 percent.

A landmark 2002 study in the New England Journal of Medicine compared the efficacy of DEET at different concentrations and found that the duration of complete mosquito protection ranged from one to two hours for concentrations between 5 and 10 percent, four to five hours at around 20 percent, and only marginally longer up to 50 percent, with no improvement at higher levels. “Slow-release” formulas can extend protection time to eight hours or more. When it comes to picaridin, recent studies have indicated that a concentration of 7 percent is equivalent to about 10 percent DEET (one to two hours of protection), and a 20 percent concentration offers the same protection (four to five hours) as an equivalent DEET concentration.

Few studies have evaluated the relative efficacy of DEET and picaridin in fending off ticks, black flies, sand flies, no-see-ums, midges, and other biting insects. Available evidence indicates that picaridin and DEET are both effective at repelling black flies, while DEET is more effective at preventing tick bites. Conversely, picaridin seems to be better at repelling other biting insects, notably no-see-ums.

Permethrin: Pyrethrin insecticides from pyrethrum daisies (Chrysanthemum cineraria folium) have been used in various forms for thousands of years. They were originally discovered in China and imported into Europe as “Persian powder”. Permethrin was first registered, and tolerances established in the United States in 1979 for use on cotton. Unlike topical insect repellents applied to the skin, Permethrin is applied to clothing and outdoor gear material, bonding to the fabric fibres for up to 6 weeks (42 days) or 6 washings. The decline in effectiveness over time since application and the fact that washing reduces effectiveness are very problematic for employees applying permethrin “at home”.

When a tick, mosquito, or other insect contacts Permethrin-treated material, it absorbs a dose that will either repel or kill the insect. The synthetic version of pyrethrum (a natural insecticide derived from the chrysanthemum flower), Permethrin is non-toxic and registered for use by the U.S. EPA. Permethrin is very toxic to fish and toxic to cats. Apply it in an open area outdoors, such as a driveway or back yard away from flowers (it is also toxic to bees).

To apply, follow the manufacturer instructions and spray Permethrin directly onto clothing and gear with a slow sweeping motion, keeping the bottle about 6 to 8 inches away and treating each side of the garment for about 30 seconds. The garment should be damp but not dripping. Only apply to the exterior of the clothing.

Insect Shield is a service that pressure infuses permethrin in your clothing, locking the permethrin in place at the molecular level. The repellence of Insect Shield-treated apparel is EPA-registered to last through 70 launderings – the expected lifetime of a garment. More information is available on www.insectshield.com or by calling Insect Shield directly at 866.712.7110.

3.17.6.1 Washing and Drying Permethrin Treated Clothing

Permethrin applied to clothing is one of the most effective ways to reduce exposure to ticks. Sweating and exposure to water does not significantly deteriorate the application. It is primarily the agitation of a washing machine which deteriorates the permethrin application as it knocks the molecules loose from the fabric. For best results, hand washing, and air drying is recommended. When using a conventional washer and dryer, use the gentle wash and dry cycles. Loss due to the dryer is limited compared to the detergent and washer agitation. Dry cleaning will remove the permethrin from the fabric. Record the date permethrin was applied and record the number of times the garment has been washed. Depletion of permethrin is important in regard to washing but the chemical will only remain effective for up to 6 weeks regardless of the number of times it is washed.

3.17.7 Snakes

3.17.7.1 Rattlesnakes

The possibility of encountering snakes exists, specifically for workers working in wooded or vegetated areas. There are two groups of venomous snakes in the U.S.: pit vipers and elapids. The Crotaline, commonly known as pit vipers, are a subfamily of venomous vipers found throughout Europe, Asia, and the Americas. They are distinguished by the presence of a heat-sensing pit organ located between the eye and the nostril on both sides of the head. This group of snakes include rattlesnakes, water moccasin (aka cottonmouth) and copperhead. Venom from pit vipers is broadly categorized as hemotoxins because they destroy red blood cells. Bites from pit vipers found in the U.S. are rarely fatal. Approximately 5,000 people are reported to be bitten in the U.S. each year with approximately 5 bites resulting in death.

Among the venomous snakes in the US, Copperhead snakes are responsible for the most snake bites, however, the bite is rarely fatal. Adult species can be identified by a “Hershey’s Kisses” pattern on the body.

Rattlesnakes account for the most deaths, whereas Copperhead snakes account for the most bites, often resulting from the snake being stepped on. Pit vipers are capable of controlling the amount of venom they inject. Approximately 20%-25% of pit viper bites are “dry”, meaning no venom is injected in the victim.

3.17.7.2 **Controls**

All workers walking through areas that are suspected or prone to have snake activity must be aware of the potential for encountering snakes and the need to avoid actions that will increase the risk of such an encounter (e.g., turning over logs). Avoid typical places where snakes like to hide, such as patches of tall grass and piled leaves, and rock and woodpiles. If you encounter a snake, give it space to retreat and let it take cover. Rattlesnakes will often coil when threatened and rattle, warning people of their location.

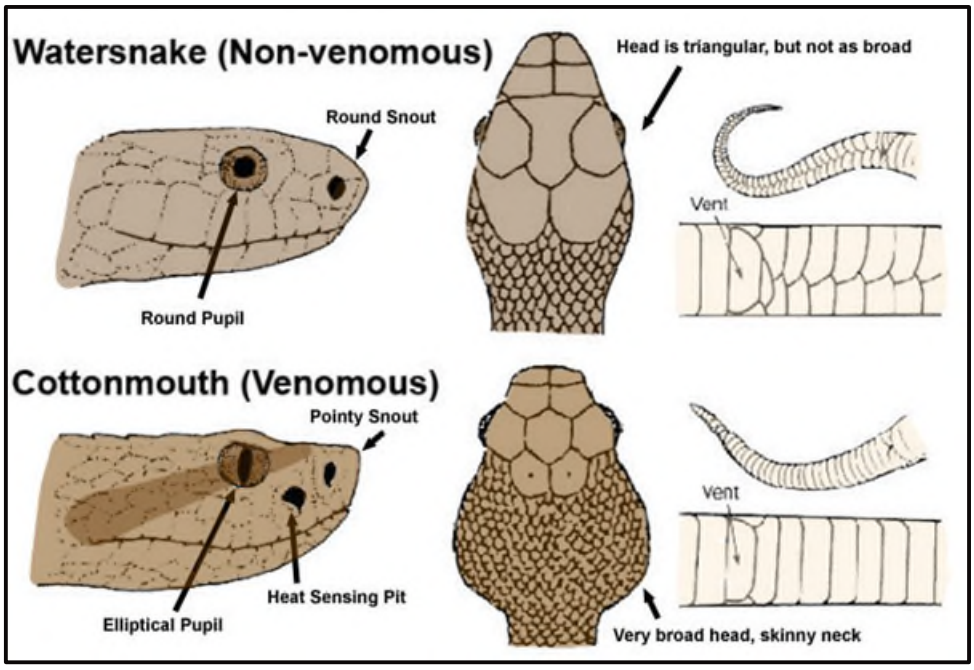


Figure 3-10 Differences in Venomous vs Non-Venomous Snakes

The snake species above illustrate the differences between a non-venomous snake and the Cottonmouth or Water Moccasin, a pit viper. All pit vipers have similar head structured and elliptical pupils. Some non-venomous snake species are capable of mimicking a venomous snake by creating a triangular shaped head appearance. In low light, the pupils of venomous snakes may be round.

When working outside where snakes may be present, wear tall boots, long pants, and leather gloves. If a venomous snake is identified in an area in which Arcadis will be continuing work, Stop Work and seek a professional pest removal service. Arcadis workers should not attempt snake removal.

3.17.7.3 First Aid

If a snake bite occurs, attempt to obtain markings, size, and color of the snake for identification. If bitten by a Rattlesnake, the victim must be transported to the nearest hospital as soon as possible.

Snakebite 911 is an app that provides basic steps for rendering first aid to the victim of a venomous snake bite. Includes a venomous snake identification guide and hospital locations with antivenom supply.

To identify a snake bite, consider the following general signs and symptoms:

- numbness in the face or limbs
- lightheadedness
- weakness
- nausea or vomiting
- sweating
- salivating
- blurred vision
- difficulty breathing.

Take the following actions:

- Do a scene survey and primary survey. Most snakes will be in close proximity to the place where the bite took place–be careful;
- Reassure the victim. Remember, almost ¼ of bites result in little to no envenomation;
- Remove jewelry as swelling is likely near the bite location;
- Place the casualty at rest in a semi-sitting position and keep the affected limb below heart level. By placing the casualty at rest, the venom won't spread as quickly;
- Wash the bite location with soap and water, when possible;
- DO NOT use snake bite first aid kits that include cutting a "X" over the bite location and attempting to suction out venom. These kits often do more harm than good and are not recommended by medical professionals;
- DO NOT take antihistamines or anti-inflammatory medications. These medications have no benefit and may actually cause more harm. Antivenom, IV fluids, pain management and bloodwork to assess hematological changes are appropriate clinical measures.
- Seek emergency medical help as soon as possible. A doctor will evaluate the victim to decide on a specific course of treatment. The severity depends on the location of the bite and the age and health of the victim;

- Do not let a snakebite casualty walk if there is any other method of transportation to medical help. Limiting motion will slow down circulation of the venom;
- If the bite is not serious, the doctor may simply clean the wound and give the victim a tetanus vaccine. If antivenom is needed, the sooner the patient is provided with this treatment the more effective it will be; and,
- If the snake is confirmed to be non-venomous by a trained and experienced witness, contact WorkCare.

Figure 3-11 Coral Snake

Coral snake. The adage "Yellow on black is friend of Jack, red on yellow will kill a fellow" applies to the North American Coral Snake; however, there are species of coral snake that do not apply!

3.17.8 Fire Ants

Fire ants are prevalent throughout the southeast U.S. and live in nests in the ground. Fire ants typically climb unnoticed onto their prey and then simultaneously bite the victim. A bite is painful, usually resulting in a blister and later, itching that can lead to infection. Multiple bites can trigger an allergic reaction that can include swelling, heart palpitations, and responses similar to that of a bee sting.

Fire ant nests are not always visible and often located under the top layer of vegetation.

FiFigure 3-12 Fire Ants

3.17.8.1 Controls

When working in an area where ants may exist, a thorough inspection of the area should be made to mark and avoid the nests. Do not lay tools and equipment on the ground. Visibly check anything that may have come in contact with the ground before picking it up. Additional safety precautions include:

- Use caution when coming in contact with monitoring wells or any other item that is already in place.
- Individuals who know they are allergic to ant bites should wear Modified Level D PPE with pant legs taped to boots; gloves should be taped to sleeves to preclude ants crawling onto the skin.

- Allergic individuals should carry their auto-injectors when in the field and check that the auto-injector has not expired.

Fire ants have the appearance of ordinary ants, are reddish brown to black in color, and range from 2.5 to 6.3 mm (1/10- to ¼-inch) in size. Fire ants typically construct soil mounds up to 46 cm (18 inches) high in open sunny areas; however, fire ants may also colonize in mulched areas, cracked areas of pavement, electrical equipment, and utility housings, and may nest around bodies of water.

Fire ants are very aggressive when agitated and can cause painful bites and stings. Avoiding fire ant colonies is the preferred method to prevent bites and stings. However, if fire ants cannot be avoided, baits and chemical controls may be used in limited quantities (similar volume and frequency as a household consumer). Broad application of pesticides, without a license, is prohibited by law. Biological controls are generally considered beyond the scope of this handbook.

If bitten or stung by fire ants call WorkCare. An allergic reaction may occur that, in some instances, could be life threatening to sensitive individuals. If symptoms of flushing; general hives; swelling of the face, eyes, or throat; chest pains; nausea; severe sweating; loss of breath; serious swelling; or slurred speech occurs, the individual must promptly seek medical treatment.

General first aid for fire ant bites and stings includes:

- Elevate the extremity and apply ice or cold compress to reduce swelling and pain;
- Clean blisters with soap and water to prevent secondary infection; however, do not break blisters; and,
- Use topical steroid ointments or oral antihistamines to reduce itching associated with allergic reactions.

3.17.9 Spiders

Figure 3-13 Black Widow

Workers may encounter spiders during work activities. Two spiders of concern are the black widow and the brown recluse. Both prefer dark sheltered areas, such as basements, equipment sheds, and enclosures, around woodpiles or other scattered debris, and monitoring wells and vaults. The black widow is shiny black, approximately 1-inch long and found throughout the U.S. A distinctive red hourglass marking is located on the underside of the black widow's body. Generally, only females are cause for concern. The bite of a black widow is rarely fatal to healthy adults, but effects may include respiratory distress, nausea, vomiting, and muscle spasms. Even then the small amount of venom they produce gets quickly diluted by the human body. A black widow bite can, however,

cause severe pain at the bite site and lead to painful muscle contractions. Although these bites are generally not life-threatening for healthy adults, medical attention should always be sought following a black widow bite — particularly for children and the elderly. Other spider's native to the U.S. are not venomous, although bites from some spiders can be quite painful and dangerous, if they become infected.

The brown recluse (pictured) is smaller than the black widow and gets its name from its brown coloring and behaviour. The brown recluse is more prevalent in the southern U.S. The brown recluse has a distinctive violin shape on the top of its body. The bite is painful, and the bite site ulcerates and takes many weeks to heal completely. It is not uncommon for brown recluse bites to result in hospitalization.

Figure 3-Figure 3-14 Brown Recluse

The most telltale characteristic of brown recluse spiders is the presence of a dark, violin-shaped mark on the dorsum of the arachnid's light brown or yellowish-brown cephalothorax. The neck of this distinct violin pattern is directed toward the abdomen.

Both the black widow and the brown recluse spiders prefer dark sheltered areas, such as basements, equipment sheds, and enclosures, around woodpiles or other scattered debris, and monitoring wells and vaults.

3.17.9.1 Controls

To minimize the threat of spider bites, all workers walking through areas prone to have spider activity (e.g. wet, damp, dark crawl spaces, vegetated areas, basements) must be aware of the potential for an encounter. Workers should avoid actions that may result in encounters, such as turning over logs and placing hands in dark places, such as behind equipment or in corners of equipment sheds or enclosures. If spiders cannot be avoided, baits and chemical controls may be used in limited quantities (similar volume and frequency as a household consumer). The broad application of herbicides or pesticides may be considered a commercial application. Commercial applications may only be completed by a licensed and permitted professional. Be sure to understand federal, provincial, territorial and local laws regulating such applications before purchasing and using insecticides. To treat a large area for spiders, subcontract a professional pest control service.

If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible. First aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

3.17.10 Chiggers

Chiggers are small red mites (as adults) that are barely visible to the naked eye. Although not originally found in Canada, their habitat has expanded into southwestern Ontario. Typical chigger habitat includes tall grasses and overgrown brushy areas. When in the larval stages, chiggers are prone to feeding on animals and humans. Larval chiggers attach themselves to the skin, secret a digestive enzyme and feed off of liquified host tissue. The chigger's salivary secretions can cause an allergic reaction, resulting in a rash and intense itching. The following actions will reduce exposure to chigger hazards:

- Avoid unnecessary entry into tall grass and brushy areas; Wear insect repellents containing DEET; and,
- Minimize exposed skin and tuck pants into socks or boots.

Figure 3-15 Chiggers

Chiggers are so small, they're virtually impossible to see with the naked eye. Typically, orange-red to reddish-brown and covered with long surface hairs, their oval shape is very similar to the larger, adult form and to their close relatives, the ticks.

3.17.11 Caterpillars

While not aggressive towards humans, many caterpillars have bristles associated with venom glands, called urticating hairs, and can cause skin irritation on contact. In general, caterpillars should not be handled without protective gloves. In areas with high populations where caterpillars can fall from overhead trees, long sleeves and long pants should be worn.

3.17.12 Physically Damaging Plants

Plants like thistles, nettles, roses, raspberries, cactus, and hawthornes, which have thorns and irritating hairs, can create a hazard to skin and can damage protective or personal clothing. Plants of this nature are common on project sites and can often be found along fence lines, abandoned structures, or equipment. If work will be conducted near these plants, they should be removed prior to implementing the work activity. Long pants or chaps should be worn when working in dense thorny vegetation. Talk to local staff or plant experts to learn of hazardous plants unique to your location or geography. Often, new or visiting staff are not familiar with the appearance or hazards of plants in unfamiliar locales.

3.17.12.1 Common Nettle

Common Nettle or Stinging Nettle has many hollow stinging hairs called trichomes on the leaves and stems, which act like hypodermic needles, injecting histamine and other chemicals that produce a stinging sensation upon contact. Contact may result in small blisters. Anti-itch drugs, usually in the form of creams containing antihistamines or hydrocortisone, may provide relief from nettle dermatitis.

Figure 3-16 Common (Stinging) Nettle

Stinging nettle is widely distributed throughout the US. It is most often found in damp, rich soil.

3.17.12.2 Poisonous Plants

Figure 3-17 Poisonous Plants

The plants pictured above contain urushiol, an irritating, oily sap found in all parts of poison ivy, poison oak, and poison sumac plants, including the leaves, stems, and roots. It's even present after the plant is dormant or has died.

Poisonous plants are frequently present at Arcadis project sites. Workers should be alerted to their presence and instructed on methods to prevent exposure. Plants containing urushiol are notorious for causing contact dermatitis. Poison ivy, poison oak, and poison sumac, each contain urushiol, and are found throughout United States. The sap of giant hogweed is phototoxic and causes phytophotodermatitis in humans, resulting in blisters and scars. Contact with any poisonous plant should be avoided. If present on a project site, care should be taken to either avoid these plants or to have them removed by trained individuals equipped with appropriate tools and PPE. In general, poison ivy grows east of the Rocky Mountains, poison oak west of the Rocky Mountains, and poison sumac in the southeastern United States.

Poison sumac grows as a shrub or small tree with large alternate, compound leaves having seven to 13 leaflets without teeth. All plant parts are poisonous. The lack of leaflet glands, “wings” between the leaflets and teeth on the leaves, in addition to this species’ red stems supporting the leaflets and leaves, help to distinguish this plant

from similar-looking non-poisonous species, such as other sumacs and tree-of-heaven. Flowers are shades of green, white, and yellow and appear in late spring. Fruits are small white berries that mature in late summer and may last through winter. Poison Sumac grows almost exclusively in wet or clay soils, typically in swamps and peat bogs. Non-poisonous sumac is widely distributed in subtropical regions and is known for conical shaped clusters of bright red fruit in autumn.

Poison ivy grows in a number of different forms including as single plants, as a woody shrub or vine with hairy-looking aerial roots. It grows to 10 feet or more, climbing high on trees, walls and fences or trails along the ground. In winter, poison ivy vines traversing up tree trunks appear "hairy" with thousands of attachments to the tree bark. All parts of poison ivy, including the roots, are poisonous at all times of the year.

Poison oak is usually found in relatively dry sunny sites in woodlands, thickets, or fields. This species of poisonous plant generally prefers sandy soils. Poison oak grows as low shrubs that do not climb; leaves are dull green, densely hairy, are often lobed (3 to 7) and coarsely serrated. The fruit is white and hairy.

3.17.12.3 Controls

The main control for poison ivy, sumac, and oak is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. When working around poisonous plants cannot be avoided, workers should wear modified Level D PPE and decontaminate appropriately. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants including animals exposed to these plants and tools contacting the plants. Treat every surface that may have touched the plant as contaminated. Any object that contacts these plants can cause the rash if it subsequently contacts human skin. Removing PPE must therefore be executed in strict adherence with contaminated sites PPE doffing protocols. Other procedures may include privacy facilities for clothing removal and bagging (sealed containment).

If you come in contact with poison ivy, oak, or sumac wash the affected area(s) with soap and cool water as soon as possible. Washing within the first 6 hours, before the first symptoms appear, will help to minimize the effects of an outbreak or even completely prevent an outbreak. Commercially available products, such as Technu, break down the oils that cause rashes and should be used as soon as possible after exposure. Washing in tepid water and using friction is important in removing urushiol from the skin.

Rash symptoms can appear within a few hours but can take 2 to 5 days to appear. The rash starts as a red, annoyingly itchy area that starts to swell. The area then becomes inflamed and will get covered in clusters of tiny pimples; the pimples eventually merge and turn into blisters. The fluid in the blisters turns yellow, dries up, and becomes crusty. Left completely untreated, this cycle can last as short as 5 days and in severe cases, as long as 5 to 6 weeks.

Contact with giant hogweed should be avoided. Contact a professional landscape company to remove giant hogweed from a project site. Hogweed sap can severe phytophotodermatitis, which results in ultraviolet light from the sun causes sunburning where the sap is present. This can result in localized destruction of skin tissue. Hogweed sap can also cause blindness if the sap comes in to contact with the eyes.

3.17.13 Bears

Bears are curious, intelligent, and potentially dangerous animals, but undue fear of bears can endanger both bears and people. Most bears tend to avoid people. Bears feed on green grasses and on vegetation that grows in wet areas. They often rest in cool, dark, thick forests. Grizzly bears are typically, but not exclusively, active during dawn, dusk, and night-time.

3.17.13.1 Avoiding Bear Encounters

Be alert where recent bear activity has been documented. Some common areas where bears like to frequent are landfills, avalanche chutes, stream beds, dense edge cover, and, in late summer, berry patches.

- Use caution when travelling on trails in the early morning, at dusk, or at night;
- Watch for scat or bear tracks on the trail or near possible camp sites;
- If you come upon a dead animal carcass, immediately leave the area. Bears will often feed on a carcass for days and will stay in the area to protect their food; and,
- If you see a bear cub, the sow is likely nearby. Female bears will fiercely defend their young, so it is best to leave the area and find an alternative route.

Like all wildlife, bears can be unpredictable and may be aggressive when startled or approached. Of particular concern are adult bears that are accompanied by cubs, which they may defend aggressively.

Like all wildlife, bears can be unpredictable and may be aggressive when startled or approached. Of particular concern are adult bears that are accompanied by cubs, which they may defend aggressively.

Bears may make barking, woofing, and moaning sounds when agitated or threatened. Jaw popping is reportedly common before charging. A bear can reach speeds of 50 km per hour (30 to 35 mph) in a matter of seconds so attempting to outrun a charging bear is futile.

3.17.13.2 Controls

If bear encounters are a real threat, consider the use of a subcontracted professional wildlife monitor. Always stay near and within communication distance of an armed monitor. Additional personal controls to be considered in bear country are:

- Do not travel alone; use the buddy system or small groups;
- If possible, make plenty of noise on the trail, especially on blind curves, in dense vegetation, or areas with limited vision;
- Be conscious of the wind—bears have an excellent sense of smell. If the wind is at your back, chances are that a bear will smell you and leave the area well before you reach it. If the wind is blowing in your face, your chances of an encounter greatly increase. In high wind situations or along creeks and streams, a bear might not hear you coming, or you might not hear it;
- Consider bear encounter and/or attack survival training for staff in bear prone areas;
- Wherever possible stay near your vehicle or other mode of transportation or permanent shelter;
- Be careful with food smells—never cook close to camp. Store all foods in plastic away from camp at night. When camp is unattended, store food away from the camp site and at least 2 m up a tree hung 1.2 m away from the trunk; and,
- Project workers should always carry bear repellent pepper spray when working in bear country. Bear repellent spray is a proven defense against possible attack by grizzly and black bears.

3.17.13.3 Bear Encounters

Bear attacks are rare; most bears are only interested in protecting food, cubs, or their space. Being mentally prepared can help you have the most effective reaction when a bear encounter occurs. Every situation is different, but below are guidelines on how brown bear attacks can differ from black bear attacks. Help protect others by reporting all bear encounters immediately.

Brown/Grizzly Bears: If you are attacked by a brown/grizzly bear, leave your pack on and PLAY DEAD. Lay flat on your stomach with your hands clasped behind your neck. Spread your legs to make it harder for the bear to turn you over. Remain still until the bear leaves the area. Fighting back usually increases the intensity of such attacks. However, if the attack persists, fight back vigorously. Use whatever you have at hand to hit the bear in the face.

Black Bears: If you are attacked by a black bear, DO NOT PLAY DEAD. Try to escape to a secure place such as a car or building. If escape is not possible, try to fight back using any object available. Concentrate your kicks and blows on the bear's face and muzzle.

If any bear attacks you in your tent, or stalks you and then attacks, do NOT play dead—fight back! This kind of attack is very rare but can be serious because it often means the bear is looking for food and sees you as prey.

3.17.14 Moose

In the summer months, moose blend in well to their environment and can be surprisingly hard to see for such large animals. They are likely to stand their ground even when they hear people approaching, so pay close attention to your surroundings, especially in prime moose habitat such as willow thickets or around streams or ponds.

During the fall mating season (in late September and October) bull moose may be aggressive toward humans. Cow moose with young calves may also defend them aggressively.

If you do find yourself close to a moose:

- If it hasn't detected you yet, slowly retreat;
- If it knows you're there, talk to it softly and move away slowly;
- Don't be aggressive - you want to convince the moose that you aren't a threat; and,
- If you think the moose is going to charge you, take cover or run away.

If its ears are laid back and hackles are up it is likely to charge. Most of the time, when a moose charges it is a 'bluff', or warning for you to get go away. Once a moose bluff charges it is already agitated. If possible, get behind something solid (like a tree or a car). Unlike with bears, it is okay to run from a moose. It is rare for moose to chase people long distances.

3.17.15 Cougar (Mountain Lion)

When working in cougar (a.k.a. mountain lion, puma, catamount, panther) country, use the following precautions to avoid (or during) an encounter:

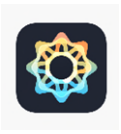
- Make noise. Cougars will often retreat if given the opportunity. Walking in large groups and making noise will give a cougar the chance to retreat and reduce the likelihood of a sudden encounter;
- Be cautious at dusk and dawn. Contrary to popular belief, most predators are most active at dusk and dawn. These are times to be especially cautious;

Cougars have short, muscular limbs and long, cylindrical tails that reach nearly one third of the animal's full length. They have four digits on their hind feet and five digits on their front feet, along with retractable claws.

- Remember, cougars are very different from bears. Cougars do not bluff charge and playing dead is never recommended in a cougar attack;
- Do not run. Cougars are a powerful predator. Running may trigger an attack;
- Face the cougar and retreat slowly. Keep direct eye contact with the cougar while you slowly retreat toward safety;
- Raise your arms above your head to make yourself look larger than normal. This may help to intimidate the cougar. You may also want to throw rocks and yell at it. Aggression will often scare it off. If a cougar attacks, fight back. Many people have survived cougar attacks by fighting back with anything, including rocks, sticks, and bare fists; and,
- Report the sighting.

3.18 Illumination

All portions of each work location will be sufficiently lit using natural or artificial illumination. All project sites should be lit so that all surfaces are illuminated at 54 Lux (5 foot candles; 5 lumens per square foot) or greater. The Site Supervisor will determine, based on feedback from site workers, whether an area is adequately lit. This may require the use of a light meter. **Table 3-6** provides minimum illumination requirements for various project sites and functions.



Lux Light Meter Pro is an easy-to-use, functional light intensity (lux) meter perfect for measuring, comparing, and adjusting lighting levels in your environment. While it doesn't replace a calibrated light meter, it can assist the user in determining if their work area is adequately illuminated.

Table 3-6 Lighting Requirements

Lighting Requirements			
Facility Name or Function	**Intensity**		
	(foot-candles)	**Lumens per square foot**	**Lux**
Access Ways			
General indoor	5	5	54
General outdoor	3	3	32
Exit ways, walkways, ladders, stairs	10	10	108
Administrative areas (offices, drafting, meeting rooms, etc.)	50	50	538
Chemical laboratories	50	50	538
Construction areas	5	5	54
General indoor	5	5	54
General outdoor	3	3	32
Tunnels and general underground work areas [minimum of 108 Lux (10 foot candles) required at tunnel and shaft heading during drilling, mucking and scaling]	55	55	592
Conveyor routes	10	10	108
Docks and loading platforms	3	3	32
Elevators, freight and passenger	20	20	215
First-aid stations and infirmaries	30	30	323
Maintenance, operating, and construction areas			
Vehicle maintenance shop	30	30	323
Carpentry shop	10	10	108
Outdoors field maintenance area	5	5	54
Refuelling area, outdoor	5	5	54
Shops, fine detail work	50	50	538
Shops, medium detail work	30	30	323
Welding shop	30	30	323
Mechanical/electrical equipment rooms	10	10	108
Parking areas	3	3	32
Toilets, wash and dressing rooms	10	10	108

Lighting Requirements			
Facility Name or Function	Intensity		
	(foot-candles)	Lumens per square foot	Lux
Visitor areas	20	20	215
Warehouses and storage rooms and areas			
Stockrooms, active or bulk storage, indoor	10	10	108
Inactive storage, indoors	5	5	54
Rack storage, indoors	25	25	269
Outdoor storage	3	3	32
Work areas – general (not listed above)	30	30	323

3.19 Medical Surveillance

Arcadis workers may be required to participate in medical monitoring, either over the long term or for specific periods of time as part of doing work. Workers are required to participate in the Arcadis medical monitoring program if they:

- Perform field work on US HAZWOPER sites;
- Have the potential to be exposed above the permissible exposure limit (PEL) to hazardous substances; defined in OSHA regulations;
- Wear a respirator while performing work;
- Are exposed to noise in excess of PELs; or,
- Are required by Corporate H&S; and,
- Are required by a client.

Did You Know? Arcadis Standard ARC HSGE010 “Medical Surveillance” includes requirements for Arcadis’ medical monitoring program.

3.19.1 Baseline and Annual Medical Examination

Where and when required, the baseline and annual medical examinations are administrated by Arcadis' third party medical surveillance service provider (currently WorkCare) and typically include the following elements:

- Medical and occupational history questionnaire;.
- Physical examination;
- Complete blood count, with differential;
- Liver enzyme profile;
- Chest x-ray, at a frequency determined by the physician;
- Pulmonary function test;
- Audiogram;
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- Drug and alcohol screening, as required by job assignment;
- Visual acuity; and,
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

Additional elements may also be examined. Contact Corporate H&S for a complete list of elements examined during medical monitoring.

The examining physician will provide the worker with a letter summarizing his or her findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each worker during all project site work.

3.19.2 Respirator Questionnaires

If a worker is required to wear a respirator, or may be required to wear a respirator, they must be medically cleared to do so. This is accomplished by the Arcadis worker completing a respirator screening questionnaire and submitting it to Arcadis' third-party medical surveillance service provider (currently WorkCare) for review by a physician. Based on the answers provided, the physician may clear the worker to wear a respirator, clear the worker to wear a respirator with some restrictions, request that an in-person assessment be completed, or not clear the worker to wear a respirator.

3.19.3 Other Medical Examinations

In addition to baseline, annual and exit physicals, workers may be examined:

- At the worker's request, after known or suspected exposure to toxic or hazardous materials; and,

- At the discretion of Corporate H&S or occupational physician in anticipation of, or after a known or suspected exposure to, toxic or hazardous materials, noise, or other conditions that may affect the health of the worker.

3.19.4 Periodic Exam

Following the baseline examination, all workers that are enrolled in the medical surveillance program must undergo an annual or biannual examination. For workers potentially exposed more than 30 days per year to hazardous site conditions, periodic examinations will be conducted annually. For workers potentially exposed less than 30 days per year, periodic examinations may be conducted every 24 months if approved by WorkCare.

If WorkCare identifies a need to restrict work activity, the medical monitoring coordinator for Arcadis and the worker will be notified. The medical monitoring coordinator will notify the worker's supervisor of the restriction.

3.20 Field Office General Health and Safety Requirements

Injuries and accidents in field offices are just as serious and costly as those occurring at field locations. Many of these accidents involve tripping, slipping and falling; strains; and sprains. The field office must be kept neat and tidy, and workers must report and correct unsafe conditions. Complete workstation self-evaluations for long-term projects (>3 months). Contact Arcadis H&S representative for assistance in completing workstation assessments.

3.20.1 Access and Egress

- Ice and snow accumulation along entrances and exits must be addressed at Arcadis project sites and facilities to prevent worker injuries from slips, trips, and falls; or vehicle accidents;
- Outdoor steps leading to office trailers should have holes to allow dirt, sand, salt, etc. to fall below. If steps do not have holes, extra care must be taken to ensure they remain clean. Salt pellets used to melt snow and ice may cause a slick surface;
- Aisles, stairways, and walkways, and access to safety, firefighting equipment, and first-aid equipment must be kept clear of obstructions (e.g., equipment deliveries, office supplies), and/or tripping hazards;
- All fire lanes, access roads, and evacuation routes must be kept clear of equipment, materials, and parked vehicles at all times; and,
- The following list of unsafe situations should be avoided to make your field office workplace safer:
  - Blocked, malfunctioning, or non-functioning exit doors (e.g., locked, hard to open);
  - Blocked or cluttered exit passageways (e.g., halls, stairwells);
  - Extra or unnecessary boxes, paper, or other flammable/combustible products;

- Improper storage of office equipment and supplies;
- Overloaded outlets;
- File and desk drawers in poor condition and left opened; and,
- Sharp/bladed equipment (e.g., scissors, cutting knives) improperly stored and poorly maintained

3.20.2 Project Sites and Office Furniture

- Keep project sites clean and free of tripping hazards (e.g., cords, drawers, books, files);
- Never use chairs and other office furniture as stepping stools, ladders, or climbing aids;
- Leaning back in straight-backed chairs should be avoided.

3.20.3 Filing and Storage Cabinets

- Prevent cabinets from tipping over by bolting cabinets together side by side, where possible, or bolting to support walls;
- Do not overload top shelves or drawers. Materials on shelves or in file cabinets should be stored with no heavy items kept above shoulder height);
- Open drawers one at a time and close them after use to avoid overbalancing the cabinet. Use handles for closing the drawers to prevent fingers from being pinched and broken; and,
- Do not struggle with firmly stuck drawers to avoid hurting your back or having the drawer pull loose and drop on your foot.

3.20.4 Paper Cutter and Shredder

After using the paper cutter, close the blade. Be careful when using the paper shredder to avoid catching jewelry, ties, clothing, or long hair in the blades.

3.20.5 Wastepaper Baskets

If the basket is being used to dispose of glass, sharp-edged cans, or other similar objects, first place these objects in a paper bag or wrap them in newspaper and mark the contents clearly. Never place these items loose in the basket.

3.20.6 Electrical Cords

- To avoid a fire hazard, make sure that all electrical cords and receptacles, including power bars, are in good condition and that they do not become overloaded;
- Do not “daisy-chain” multiple power strips;
- Repair or replace any worn or frayed cords immediately;
- Do not affix temporary electric cords to parts of any structure or run temporary electric cords through walls or ceilings;
- Do not run electrical or telephone cords across aisles or walkways where they may become damaged or present a slipping or tripping hazard around desks or in walkways; and,
- Never pull an electrical cord from the wall socket by yanking on the cord; pull the plug instead.

3.20.7 Floor, Aisles, Hallways, and Stairways

- Keep floors, aisles, entryways, exits, halls, and stairs free of debris and storage boxes and other obstructions;
- While walking, do not obstruct your view by carrying oversized loads;
- Watch for blind spots when walking down halls or around corners; be careful when carrying hot drinks;
- Pick up debris, wipe up spills immediately and watch for slippery surfaces;
- Use aisles provided to move around the office; do not take shortcuts between desks; and,
- Use handrails when climbing or descending stairways.

3.21 Fatigue Assessment

Fatigue is a human condition primarily caused by prolonged wakefulness and/or insufficient or disturbed sleep. It includes physical, cognitive, psychological, and physiological dimensions that interact with each other to reduce human performance and lead to uncontrollable sleep onset. Fatigue can lead to poor judgment, poor performance on skilled tasks, and slower reaction times. Fatigue can affect your decision-making and analytical process.

There are many factors that impact fatigue on a project including:

- Location of work such as remote areas versus easily accessible controlled sites;
- Weather conditions (cold, heat, snow, rain);
- Shift-work;

- Work duration;
- Travel distance to/from project location;
- Physical requirements of the project task(s); and,
- Mental intensity of work such as high intensity incident response versus lower intensity routine field work.

Some signs and symptoms of fatigue might include:

- blurred vision;
- difficulty keeping your eyes open;
- head nodding;
- drowsy relaxed feeling;
- irritability;
- not feeling refreshed after sleep (waking tired);
- falling asleep at work; and,
- micro sleeping – falling asleep for less than a second to a few seconds and being unaware that you have done so (usually due to sleep loss).

The following are tips to reduce fatigue:

- schedule critical tasks at times of maximum alertness;
- increase awareness of the need to get good sleep;
- establish a sleep routine that works best for the individual, take naps when needed;
- implement good dietary and hydration practices;
- when off-duty, take the time to rest and relax; and,
- exercise Stop Work Authority if you feel you cannot safely work.

PMs and Site Supervisors should evaluate potential fatigue on their projects on a site-specific basis and discuss the signs of fatigue and use Stop Work Authority with staff if necessary. If the PM or Site Supervisor use TRACK and determine that staff fatigue could be a potential concern, appropriate fatigue management methods and procedures should be implemented such as:

- Establishing work schedules compliant with federal, state and local regulations and appropriate for the task(s) being performed;
- Limiting the duration that a person can operate equipment, including motor vehicles;
- Establishing and effectively communicating, including conspicuously posting, notices regarding mandatory breaks, meal periods, and scheduled rotations;
- Being mindful of workers traveling from other time zones and making allowances for adjustments in the sleep/work cycle;

- Job rotation; and,
- Requiring overnight stays if driving before or after field work is a safety concern.

All project staff are encouraged to be cautious, stop work, and notify their supervisor if they feel fatigue is affecting their ability to work safely. Workers working under regulatory requirements with fatigue management elements (e.g. commercial motor vehicle drivers) will follow all aspects of those requirements in conjunction with any fatigue management requirements implemented on the project.

3.22 Personal Protective Equipment

All workers at Arcadis project sites are required to wear and use PPE to provide protection from potential hazards, as indicated by the project HASP. Every worker who works in the field or visits a client facility must be equipped with appropriate H&S gear and PPE. Minimum PPE includes a hard hat, work boots, visi-vest, gloves suited to task and protective eyewear.

Did You Know? Arcadis Standard ARC HSGE015 “Personal Protective Equipment” includes requirements and recommendations for utilizing and storing personal protective equipment.

3.22.1 General

Engineering and work practice controls are used to eliminate the hazard or to stop, contain, or capture it at the source or intercept it along its path to the worker. When feasible, these controls are preferred to burdening the worker with PPE. Administrative controls are measures to limit the duration of exposure to the hazard. Generally, administrative controls are not acceptable to control inhalation or direct-contact skin hazards, except when no other control technology is feasible or effective.

Arcadis will provide suitable PPE as required for the nature of the job being performed, such as, but not limited to, safety toe, puncture resistant and shock resistant sole work boots, chemical protective and high visibility clothing, respirators, eye and face protection, hard hats, and gloves. Workers will use assigned PPE on any task where there is potential exposure to physical hazards, such as equipment operation or falling objects, or to materials that may cause respiratory injury or skin irritation. Specific requirements will be established through a hazard assessment and documented in the applicable project HASP or other applicable planning documents.

3.22.2 Selection

The selection of PPE is based on the hazards identified during the workplace hazard assessment and the activities that will be performed while using the PPE. To provide adequate protection, the selected PPE will meet ANSI requirements where standards have been published (e.g., foot, eye, and head protection) and NIOSH or Mining Safety and Health Administration (MSHA) requirements for respiratory protection. The minimum level of PPE (hard hat; safety glasses; class II high-visibility vest, shirt, or coat; gloves and protective footwear with protected-toe cap puncture resistant sole and shock resistant sole work boots) is expected to be worn on all project sites unless in a field trailer or vehicle, unless a specific exemption has been established within an approved HASP or modification to a task-specific JSA or Permit to Work upon completion/review of the hazard analysis.

PPE should be purchased through Arcadis's national safety supply vendors. All personal prescription safety eyewear should be acquired through Arcadis national safety eyewear provider. Workers who require prescription glasses are eligible to participate in the prescription safety glasses program. See the Health & Safety landing page of the Arcadis Intranet site for the most current PPE vendors and order forms.

Each worker should store and carry their PPE in a durable crate, box or bag suitable for travel. **Table 3-7** lists equipment that is required by practice.

Table 3-7 PPE by Practice

Listed "General PPE" is required for field staff, the last column specifies PPE for Arcadis staff visiting project sites.	Staff in Resilience BA[1]	Staff in Mobility BA[1]	Staff in Places[1]	Staff Visiting Project Sites
Minimum PPE Required to be Worn[1]				
Hard Hat	R	R	R	R
Reflective Traffic Vest (minimum Class 2)	R	R	R	R
Safety Glasses – Clear and Tinted	R	R	R	R
Safety Toe Boots	R	R	R	R
Minimum PPE Required to Have on Hand				
Hearing Protection - Ear plugs (need for earmuffs TBD)	R	R	R	R
Safety Gloves and Glove Clip	R	R	R	R
First Aid Supplies[2]				
Small First-aid Kit	R	R	R	O

Table 3-7 PPE by Practice

Listed "General PPE" is required for field staff, the last column specifies PPE for Arcadis staff visiting project sites.	Staff in Resilience BA[1]	Staff in Mobility BA[1]	Staff in Places[1]	Staff Visiting Project Sites
16 oz. Bottle of Eye Wash	R	R	R	O
Tick Remover (fine-tip tweezers)	O	O	O	O
PPE Supplies				
PPE duffel bag with logo, or equivalent	O	O	O	O
Half Face or Full-Face Respirator[3]	O	O	O	O
Insect Repellent (Recommended 20-30% DEET)	O	O	O	O
Sunscreen	O	O	O	O
Hand Sanitizer	O	O	O	O
Cut-Resistant (Level II) or Chemical-Resistant Gloves[4]	O	O	O	O
Poison Ivy Pre-exposure Wipes or Post-exposure Cleanser (i.e., Tecnu or Zanfel)	O	O	O	O
Other Specialized Protective Equipment (see THA)	O	O	O	O
Outdoor Wilderness Survival Kit[5]	O	O	O	O

R – Required **O** - Optional. Based on HASP Task Hazard Analysis (**THA**) or geographic location of work.

THA - Task Hazard Analysis - Review the HASP Task Hazard Analysis (THA) in making this determination. Certain specific factors can influence the determination for requiring this PPE for the site or task. For example, certain geographic regions may have a higher incidence of the hazard or associated risk, the proximity of the site relative to emergency services may require such, previous observations of the hazard at the site, or where unknown hazard conditions apply. Modifications to the minimum required PPE are required to be communicated via the HASP and/or JSA.

[1] The Division Director, Operations Manager, Project Manager or Worker Supervisor is responsible for making the decision to provide Arcadis branded shirts to workers. Billing of such shirts is related to the authority level of the decision maker.

[2] For project sites with an office/trailer, First Aid/emergency response supplies can be kept in a central location and may not be required to be carried by each Arcadis worker.

[3] Staff must comply with the Arcadis Respiratory Protection H&S Standard before a respirator can be worn. The H&S Standard is available on the H&S landing page of the Arcadis Intranet Site.

[4] Determination for use of cut resistant (Level II), chemical resistant gloves or other specialized hand protection are to be based on the THA in the project HASP.

[5] Outdoor survival kits are generally required when working in remote wilderness locations. See the HASP THA and the Field H&S Handbook for requirements and supply list.

Workers are expected to maintain this PPE in a clean, ready-to-use condition, and to perform periodic inspections to confirm that PPE is undamaged and fully functional. Any problems should be identified to the Site Supervisor immediately so that replacements can be arranged.

Prior to use of any safety equipment (individually issued or centrally stored), workers should inspect each piece to confirm that it is in good working order. Equipment exhibiting any signs of wear or damage will be immediately placed out of service and repaired or replaced.

3.22.3 Flame-Resistant / Arc Flash Clothing

Since the 1970s, oil/gas and chemical processing industries have relied on flame-resistant (FR) clothing to help protect workers in the event of a flash fire. These industries recognized the damage that ordinary cotton clothing and synthetic clothing had on the wearer when these short duration, high temperature fires occurred. Today, FR clothing is used in many industries to protect workers performing tasks that range from working around live electric conductors, which may have the potential to release a sudden burst of energy known as an “arc flash” to working in refineries or product distribution pipelines where there is a higher potential of injury from flash fires. The National Fire Protection Association (NFPA) developed guidelines for wearing personal protective equipment (PPE) when the potential for an arc flash exists. NFPA 70E, Standard for Electrical Safety in the Workplace, identifies when specialized PPE is required based on the results of a hazard assessment related to the task. In the latest version of NFPA 70E, the term Hazard Risk Category (HRC) was changed to PPE Category (CAT), which consumers will see on up-to-date garments tags. The four levels, CAT 1 through CAT 4, are where most employees stop since the testing methods and various material requirements do get a little complicated. In a nutshell, CAT ratings are based on a garment’s Arc Thermal Performance Value (ATPV) and its Energy Breakopen Threshold (EBT). These values are determined by applying various level of heat energy, measured in calories, to material to determine specific failure points. The PPE needs for an electrician working near live electrical circuits will vary but approximately 2/3 of most live electrical work will be covered by CAT 2 level of protection.

Poeple working in the oil and gas industry have different PPE requirements than electricians. NFPA 2112, Standard on Flame-Resistant Clothing for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fires, specifies the test methods and minimum construction and performance requirements that FR fabrics, components, and garments must meet to provide protection from Flash Fires (the 2018 version no longer uses the term “flash fires” and instead labels them as “short duration thermal exposures”). This clothing is tested under ASTM F1930 – 18, which is the Standard Test Method for Evaluation of Flame-Resistant Clothing for Protection Against Fire Simulations Using an Instrumented Manikin. The test method focuses on a sudden thermal exposure of no more than 3 seconds.

Remember, NFPA 70E and CAT levels are for those concerned about arc flash and NFPA 2112-compliant garments are for oil and gas employees needing protection from flash fires. The flame-resistant layer should always be the outermost layer AND synthetic materials should never be worn under the FR. Because of these limitations, it is important to choose a variety of garments that will work well in various climates.

3.22.4 Hinderances or Reduced Effectiveness of PPE

Employees should use TRACK when deciding the appropriate PPE. Site conditions, such as temperature, humidity, physical hazards, should be considered. Additionally, items such as jewelry, piercings, long fingernails, hairpins, etc. should be avoided when working in the field.

3.22.5 Training

Workers must receive training on the proper use, inspection, and maintenance of the assigned PPE. Training will include:

- How to know when and what PPE is required;
- How to properly don, doff, adjust, and wear PPE;
- Limitations of the PPE;
- Decontamination procedures;
- Proper care, maintenance, useful life, and disposal of PPE.

3.23 Confined Spaces

***NOTE**: Persons using this section of the handbook must first have core competency and training as required by the Arcadis Confined Space Health and Safety Standard (ARC HSFS003)*

Confined spaces include, but are not limited to: storage tanks, bins, sewers, in-ground vaults, vessels, tunnels, manholes, attics, crawl spaces, and pits. These enclosures, because of inadequate ventilation and/or the presence of hazardous gases and vapors, may present conditions that could lead to asphyxiation. Further, the physical conditions of the confined space, or equipment contained therein, or any other recognized serious safety or health hazards could result in injury and must be considered prior to entering confined spaces.

Did You Know? Arcadis Standard ARC HSFS003 “Confined Space” includes requirements and recommendations for use when working in and around confined spaces.

Potential confined spaces in the work area that could be purposely or mistakenly entered by Arcadis or subcontractor worker must be identified as confined spaces. Entry is forbidden into these spaces until they are classified. If no entry is necessary, classification is not required. A competent person must evaluate each confined space in accordance with the criteria defined in the Confined Space Evaluation Form as either Permit require, Alternate Procedures or Non-Permit Required Confined Space.

If a permit-required confined space (PRCS) exists at a project site, the following requirements will apply:

- PRCS must be marked to identify them as such if not already;
- PRCS must be identified in the site-specific HASP and a task-specific JSA must be developed;
- A thorough hazard analysis of the space and the activities that could create hazards in the space must be completed – TRACK;
- A permit package must be completed prior to any entry, including the evaluation form, the permit form, and the confined space entry checklist;
- All hazards must be appropriately controlled (i.e. locked out and tagged out) and their conditions verified before entry;
- An Entry Permit must be reissued for each entry and cancelled at the completion of an entry. Cancelled permits should be maintained in the project files;
- Before entering, attending, or supervising a confined space, the Site Supervisor and project manager must be notified of the intent to enter, attend, or supervise;
- A monitoring plan and implementation of the plan is required for the entry.
- Entrants and attendants must be suitably trained in Confined Space Entry;
- The identified rescuer must be appropriately trained to conduct confined space rescue;
- Entrants must be outfitted with appropriate equipment including PPE and rescue equipment; and,
- A pre-planned rescue plan is required including identification of rescue services and trained workers.

If it is required for Arcadis or subcontractor workers to enter, attend, or supervise entry into confined spaces, the PM, with assistance from Arcadis H&S staff, will verify that a program has been developed and implemented, that

all applicable workers have received the appropriate training and that a PRCS Entry form has been completed and is in place at the site.

The Site Supervisor will review the following safe entry requirements with site workers:

- Before entering, confined spaces should be as clean and free of hazardous materials and chemicals as possible. Where appropriate, confined spaces may be purged with water, air or other suitable means. Purging with hazardous solvents should be avoided where possible;
    - All input lines that discharge into the confined space shall be disconnected and capped or isolated;
    - The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited. However, the use of a double in-line valving arrangement with a vent or drain in between the two valves is acceptable, provided that dangerous air contaminants are not introduced by such venting; and,
    - Isolation valves will be locked in the closed position, vent or drain valves will be locked in an open position, and the person performing the work will keep the key;
- Electrical lockout of energized equipment in a confined space:
    - If electrical devices located within the confined space (e.g., motors, switches) must be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the “OFF” position;
    - The lock key will be kept by the person performing the work, and only this person is authorized to unlock the switch and remove the tag upon completion of the work; and,
    - If more than one person is working on the line, each person must place a lock on the switch and retain possession of their key;
- If multiple sources supply power to an electrical device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician will test the power supply lines to verify that power has been secured;
- Line-disconnect switches supplying power to any mechanical apparatus in the confined space (e.g., mixers, conveyors) must also be tagged and locked in the “OFF” position. This must be done for any entry, even when work will not be performed on the apparatus itself;
- All manhole and cleanout covers will be removed, and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they will be secured so they cannot close;

- The Site Supervisor, using only equipment approved and tagged for Class 1, Division 1 locations will conduct appropriate tests for oxygen-deficient and toxic atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall confirm the following:
  - Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit;
  - Oxygen content is no less than 19.5 percent and no greater than 23.5 percent;
  - Appropriate respiratory protective equipment and other appropriate personal protective devices will be provided for all workers if concentrations of toxic materials* exceed applicable occupational exposure levels;

    ** Testing for these materials must be made using equipment appropriate for potential chemical compounds. If space contains and/or has potential to contain an unknown chemical, Level B equipment must be used to enter the confined space.*
- If the nature of the work to be performed introduces, or has the potential to introduce, harmful air contaminants, or the oxygen content drops below 19.5 percent, all personnel will evacuate the confined space immediately;
- All confined spaces found to be unsafe must be ventilated by mechanical exhaust systems arranged to avoid recirculating contaminated air. Personnel will be evacuated immediately in the event of failure of the mechanical ventilation system. The confined space will be retested prior to reentry following ventilation system repair;
- All entry of permit-required confined spaces will be performed in accordance with the Permit-Required Confined Space Entry Program. As a minimum, signs with the following wording must be posted around the entrance and exit of confined spaces:
  - HAZARD AREA KEEP OUT;
  - DANGER;
  - CONFINED SPACE;
  - AUTHORIZED WORKERS ONLY; and,
  - PPE IS REQUIRED IN THIS AREA

While excavations have the elements of a confined space when worker entry is required, they are regulated under the OSHA Excavation standard and should not be classified as confined spaces. Spaces WITHIN the excavation, such as manholes, vaults, sewers, caissons, etc. may be classified as confined spaces. It should be noted that

some Clients may classify excavations as confined spaces. In these circumstances, Arcadis will proceed in accordance with Client requirements.

3.23.1 Sewer Entry

Sewer entry differs in three vital respects from other permit entries; first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer, and third, experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

- Only designated entrants who are thoroughly trained in the sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries are permitted to complete sewer entry.
- Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions are encountered:
    - Oxygen concentration less than 19.5 percent;
    - flammable gas or vapor at 10 percent or more of the lower flammable limit (LFL);
    - or hydrogen sulfide or carbon monoxide at or above 10 ppm or 35 ppm, respectively, measured as an 8-hour time-weighted average. Atmospheric monitoring equipment needs to be calibrated according to the manufacturer's instructions. The oxygen sensor/broad range sensor is best suited for initial use in situations where the actual or potential contaminants have not been identified, because broad range sensors, unlike substance-specific sensors, enable employers to obtain an overall reading of the hydrocarbons (flammables) present in the space. However, such sensors only indicate that a hazardous threshold of a class of chemicals has been exceeded. They do not measure the levels of contamination of specific substances. Therefore, substance-specific devices, which measure the actual levels of specific substances, are best suited for use where actual and potential contaminants have been identified. The measurements obtained with substance-specific devices are of vital importance to the employer when decisions are made concerning the measures necessary to protect entrants (such as ventilation or personal protective equipment) and the setting and attainment of appropriate entry conditions. However, the sewer environment may suddenly and unpredictably change, and the substance-specific devices may not detect the potentially lethal atmospheric hazards which may enter the sewer environment.

- Although OSHA considers the information and guidance provided above to be appropriate and useful in most sewer entry situations, the Agency emphasizes that each employer must consider the unique circumstances, including the predictability of the atmosphere, of the sewer permit spaces in the employer's workplace in preparing for entry. Only the employer can decide, based upon his or her knowledge of, and experience with permit spaces in sewer systems, what the best type of testing instrument may be for any specific entry operation.
- The selected testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.
- Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.
- Entry into large bore sewers may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least 10 minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

3.24 Control of Hazardous Energy

***NOTE**: Persons using this section of the handbook must first have core competency and training as required by the Arcadis Lockout / Tagout (LO/TO) Health and Safety Standard*

LO/TO is the process used to prevent injuries by controlling energy sources, such as electrical power, hydraulic fluid under pressure, compressed air, steam, energy stored in springs, potential energy from suspended parts, or any other source that may cause unexpected energization when it is necessary to perform work on the system. LO/TO also applies to similar functions performed on systems containing hazardous materials. All potential sources of energy must be isolated prior to work on any equipment capable of transmitting that energy. This isolation can be anything from turning off a circuit breaker to blocking open a power press. Once the energy source is isolated, steps must be taken to make sure that the isolation technique is not discontinued until the worker is done with his/her work. This will be accomplished by using locks to secure access to the system, and/or

placing warning tags at the isolation point. The use of tags alone for energy control is only authorized where the use of lockout devices is impractical or otherwise cannot be performed.

A written LO/TO Procedure will specify the proper LO/TO Procedures, which includes obtaining a Permit to Work. LO/TO of energy sources must be performed only by the authorized employee doing the work. If more than one worker is involved, either each individual worker must use his/ her own lock (multiple LO), or a group LO can be performed by the workers' supervisor/ foreman. The locks, tags, and equipment will not be tampered with by any worker. Only the person originally locking and tagging the equipment is authorized to remove the locks and tags. If the worker who placed the LO/TO device/sign no longer works for the company, only the supervisor/foreman can remove the locks and tags.

Did You Know? Arcadis Standard ARC HSFS004 ""Lockout/Tagout" includes requirements and recommendations for use when completing lockout/tagout.

3.24.1 Steps to Locking Out

The authorized worker(s) shall notify all affected worker(s) prior to the shutdown and isolation of the equipment/machine. Affected workers should be informed of the reason for shutdown and the approximate length of time required for servicing or maintenance.

1. The authorized worker(s) shall review the type(s) and magnitude(s) of energy present and the hazards present as well as any other hazards present;
2. If the machine/equipment is operating, the authorized worker(s) shall have the machine/equipment operator explain the standard shutdown procedure and then shut it down according to the procedure;
3. The energy isolating devices shall be deactivated so the machine/equipment is isolated from the energy source(s);
4. Each isolating device shall be locked out and tagged out. If lockout is not feasible, only tagout of the isolating device will be conducted, and additional precautions will be required to provide worker protection equivalent to the protection provided when lockout procedures are utilized. Each authorized worker conducting activities on the equipment/machine shall attach a(n) individually assigned safety lock to each isolating device. A standard tag shall also be attached to each individual's lock that identifies, by name, the authorized worker responsible for each lock. Stored or residual energy must be released or dissipated from each system to reach a zero-energy state. Visual inspection shall be made to confirm that all moving parts have stopped. Any

stored or residual energy shall be drained, blocked, repositioned, restrained, or bled. Electrical circuits shall be grounded to discharge electricity stored in capacitors.

To confirm that the equipment is completely isolated from the energy source(s), it is necessary to test the equipment to make certain that it will not operate. The following methods shall be used to test the equipment:

- Check the area and equipment to assure that no workers are exposed to the start-up of the equipment;
- Activate all start-up devices and operating controls;
- Use tic-tracers or voltage indicators to test electrical circuit; and,
- Return all operating control(s) to the neutral or off position after verifying the isolation of the equipment.

3.24.2 Written Lockout/Tagout Procedure Exception

If the following elements exist, a written LO/TO Procedure is not required for a particular machine or equipment:

- The machine or equipment has no potential for stored or residual energy or accumulation of stored energy after shutdown that could endanger workers;
- The machine or equipment has a single energy source which can be readily identified and isolated;
- The isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment;
- The machine or equipment is isolated from that energy source and locked out during servicing or maintenance;
- A single lockout device will achieve a locked-out condition;
- The lockout device is under the exclusive control of the authorized worker performing the servicing or maintenance;
- The servicing or maintenance does not create hazards for other workers; and
- There have been no accidents involving the unexpected activation or reenergization of the machine or equipment during previous servicing or maintenance.

The authorized worker is responsible for confirming the elements listed above are met prior to proceeding with LO/TO operations without a specific written LO/TO procedure.
When performing LO/TO procedures, it is important to identify all systems that require locking out. For instance, when working on a pump, it is important not only to lock out the electrical system, but also the fluid system must

be locked out. Complex systems may have several individual components or systems that must be locked out before the entire system can be considered locked out.

3.25 Electrical Safety

***NOTE**: Persons using this section of the handbook must first have core competency and training as required by the Arcadis Electrical Safety Standard.*

3.25.1 Electricity and Electrical Equipment

When performing electrical work, always take appropriate precautions against the potential hazards including shock, arc flash and fire) likely to be encountered with this type of work, in particular:

- All electrical guards and protective devices (including LO and isolation) must be in place and functioning properly; and,
- Workers must follow safe work practices and procedures when working around electrical equipment and power lines.

Did You Know? Arcadis Standard ARC HSFS006 “Electrical Safety” includes requirements and recommendations for use when working around electricity.

3.25.2 Electrical Work Hazard Assessment

A Safe Work Permit must be completed and issued when working on energized or deenergized electrical circuits.

3.25.3 General Safety Precautions

When performing electrical work, always take appropriate precautions against the hazards likely to be encountered when performing the work. In particular:

- Consider every circuit to be energized until otherwise proven;
- Turn off electrical power before changing a light bulb;
- When operating and/or working on electrical equipment where there is a possibility of an arc flash, always stand to one side to avoid exposure to arc flash energy;

- Do not overload electrical systems;
- In an emergency when power lines are down, consider every wire, including fences and guy wires, to be energized. Only qualified workers should handle them;
- Electrical equipment must be kept clear of all obstructions; do not store materials inside, in front, behind, or on top of this equipment;
- Report broken wire poles, guy lines, and any other equipment requiring repair to your supervisor when discovered. Repair promptly;
- Use the proper stopping control for all motors. The motor should only be disconnected by the main breaker in an emergency;
- All electrical equipment will be provided with a local control station located within sight of the controlled equipment;
- All electrical maintenance tools must be in good condition and approved and certified for the work being performed;
- Electrical equipment must be cleaned by a qualified person. Only approved materials may be used;
- Work must not be performed on pole lines, outdoor electrical services, or associated equipment during electrical storms, except during an emergency;
- Never place wet rags on electrical equipment either to cool down the equipment or to dry the rags;
- The use of water for washing down equipment in the vicinity of electrical apparatus is not permitted;
- Poles supporting electrical wires, or any type of electrical equipment should not be used as a snub or dead man for winch lines on trucks or pickups; and,
- Any connected wire that is found on or near the ground shall be considered energized and not be touched by anyone except a qualified person.

3.25.4 Use of Extension Cords

Due to the hazards of arcing electrical equipment or connections, the following safety precautions must be adhered to when using extension cords at Arcadis project site:

- Listed, labelled, or certified (i.e., approved) equipment be used in accordance with the instructions included in the listing, labeling, or certification. Extension cord manufacturers often prohibit cords being plugged in to each other;

- Portable cord- and plug-connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket);
- Cord- and plug-connected equipment and flexible cord sets (extension cords) which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.
- Flexible cords and cables shall not be used:
  - As a substitute for the fixed wiring of a structure;
  - Where they run through holes in walls, ceilings, or floors;
  - Where they run through doorways, windows, or similar openings;
  - Where attached to building surfaces; or
  - Where concealed behind building walls, ceilings, or floors.
- All extension cords used in a confined space must have hazardous-location-rated connections;
- All connections at standard U-ground plugs must be made and adequately taped (to prevent them from pulling apart) before plugging into the hazardous location-rated receptacles;
- When the work is completed, connections must be broken at the hazardous-location-rated receptacle first;
- All portable electrical equipment that is approved for use in hazardous locations must have cords in good condition; and,
- Ground fault circuit interrupters (GFCIs) are required for all 120-volt, single-phase, 15- and 20-ampere receptacle outlets on construction sites that are not a part of the permanent wiring of the building or structure that are in use by workers.

3.25.5 Arc Flash Safety

Workers working around energized devices are subject to a dangerous condition associated with the release of energy caused by an electric arc called “arc flash.” An arc flash, defined as the energy released during an arcing fault, occurs when current flows through a medium that is not intended to conduct electrical current. An arc flash protection boundary (an approach limit at a distance from exposed live parts within which a person could receive a second-degree burn if an electrical arc flash were to occur) must be established for electrical devices where there is a potential for arc flash. This distance must be calculated by a qualified person. Refer to the Electrical Task Hazard Assessment Worksheet links in the Arcadis Electrical Safety Standard for additional details. The Arc

Flash Boundary must be physically demarcated prior to beginning work. Employers in all provinces are required by law to take the necessary measures to protect the health, safety and physical integrity of their workers, especially around electrical equipment.

According to the National Fire Protection Association (NFPA) 70E (2012), more than 2,000 people are admitted to intensive care burn units each year as a result of severe arc flash burns they received during an arc flash incident. Fatalities occur at a rate of approximately one per day in the United States, with nonfatal arc flash incidents occurring approximately 5 to 10 times per day.

3.25.6 Electrical PPE Requirements

Workers and contractors must use electrical PPE that meets regulatory, Arcadis-specific, industry and manufacturer requirements. The PPE must be in serviceable condition (with current certifications) and appropriate to the nature of the work to be performed. The NFPA developed guidelines for wearing PPE when the potential for an arc flash exists. NFPA 70E, Standard for Electrical Safety in the Workplace, identifies when specialized PPE is required based on the results of a hazard assessment related to the task. In the latest version of NFPA 70E, the term Hazard Risk Category (HRC) was changed to PPE Category (CAT), which consumers will see on up-to-date garments tags. The four levels, CAT 1 through CAT 4, are where most employees stop since the testing methods and various material requirements do get a little complicated. In a nutshell, CAT ratings are based on a garment's Arc Thermal Performance Value (ATPV) and its Energy Breakopen Threshold (EBT). These values are determined by applying various level of heat energy, measured in calories, to material to determine specific

failure points. The PPE needs for an electrician working near live electrical circuits will vary but approximately 2/3 of most live electrical work will be covered by CAT 2 level of protection.

3.25.7 Portable Lighting

When portable lighting is being used in a damp environment, heavy-duty extension cords must be used and connected to power supply circuits equipped with a GFCI receptacle. Suitable guards must be provided for portable lamps.

3.25.8 Temporary Power Lines

If temporary power lines are installed, they must be clearly marked in a manner that prevents storage of material beneath the line(s) and vehicles or mobile equipment from travelling under or near the power lines. All lines must be properly supported.

3.25.9 Portable and Vehicle-Mounted Generators

The receptacles (plug sockets) mounted on the generator or vehicle are to be used only to provide power to cord connected tools or equipment. Grounding is not required if the generator supplies only equipment mounted on the generator and/or cord- and plug-connected equipment through receptacles mounted on the generator. Generators greater than 5kW single phase must have a connection to ground (earth). All 125V, 15A, and 20A receptacles on portable generators must be provided with GFCI protection. This is not the same as over-amp protection.

3.26 Fall Protection

***NOTE**: Persons using this section of the handbook must first have core competency and training as required by the Arcadis Work at Heights Health and Safety Standard*

All Arcadis workers and contractor workers working from walking/working surfaces that are 6 feet or more above a lower level will be protected from falling by a guardrail system, covers, or a personal fall-arrest system. The selected fall protection method must be developed or overseen by a competent person. All workers must use or wear fall protection equipment at temporary or permanent installations if a worker could fall:

- More than 6 feet.
- Less than 6 feet when there is a possibility that a worker could sustain injuries more serious than those likely to result from landing on a solid, flat surface (e.g., over moving or rotating equipment, open water or tanks, ice, heated surfaces).

- More than 4 feet but less than 10 feet in the case of a permanent installation where guardrails or other similar means of fall restraint have not been provided.
- Any time aerial bucket equipment, powered manlifts, or forklift-attached manbaskets are used. The personal fall arrest system will be used and secured to the attachment point on the boom, manlift, or manbasket.

  There are limited construction standard exemptions for inspection work conducted prior to or after all construction work is complete, but staff must comply with all provisions outlined by the exemption detailed in the Elevated Work and Fall Protection Standard. This exemption does not apply to activities that fall within the General Industry Standard of OSHA.

Personal fall arrest, fall restrain and fall limiting devices are critical when other fall protection systems do not exist. Training on proper use of this equipment is important.

A fall protection system may include:

1. Guardrails;
2. Safety Nets;
3. Personal Fall Arrest System (full body harness with lanyard and/or lifeline);
4. Positioning Device System (vertical/horizontal lifeline);
5. Warning Line System (only applies to roofing work on low-slope roofs);

6. Controlled Access Zones (only applies to overhead bricklaying and related leading-edge work);
7. Fall Protection System (this option is available only to workers engaged in leading edge work, precast concrete erection work, or residential construction work, who can demonstrate and document that it is infeasible, or it creates a greater safety hazard to use conventional fall protection equipment);
8. Non-conforming Guardrail (a warning line at least 15 feet from edge of roof or hole, combined with effective work rules, that can be expected to prevent workers from going past the line and approaching the edge)
9. Designated Area for General Industry Work Only – such as an worker inspecting a HVAC unit on the roof (the designated area is similar to the 6-foot warning line for roofers, but several additional conditions must be met for it to apply. Refer to the Arcadis Work at Heights Health and Safety Standard); and,
10. Any other system (e.g., guardrails, scaffolds, work platforms, aerial lifts, safety net) as determined by the JSA or site-specific procedures that provide the necessary safeguards or alternative worker access relating to General Industry compliance,

Did You Know? Arcadis Standard ARC HSFS007 Work at Heights" includes requirements and recommendations for use when working at heights

3.26.1 Personal Fall Arrest Systems

Personal Fall Arrest Systems must consist of three key components:

- A body harness worn by the worker;
- A connecting device used to connect the harness to an anchor point; and,
- An anchor point or secure point of attachment to which the connecting device is attached;.

Personal Fall Arrest Systems used to protect workers from falls must meet the following criteria:

- Limit maximum arresting force to 1,800 pounds;
- Be rigged so that a worker can neither free fall more than 6 feet, nor contact any lower level;

Miller Fall Clearance Calculator app calculates the fall clearance distance for shock absorbing lanyards and self-retracting lifelines.

- Bring an worker to a complete stop and limit maximum deceleration distance to 3.5 feet; and,
- Have sufficient strength to withstand twice the potential impact energy of a worker free falling a distance of 6 feet.

NOTE: *All personal arrest systems must be visually inspected before each use and the entire device serviced per manufacturer's requirements. Staff must receive hands on training on PFAS.*

3.26.1.1 Body Wear

Where allowed, avoid the use of safety belts. Use a full body harness, which provides the best distribution of force in the event of a fall. For example, a free fall from 6 feet generates up to 1,800 pounds of force. This force is best distributed by a full body harness. In addition, the full body harness suspends the victim in an upright position while waiting for assistance in the event of a fall.

3.26.1.2 Connecting Device

The safety lanyard links the body wear to the anchor point. Lanyards are typically short lines made of rope, strap, webbing, cable, or similar materials with connectors on both ends. Many lanyards have shock-absorbing features to provide additional force reduction (up to 80 percent) in the event of a fall. Shock-absorbing lanyards may not be applicable in all situations, particularly where fall distances must be minimized. When a fall occurs, the lanyard acts as a fixed (or shock-absorbing) arresting system.

When a worker must detach and reattach the lanyard to a new anchorage point, such as when moving either horizontally or laterally, the "Y" lanyard technique must be used to avoid any period of time, however brief, that the worker is not protected. Two safety lanyards must be used, and the "old" lanyard must not be detached from the anchorage point until the "new" lanyard is attached to the "new" anchorage point. Simply detaching and reattaching a single lanyard is not permitted.

3.26.1.3 Anchor Point

The anchor point is a secure point of attachment for the connection device of the fall protection system. The anchor point is a sturdy support structure located above or at an even level with the user. Anchor points positioned above the user are preferable because they reduce the distance of free fall. A direct connection to the anchor point should be used, with a locking snap-hook and spring-loaded keeper, cross arm strap, eye bolt, or other method to properly secure the connection device. The anchor point must be capable of withstanding a static force of 22.5kN (5,000 pounds), increased by a factor of 0.2 (20 percent) for each additional lanyard.

3.26.1.4 Inspection of PFAS Equipment

Personal fall arrest systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service if any defect is identified. PFAS equipment shall also be inspected by a Competent Person annually. It is recommended that quarterly inspections of PFAS equipment be completed and documented. The following defects, as a minimum, are cause for destruction of the equipment:

- Cracked, dry, or rotten leather;
- Nylon or cord that has worn thin;
- Bent or deformed attaching hardware;
- Cuts of worn places deep enough to weaken the strap or belt; and,
- Broken stitches at buckles, D-rings, or snaps

3.26.2 Overhead Work

When working overhead, the area below must be roped off or barricaded to protect other workers from falling debris, tools, or equipment. Signs reading “Danger – Overhead Work” shall be conspicuously posted and a Safety Watch (if necessary) shall be stationed to warn other workers to stay clear.

3.26.3 Guardrail Systems

Guardrail systems used to protect workers from falls must meet the following criteria:

- Toprails must be capable of withstanding a force of at least 200 pounds applied within 2 inches of the top edge in any outward or downward direction.
- A midrail must be installed at a height midway between the top edge of the guardrail system and the walking/working surface.
- Midrails must be capable of withstanding a force of at least 150 pounds applied in any outward or downward direction.
- A toeboard must be installed and be a minimum of 4 inches tall from its top edge to the level of the walking/working surface and have no more than a ¼-inch clearance above the walking/ working surface.
- Toeboards must be capable of withstanding a force of at least 50 pounds applied in any outward or downward direction.
- Guardrail systems used around holes must be set up on all unprotected sides or edges.

3.27 Walking and Working Surfaces

At a minimum, walking and working surfaces at the project site must meet the following criteria:

- Aisles and passageways will be kept clear and in good repair, with no obstructions across or in aisles that could create a hazard;
- Floors will be kept dry with all liquid spills cleaned up as soon as possible or contained using drip trays or absorbent material;
- If water or other debris will be falling to the floor below, the area will be roped off with “DANGER – CAUTION” tape to warn any worker in that area;
- Potential hazards located in walking/working areas will be visibly marked with barriers or “DANGER – CAUTION” tape to minimize exposure and to promote worker safety. No job is complete until all material, scrap, and debris are removed, and the site is restored to a neat condition;
- Incomplete jobs will be left so that they are not a hazard to fellow workers or the public;
- All floor hole covers will be adequate to support at least twice the maximum potential loading, secured in place, and marked with the words “HOLE COVER.”;
- Every temporary or permanent floor opening will have standard railings or will be constantly attended by project worker; and,
- When working on or above open grating, a suitable covering will be used to cover the grating to prevent tools or parts from dropping to a lower level.
- Walkways and travel ways, including steps, are to be salted or cleared of snow and ice as soon as practical.
- Steps from field offices are to be swept or cleaned of sand and gravel to the extent practical. Steps with holes to allow material to fall below are preferred.
- The hazards associated with working around unstable snow and ice should be communicated to workers and incorporated in task hazard analysis.
- Cold weather supplies, such as sand, salt, or ice melt should be kept on hand to the extent reasonably possible.

3.27.1 Records

Quarterly equipment inspection records will be retained for 1 year in addition to the current year.

3.28 Hand and Power Tools

The use of hand and portable power tools during site activities is a potential source of accidents. A fundamental program for using the right tool in the correct manner, together with proper maintenance and storage, is necessary to prevent personal injury and property damage.

The following procedures will be used when performing operations involving portable hand and power tools:

- Protective eyewear and other PPE will be worn, as specified in the JSA;
- Guards will not be removed or rendered inoperative;
- Only workers who have reviewed the manufacturer's use and operations manual, review this section of this handbook and have been appropriately trained in the use, operation and proper handling of hand and portable power tools will be permitted to use hand and power tools.
- The Site Supervisor will confirm that only workers who have reviewed the manufacturer's use and operations manual, reviewed this section of this handbook and have been appropriately trained in the use, operation and proper handling of hand and portable power tools are permitted to perform work activities with portable hand and power tools;
- When working outside or in damp or wet environments, only GFCI or GFCI-protected receptacles shall be used;
- Each type of portable hand or power-operated tool will be operated using the manufacturer’s recommended operating procedures;
- If the manufacturer has not developed specific operating procedures, only workers familiar with the safe operating procedures of that equipment will be permitted to operate it. The Site Supervisor will conduct periodic inspections of hand and portable power tools that are used at the project site. Inspections will include both powered and nonpowered equipment. Any damaged, worn, or improper tool must be removed from service immediately and remain out of service until it is repaired or replaced.

Did You Know? Arcadis Standard ARC HSFS008 “Hand and Power Tools” includes requirements and recommendations for use when using hand and power tools.

3.28.1 Tools

Workers shall review the manufacturer's use and operations manual, review this section of this handbook or have adequate training, and be competent in the use of tools provided at the project site. When working with tools, workers shall meet the following requirements:

- Use of fixed open-blade knives (e.g., pocketknives) is prohibited;
- Maintain tools in accordance with the manufacturer's instructions;
- Use tools that are in good condition and proper for the job (including cutting tools). Report defective tools and remove from service;
- Secure your footing before using any hand tool;
- Guards on all power tools must be in place;
- Shut down all machinery for oiling;
- When working at height, hand tools must be tethered to the user or work platform;
- Cutting tools must be equipped with self-retracting or guarded blades; and,
- When operating vibratory tools, follow administrative controls by limit the duration of operation. Wear PPE capable of absorbing the vibration.

3.28.2 Portable and Fixed Grinders

Grinders (portable and fixed) must be used, maintained, and inspected regularly according to the manufacturer's recommendations and those provided below:

- Workers who are grinding or buffing must wear full face shields and safety eyewear with side shields;
- Prior to starting a grinder, the abrasive wheels and discs must be inspected for defects (e.g., cracks, chips etc.,).
- The position of the safety guards must be checked;
- Do not use grinders without guards;
- Abrasive wheels and discs must not be used for side grinding unless designed for that purpose;
- A work or tool rest for a grinding wheel must have a maximum clearance of 1/8-inch from the abrasive wheel, must be positioned at the center of the abrasive wheel, and must not be adjusted while the abrasive wheel is in motion; and,

- Equipment that is intended to be mounted, such as a bench grinder, must be mounted to prevent movement.

3.28.3 Portable Heaters

Workers must obtain permission from the Onsite Supervisor to heat buildings with portable heaters. Generally portable heaters will be of two (2) types – electrically powered or propane powered. It is important to keep heaters away from flammable or ignitable materials.

When using propane heaters, care must be taken to ensure there is adequate ventilation to avoid the development of toxic environments due to the buildup of carbon dioxide and carbon monoxide.

When using electric heaters, they should be plugged directly into a wall receptacle and heaters should be equipped with a tip-over safety switch which automatically shuts off the heater if the unit is tipped over.

3.28.4 Machine Guarding

Machine and equipment safeguards should not be removed except for maintenance, repair, testing, or adjustment. If removal is necessary, the following precautions must be followed:

- Remove machine guards only after the machine or equipment is shut down following Arcadis LO/TO practices;
- Do not restart a machine until it is verified that all guards have been properly replaced and adjusted according to the manufacturer's instructions;
- Never, under any circumstances, use grinding or buffing tools without a proper manufactured guard. Always use eye and face protection.

3.29 Vegetation Management

3.29.1 Mowing and Grass Trimming

Workers will review the manufacturer's use and operation manual and be trained prior to use of mowing or brush clearing equipment. Mowing equipment appropriate for site conditions will be selected to maintain grass vegetative covers. Conditions to consider include:

- Height of the vegetation
- Type of vegetation to be cut;
- On-site slopes; and,

- Type of site security measures (e.g., fences, gates) onsite that could affect use or accessibility of mowing equipment

Before mowing operations proceed, the area to be mowed must be surveyed for hidden obstacles and evidence of biological hazards including poisonous and/or harmful plants (i.e. poison ivy, poison oak, poison sumac, giant hogweed, etc.), bee, wasp or hornet nests, animal burrows, etc. In the case of harmful plants, it is preferred that these be removed by a third-party contractor that is trained and specializes in managing vegetation. Likewise, nests of stinging insects should also be removed by a third-party contractor. If you suspect the presence of an animal burrow, an animal management professional should be contacted to relocate the animal.

Mowing and grass-trimming equipment shall have all manufacturer-supplied safety devices in place and be in good working order. Mowing and grass-trimming equipment shall be inspected prior to use to confirm good working condition. Defective equipment shall not be used until repaired by a competent person in accordance with manufacturer requirements and specifications. Mowing or grass-trimming equipment used shall have sufficient power to effectively cut the materials to be mowed. Site workers, vehicles, and other items not directly involved with mowing activities should stay the following minimum distances from the mowing equipment:

- 50 feet away from grass-trimming operations;
- 50 feet away from push-mower operations; and,
- 100 feet away from riding- or tractor-mower operations.

If prolonged use of grass trimmers or push mowers is required, ergonomic improvements should be considered (e.g. vibration absorbers, torso and back support belts, cushioned insoles). Site workers responsible for mowing or grass trimming shall wear PPE specified in the JSA for the project, but at a minimum must include hearing protection, safety glasses, and safety boots. Consider the use of vibration absorbing gloves.

Fuels used to power mowers and grass trimmers should be kept in approved safety cans. Only minimal quantities of fuel, sufficient to carry out the scope of work, will be brought and stored onsite with appropriate SDS.

3.29.2 Cutting Tools

General safe work practices for machete use include:

- Sharpen machete blades only 6 inches from the butt of the handle to within 2 inches of the point;
- Always wear cut-resistant gloves while sharpening;
- If more than one project team member is cutting on the same line, always station yourself in at least 10-foot intervals;
- Lean forward while chopping, if possible;

- Always chop away from your body;
- Swing with a full swing, but do not over swing or swing too hard;
- Clear small vines and other small vegetation before cutting large vegetation.
- Do not use machetes for heavy cutting;
- Wear all PPE as required by the JSA and/or HASP. Consider the use of chaps to protect your legs from errant machete swings;
- Keep machete sheathed when not in use; and,
- Do not throw or “stick” the machete in the ground after use.

General safe work practices for axe and brush hook use include:

- Clear away any impeding light growth with a machete before chopping;
- Allow ample space between adjacent choppers and keep those not involved in the clearing activity outside the area;
- Carry axes and brush hooks with the handle gripped behind the head and the cutting-edge facing outward.
- Use a small chain saw for extended heavy brushing; and,
- Keep axes and brushhooks sheathed when not in use.

General safe work practices for using pruning tools include:

- Carry pole pruners with cutting blades pointed forward;
- Wear leather gloves when operating pruners and arm protection when cutting thorny or poisonous vegetation;
- Avoid awkward twisting of body positions during pruning activities;
- Work into the vegetation by trimming the outer layers first instead of attempting to reach toward the base for bushy vegetation and briars;
- Use pruners with spring-opening devices;
- Avoid pinch points on hand-held pruners;
- Avoid using excessive force to cut through vegetation;
- Use large pruners or a pruning saw for thick limbs;
- Keep exposed blades covered with guards when pruner is not in use; and,
- Keep pruners closed/latched when not in use.

General safe work practices for large-scale site clearing include:

- Site workers not directly involved with site clearing must stay back at least 100 feet from any clearing operation involving the use of mechanized equipment. Consider fire danger and have necessary fire protection equipment available when using powered equipment for brush and site clearing;
- Accumulated vegetation will not be burned unless properly permitted by the appropriate regulatory agency;
- Follow all requirements in the burn permit;
- Accumulated vegetation known to contain poisonous plants (e.g., poison ivy, poison oak, poison sumac giant hogweed, etc.) will not be burned if:
- A reasonable probability exists that smoke will migrate offsite into inhabited areas;
- A reasonable probability exists that site workers will be affected by smoke; and,
- Control nuisance dusts by wetting or through other appropriate engineering control.

3.29.3 Herbicides

Warning: The application of herbicides or pesticides may be considered a commercial application. Commercial applications can only be completed by a licensed and permitted professional. Be sure to understand federal, local, and state laws regulating such applications before purchasing or using herbicides. If herbicides or other substances are used to control vegetation at the project site, the following requirements apply:

- Evaluate safety concerns associated with the herbicide product in relation to the effectiveness and cost of the product. Specifically, consider:
    - The toxicity of the product to humans and the environment versus the effectiveness and cost of the product;
    - The methods of application and amount of physical stress involved with the application versus the effectiveness and cost of the product; and,
    - Volume of product required to effectively achieve the desired result versus use of an alternative product requiring less volume for application;
- Purchase only the required volume of material needed for the application event. Stockpiling materials onsite is discouraged;
- Obtain a Safety Data Sheet for any chemical product purchased to control vegetation. Beneficial insects purchased for control purposes are exempt from this requirement; and,
- Wear PPE specified in the JSA for the project when applying herbicides.

3.29.4 Tree and Limb Removal and Disposal

Tree and limb removal is considered specialized work, which is typically completed by contracting trained and experienced workers. If a tree is or tree limbs are required to be removed, the following requirements apply:

- Oversight of tree and limb removal will be completed by a competent person;
- In general, perform limb removal from the ground surface using equipment designed to access limbs at height (e.g. pole saws, telescoping tree pruners) or using elevated work platforms. If climbing is required due to tree height and site access restrictions, fall protection will be used, with any specialized requirements stipulated in the JSA for the project;
- An audible warning must be sounded when the tree or limb is ready to fall;
- All workers not directly involved with the removal process will maintain a safe distance from the cutting and fall area. The Site Supervisor will determine the safe distance based on the particular cutting situation; and,
- Inspect and maintain tools used as part of the removal process in accordance with manufacturer's recommendations.

3.29.5 Brush Chippers

The use of bush chippers is considered specialized work, which is typically completed by contracting trained and experienced workers. The following requirements apply to brush chippers used to dispose of limbs, trees, or other vegetative debris:

- Use brush chippers with a feed throat extending not less than 36 inches from the knives;
- Never place hands, arms, feet, legs, or other body parts on the feed table when the chipper is in operation or the rotor is turning;
- Do not feed material such as stones and nails into the brush chipper;
- Confirm that all brush chippers are equipped with a locking device on the ignition system to prevent unauthorized starting of the equipment;
- Keep brush chipper cutting bars and blades sharp, properly adjusted, and maintained in accordance with manufacturer's recommendations;
- Do not raise or lower the brush chipper chute while the rotor is turning;
- Use push sticks and pokers made of a material that can be consumed by the chipper to shove smaller items into the chipper;
- Feed brush chippers from the side of the centerline, and immediately turn away from the feed table when the brush is taken into the rotor;
- Avoid loose fitting clothing and clothing with tie strings that could get entangled in the brush being feed into the chipper;

- Feed brush taking care that you do not become entangled in the feedstock;
- Chock or otherwise secure trailer chippers that are detached from the vehicle;
- Mount a swinging baffle in front of the knives to prevent throwback of material;
- Gloves must be tight fitting around the wrist to avoid catching on brush being fed in to the equipment;
- Wear PPE specified in the JSA for the project when working with brush chippers; and,
- Remain at least 50 feet away from the brush chipper if not involved in the brush chipping activity.

3.30 Ergonomics

The purpose of ergonomics is to evaluate and control work conditions known to cause injuries and illnesses because of the excessive demands placed on an individual's body

3.30.1 Manual Lifting

Prior to lifting, carrying, or lowering any object, some general considerations should be followed to move the object properly:

- Think before moving any object. Objects should be realistically evaluated by the lifter to determine if the mass of the object exceeds the lifter's ability to lift the object;
- Use mechanical aids (e.g. hand trucks, carts) or the buddy system whenever possible to move heavy objects, objects with poor hand holds, or large bulky objects;
- Prior to moving the object, evaluate the object for the presence of any physical hazards such as pinch points, sharp or jagged edges, burrs, and rough or slippery surfaces.
- Evaluate the route in which the object will be moved. The route should be free and clear of obstructions that could cause difficulty in moving the object;
- Avoid lifting outside of the worker's safety zone (the area below the knees or above the shoulders). Generally, heavy materials should not be stored at levels higher than 5 feet off the floor or on the floor unless appropriate mechanical aids are available to move the object;
- Design out of the work process recognized lifting hazards whenever possible; and,
- Perform stretching and warm-up exercises prior to lifting.

The NIOSH Lift Calculator app is a tool used to calculate the overall risk index for single or multiple manual lifting tasks. While it is technical in nature, it utilizes decades of research in back injury and risk reduction.

3.30.1.1 Proper Lifting and Carrying Techniques

The following techniques should be used to lift heavy objects (**Figure 3-9**):

- Establish a firm footing with the feet approximately shoulder-width apart and one foot slightly ahead of the other. This will aid in keeping good balance and provide a stable lifting base;
- When bending down to pick up the object, keep your back straight and as upright as possible (preferably perpendicular to the ground);
- Always bend at the knees, not at the waist when lowering or raising the object;
- Obtain a good secure grip on the object;
- When beginning to lift, tighten your stomach muscles and use your legs to lift the object. Your leg muscles should do all the work because they are a lot stronger than the lower back muscles;
- Take small steps and move slowly;
- If possible, face the direction in which the object is to be carried prior to lifting the object. Avoid twisting the body when carrying an object; always pivot with the feet;
- Hold the object as close to the body as possible and maintain a secure grip;
- Avoid objects that are large and bulky to the point where the worker's vision is obstructed while carrying the object; and,
- If possible, break down heavy objects that must be carried over a long distance into smaller, lighter loads to reduce stress on the body.

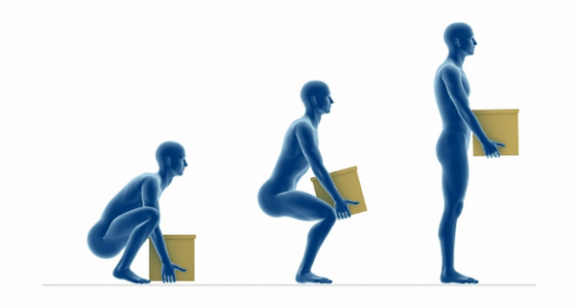


Figure 3 18 The Basic Lift

3.30.1.2 Lowering Objects

The following techniques should be used when lowering objects:

- Establish a firm footing with the feet approximately shoulder-width apart and one foot slightly ahead of the other;
- When beginning to lower the object, tighten your stomach muscles and use your legs to lower the object;
- Maintain a good secure grip on the object;

- Always bend at the knees, not at the waist when lowering the object; and,
- Keep your back straight and as upright as possible (preferably perpendicular to the ground) when lowering the object.

3.30.1.3 Lifting Utility Hole Covers

Always use a Utility Hole cover hook or lifter tool to lift and remove utility hole. The following instructions apply to removal and replacement of utility hole covers with the appropriate tool:

- Freeing the cover:
  - When a cover is stuck in its frame, remove any encrustation with a cold chisel; and,
  - Place a block of wood on the cover near the rim and hit the block with a heavy hammer. Do this at different points until the cover is loosened;
- Unseating the cover:
  - Lift the cover with the tool provided;
  - Engage the circumferential rib before lifting;
  - Unseat the cover about 4 inches by pulling and lifting with the leg and arm muscles; and,
  - Never place fingers or hands under the cover— injury can result;
- Removing the cover:
  - Use a helper when available;
  - Clear the area of any hazards to footing;
  - With your feet spread and footing secure, pull the cover clear of the frame and keep pulling until the cover is in a nonhazardous location; and,
  - Pull with the arm and leg muscles;
- Replacing the cover:
  - Stand parallel to the desired direction of travel with toes in the clear;
  - Place the point of the hook under the edge of the cover nearest you;
  - Lift slightly and swing the cover toward the structure;
  - Move to the opposite side and repeat the lifting and swinging;

  - Continue this alternate lifting and swinging until the cover is partially over the structure's opening; and,
  - With the hook, lift the edge that is farthest from the opening;
- Lift until the cover slides into the frame of the structure. If a helper is available with another hook, stand on opposite sides of the cover, parallel to the direction of travel; and,
- Securely hook under the cover and slide it to the frame.

Note: Once the utility cover has been removed, the opening may be required to be surrounded by a guardrail or the opening restricted in such a manner as to prevent a person from falling.

3.30.2 Repetitive and Range of Motion Activities

Certain field activities may require repetitive motion, such as climbing stairs repeatedly, crouching and standing repeatedly, carrying objects repeatedly, purging monitoring wells using inertial pumps, etc. It is important to recognize acute injury can occur from repetitive motion. As always, eliminating the need for repetitive motion is preferred. If equipment, tools or any load is to be moved repeatedly, seek assistance or attempt to move by mechanical means. Stretching and taking frequent breaks may also prevent acute injury due to repetition.

A hazard assessment must be completed to reduce or eliminate hazards associated with tasks such as standing for extended periods of time. Comfortable, supportive footwear is important. Also consider other PPE, such as knee pads, if kneeling is involved in the repetitive motion.

3.30.3 Field Workstation

Due to the nature of our field work it may be necessary to establish temporary workstations. Ergonomics should be considered for temporary workstation setup. It is important to maintain a neutral position when working for extended periods of time. It may be necessary to obtain folding tables and folding chairs or other proper work surfaces for the completion of administrative tasks and field sampling activities. Avoid using buckets, coolers, etc. as seats and tables.

Did You Know? Arcadis Standard ARC HSGE011 Office Ergonomics" includes guidance on establishing a safe workstation, some of which may be applied in field or remote work settings.

3.31 Site Storage of Hazardous Chemicals, Gases, and Solvents

In general, only approved chemicals should be used on Arcadis project sites. All chemicals must be properly labelled and the SDS reviewed by the Site Supervisor before being allowed on Arcadis project sites. Limit the storage of chemicals and other potentially hazardous materials to quantities that are reasonably needed at the project site.

The NIOSH Mobile Pocket Guide is a useful app that provides general industrial hygiene information for workers and includes details on 677 chemicals and substance groupings.

3.31.1 Container and Portable Tank Storage Requirements

This section describes the storage of liquids in drums or other containers with an individual capacity less than 119 gallons, portable tanks less than 660 gallons individual capacity, intermediate bulk containers less than 793 gallons individual capacity and overpack drums (used for temporary containment of containers) less than 60 gallons capacity. The container selected shall meet NFPA 30 standards.

Many projects use gasoline (Class I B Flammable Liquid) or diesel fuel (Class II Combustible Liquid) in limited quantities to operate machines such as generators, pumps, and pressure washers. Best management practice includes use of a DOT-approved metal closed container (not more than 5-gallon capacity, having a flash arresting screen, spring-closing lid, and spout cover, and so designed that it will safely relieve internal pressure when subjected to fire exposure) to store and transport gasoline and/or diesel. While most safety cans approved by listed agencies or organizations (e.g., Factory Mutual Engineering Corp.; Underwriters' Laboratories, Inc.; or Federal agencies such as Bureau of Mines or U.S. Coast Guard) have flame-arrestor screens in safety can spouts (Underwriters' Laboratories, Inc. does not require them for approval of safety cans). According to OSHA, the use of a UL listed <5 gallon-gasoline container could result in a *de minimis* violation for absence of a Flame Arrestor Screen in a Safety Can. A *de minimis* violation is one that has no direct or immediate relationship to safety or health. Consequently, there will be no citations, no penalties, and no abatement dates issued by OSHA, just documentation of the *de minimis* finding.

Therefore, UL approved gas safety cans, without a flame-arrestor screen, are technically permitted for the storage/transportation of gasoline; however, where feasible and practical, and if required by a client, Arcadis will use an approved container to store and transport gasoline.

Common decontamination materials like isopropyl alcohol (Class I B Flammable Liquid) will be stored in the container in which the material was purchased with a maximum capacity not exceeding the volumes shown in Table 3-8. If the purity of the material (such as American Chemical Society analytical grade or higher) requires storage in glass containers to preserve purity, the maximum size of the container shall not exceed 1.3 gallons. Care will be taken to protect glass containers from breakage during storage and handling.

Table 3 8 Flammable / Combustible Liquid Storage Requirements

Flammable/ Combustible Liquid Storage Requirements					
Container Type	Flammable Liquids			Combustible Liquids	
	Class IA	Class IB	Class IC	Class II	Class III
Glass or approved plastic	475 mL (1 pt)	950 mL (1 qt)	3.8 L (1 gal)	3.8 L (1 gal)	3.9 L (1 gal)
Metal (other than DOT drums)	3.8 L (1 gal)	18.9 L (5 gal)	18.9 L (5 gal)	18.9 L (5 gal)	18.9 L (5 gal)
Safety drums	7.6 L (2 gal)	18.9 L (5 gal)	18.9 L (5 gal)	18.9 L (5 gal)	18.9 L (5 gal)
Metal drums (DOT specifications)	227 L (60 gal)	227 L (60 gal)	227 L (60 gal)	227 L (60 gal)	227 L (60 gal)
Approved portable tanks	2,500 L (660 gal)	2,500 L (660 gal)	2,500 L (660 gal)	2,500 L (660 gal)	2,500 L (660 gal)

All safety cans and other containers used to hold flammable or combustible liquids will be labelled in accordance with WHMIS requirements. If such items are stored in an Arcadis office all items will be recorded on the WHMIS Master Inventory List.

3.31.2 Storage Cabinet Requirements and Placement

Project sites with long-term use of flammable or combustible liquids shall be equipped with a storage cabinet meeting NFPA 30 standards Cabinets of this type are typically referred to as Flammable Cabinets. The capacity of each individual cabinet shall not exceed 120 gallons volume for Class I, Class II, and Class III A liquids.

Not more than three Flammable Cabinets may be stored in any one fire area. Metal cabinets shall be constructed in the following manner:

- The bottom, top, door, and sides of the cabinet shall be at least No. 18 gauge sheet steel and double walled with 1 ½-inch air space;
- Joints will be riveted, welded, or made tight by some equally effective means; and,
- The door will be provided with a 3-point latch arrangement and the door sill will be raised at least 2 inches above the bottom of the cabinet to retain spilled liquid within the cabinet.

Cabinets placed inside of buildings, office trailers, storage sheds, and other facilities shall be placed in locations where egress is not obstructed. Class I liquids will be placed so that a fire in the liquid storage area would not prevent egress from the area.

Under OSHA General Industry regulations (29 CFR 1910.106), the quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:

- 25 gallons of Category 1 flammable liquids (includes gasoline) in containers;
- 120 gallons of Category 2, 3, or 4 flammable liquids in containers; and,
- 660 gallons of Category 2, 3, or 4 flammable liquids in a single portable tank.

3.31.3 Transfer of Flammable and Combustible Liquids

When transferring flammable and combustible liquids from one storage container to another (conductive containers), the containers must be bonded and grounded. The transfer of flammable liquids from a storage container to an equipment gas tank or vehicle gas tank (refueling activities) does not require bonding or grounding unless required by the Site Supervisor. Portable equipment should be allowed to cool down prior to refueling. Carry fuels and other flammable liquids only in OSHA-approved, sealed containers.

3.32 Incident Response and Recovery Training (Hazwoper)

Arcadis provides emergency response services to several our North American clients in both Canada and the US. Those field staff who are part of the emergency response team in Canada have received HAZWOPER training, a weeklong, primarily health and safety focused training that trains workers in the care and use of Level A, B, C, and D personal protective equipment, including encapsulation suits and supplied air respirators.

3.32.1 Workers Covered by the HAZWOPER Standard

Employees and subcontractors who perform work or who are likely to perform work at incident response and recovery (IRR) sites should have HAZWOPER training.

If “skilled support contractors” are required as part of emergency response operations and these individuals lack the Hazwoper training, these individuals will be trained (minimum of 4 hours) commensurate with the duties they will perform.

3.33 Compressed Gas Cylinder Handling, Storage, and Use

Several hazards are associated with compressed gases, including oxygen displacement, fires, explosions, toxic effects from certain gases, as well as physical hazards associated with pressurized systems. Special storage, use, and handling precautions are necessary to control these hazards. A compressed gas is:

i. A gas or mixture of gases having, in a container, an absolute pressure exceeding 276 kPa at 21.1 °C (40 psi at 70 °F); or
ii. A gas or mixture of gases having, in a container, an absolute pressure exceeding 717 kPa at 54.4 °C (104 psi at 130 °F) regardless of the pressure at 21.1 °C (70 °F); or
iii. A liquid having a vapor pressure exceeding 276 kPa at 37.8 °C (40 psi at 100 °F) as determined by ASTM D-323-72.

3.33.1 Transport of Compressed Gas Cylinders

The following requirements apply to the transportation of compressed gas cylinders:

- Ensure the valve is fully closed;
- Remove regulators and ensure protective caps are in place prior to moving cylinders;
- Move using a gas cylinder trolley or by tilting and rolling on bottom edge;
- Prevent dropping or striking the cylinder or letting cylinders strike each other;
- Transport cylinders in a vertical position and only when secured to prevent movement for each cylinder
- To secure compressed gas cylinders appropriate tie-down straps must be used. Seat belts or bungee cords may not be used to secure a compressed gas cylinder; and,
- When hoisting cylinders:
  - Secure in cradle, slingboard, or pallet;
  - Never hoist by slings, chains, or magnets; and,
  - Do not use valve caps for lifting.

3.33.2 Handling and Storage of Cylinders

The following requirements apply to handling and storing cylinders:

- Compressed gases will be handled and used by appropriately trained persons only;
- Exercise care in handling all gas cylinders;
- Inspections will comply with OSHA and DOT requirements;
- Conspicuously post a sign with “Danger – No Smoking or Open Flames” or approved equivalent wording in rooms and entrances to areas where flammable gases are stored;
- Properly identify all compressed gas cylinders by stenciling, stamping, or labeling the shoulder of the cylinder;
- Do not drop or jar the cylinders;
- Do not drag or slide the cylinders. Move the cylinders long distances using a cylinder trolley and move them short distances by tilting and rolling on their bottom edge;
- Keep cylinder valve protective caps in place at all times except during use;

- Secure cylinders from moving with a chain or similar device when transporting via equipment (e.g. a hand truck or forklift.);
- Use a suitable platform when handling cylinders with a crane or derrick. Handling with slings is prohibited;
- Do not use valve protection caps to lift cylinders from one vertical position to another; however, it is permissible to raise a cylinder from a horizontal to a vertical position by grasping the valve protection cap;
- Whenever possible transport cylinders in an upright position and secured to prevent movement for each cylinder. Compressed gas cylinders must be secured in an upright position when stored at project sites;
- Use approved lifting methods to raise or lower cylinders from vehicles;
- Secure gas cylinders, whether full or empty, in an upright position using a chain or other suitable noncombustible materials;
- Appropriately mark and store all empty cylinders separately from full cylinders;
- Separate oxygen cylinders in storage from fuel-gas cylinders and other combustibles by a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least a half hour;
- Do not store cylinders containing flammable gases (e.g. acetylene, hydrogen, liquefied petroleum gas) inside an occupied building or any building where an ignition source may be present. These cylinders will be stored in a separate, well-ventilated, fireproof area;
- Protect cylinders from weather extremes and from the direct rays of the sun;
- Connect a full cylinder to a header or manifold with other cylinders only when their temperatures are approximately the same; and,
- Some common materials used at project sites may include compressed gasses or products in the form of fire extinguishers, paint cans, some bug sprays, etc. While these may or may not fall under the definition of a compressed gas cylinder, they should be stored and secured in a manner that prevents physical damage and limits extreme temperature fluctuations due to direct sunlight or extreme cold. Extreme temperatures may cause pressurized containers to rupture.

3.33.3 Liquid Petroleum Gas and Compressed Natural Gas

The following requirements apply to the use of liquid petroleum gas (LPG) and compressed natural gas (CNG) at project sites:

- Store, handle, and use LPG and CNG in accordance with safe practices and standards;
- LPG must be stored outdoors, in a well-ventilated rack or cage, when not in use;
- Install appropriate guarding around LPG and CNG tanks to prevent damage from vehicles;
- Smoking and open flames are not permitted where LPG and CNG are used;
- Post “No Smoking” signs on LPG and CNG storage tanks and in associated storage areas;

- Electrical and grounding:
  - Properly ground all major stationary equipment. Provide ground connections between stationary and mobile equipment before any flammable gas is loaded or unloaded; and,
  - Electrical equipment and wiring shall be explosion proof.

3.33.4 Gas Cylinder Setup and Removal

The following requirements apply to gas cylinder setup and removal:

- Keep cylinders away from heat and from welding or cutting operations where sparks could reach them;
- Do not use the recessed top of cylinders to store tools;
- Do not use a leaking cylinder. Leaking cylinders should be tagged and taken outdoors away from sources of ignition. Management should be notified so the cylinder supplier can be notified. No attempt should be made to repair leaking cylinders;
- Never use a flame to detect cylinder leakage;
- Never tamper with the safety relief devices on cylinders;
- Never apply force to connections that do not fit;
- Never open the valve on a gas cylinder to “blow out” or clean the valve;
- Do not allow cylinders to come in contact with energized conductors, ground wires from electrical equipment, welding machines, or to be used as a grounding device;
- Make sure that ancillary equipment (regulators, connectors, hoses) is inspected and appropriately rated; and,
- Before removing a regulator from a cylinder, close the valve and release all pressure from the regulator.

3.33.5 Cryogenic Liquids

A broad range of compressed gases such as methane, oxygen, argon, carbon dioxide, nitrogen, hydrogen, and helium can create forming fluids. They can cause frostbite on skin and exposed eye tissue. When spilled, they can blanket surfaces completely, causing a potential oxygen-deficient atmosphere, in addition to their cooling properties.

The following requirements apply to worker exposure to cryogenic liquids at a project site:

- Properly ventilate areas exposed to high volumes of cryogenic liquids prior to entering the area (may require compliance with confined space entry policies); use instruments to monitor the area; and,
- Wear appropriate protective equipment such as gloves, eye protection, and protective clothing if exposed to cryogenic liquid or cold vapor:

- Wear protective gloves when cold liquids and their vapors are handled. Gloves will be loose fitting so they can be removed quickly if liquids spill into them; and,
- Keep bottoms of trousers outside of boots or work shoes.

3.33.6 Oxygen

The following requirements apply to the storage and handling of oxygen at a project site:

- Store oxygen cylinders with the valve end up;
- Keep sparks and flames away from oxygen cylinders;
- Liquid oxygen or oxygen-rich atmospheres should not come in contact with combustible materials;
- Smoking or open flames are not permitted where liquid oxygen is stored or handled;
- Post “No Smoking” signs in oxygen storage areas;
- Do not use oxygen to provide ventilation and,
- Properly label cylinders in accordance with WHMIS regulations.
- NFPA 704 labels are required when another Federal, state, or local regulation or code requires their use. NFPA 704 does not specify when a container, tank, or facility must label with the 704 diamond. It explains HOW to label when another code, standard, or an AHJ (Authority Having Jurisdiction, such as the local fire department) requires such labeling.

3.33.7 Acetylene

The following requirements apply to the storage and handling of acetylene at a project site:

- Store acetylene cylinders with the valve end up;
- Keep sparks and flames away from acetylene cylinders;
- Do not use acetylene at a pressure exceeding 103.4 kPa (15 pounds per square inch);
- Never use wrenches or other tools for opening or closing cylinder valves, except those provided by the valve or acetylene manufacturer. The wrench used for opening the cylinder valve should always be kept on the valve spindle when the cylinder is in use;
- Do not “crack” an acetylene cylinder valve without a suitable regulator and flow restrictor such as an attached torch. Opening the cylinder valve without proper attachments can cause a cylinder to spit acetylene and may cause an acetylene fire;
- Always open the acetylene cylinder valve slowly. Open the acetylene cylinder valves the minimum amount required to deliver acceptable flow so that it can be closed as quickly as possible in an emergency situation (¾ of 1 turn open is typically sufficient to provide adequate flow);

- Always close the cylinder valve when work is finished. Be sure the cylinder valve is closed and that all gas is released from the regulator before removing the regulator from a cylinder;
  Never use acetylene or any other compressed flammable gas to inflate bags or containers of any kind, due to the extreme risk of explosion and burns from fire; and,
- NFPA 704 labels are required when another Federal, state, or local regulation or code requires their use. NFPA 704 does not specify when a container, tank, or facility must label with the 704 diamond. It explains HOW to label when another code, standard, or an AHJ (Authority Having Jurisdiction, such as the local fire department) requires such labeling.

For those cylinders owned/maintained by Arcadis, the hydrostatic testing and date stamp requirements will be consistent with manufacturer and cylinder design requirements. To obtain these requirements, check with your H&S representative.

3.34 Drums and Other Material Handling

3.34.1 Use of Drums and Containers

OSHA defines “anything that holds hazardous chemicals except pipes and piping systems” as a container. OSHA does not concern itself with nonhazardous materials; however, that does not mean that drums or containers containing nonhazardous materials cannot cause injury to workers. Examples of nonhazardous materials stored in drums and containers causing injury would include a drum of molasses rolling or falling and striking a worker.

As applicable, additional activities requiring appropriate training of workers include:

- Sampling procedures;
- Communication methods;
- Methods for relieving pressure from drums and containers or for shielding when pressure cannot be relieved from a remote location;
- Emergency response to accidents on-site;
- Characterization of wastes to be bulked; and,
- Use of monitoring equipment.

3.34.2 Labelling Drums and Containers

Drums and containers shall be labelled in accordance with WHMIS Regulations. Labels on drums or containers of waste soil cuttings or purge water should identify its contents, the date the wastes were generated, the Project Manager responsible for the waste and their Arcadis office address and telephone number.

3.34.3 Procedures for Handling Drums and Containers

Where containers with capacities greater than 5 gallons are used for chemical products or waste materials, the containers will be handled according to the following procedures:

- When not in use, cover drums/containers with tightfitting lids or bung caps;
- Pressure relief bungs may be required when storing volatile liquids;
- At the conclusion of each work shift, place all drums/containers in a designated storage area. This area will be properly marked and secured;
- Use mechanical or powered drum handling equipment to move “filled” drums/ containers; and,
- Manual handling of the drums may lead to musculoskeletal injuries and should be avoided to the extent possible.

3.34.4 Drum Staging

The following practices should be followed when staging drums to eliminate or reduce unnecessary drum movement:

- Stage drums in rows, two drums wide, with adequate walking space between rows;
- Face drum labels out, toward the aisle so they can be easily read without moving a drum;
- Face the bolt on drums with lid rings out, toward the aisle;
- Do not stack drums on top of one another;
- Stage drums on pallets prior to filling, if possible; and,
- Leave enough room between drums to allow them to be tilted to facilitate a drum trolley (a.k.a. drum truck).

3.34.5 Opening Drums and Containers

Only slight built-up pressure can cause a loosened fitting to fly into the air like a rocket. This projectile can cause injury to site workers and can puncture adjacent containers or drums, causing rupture and leakage. If the drum or container is filled to or near the level of the opening, material can spew from the opening causing injury to site workers, formation of hazardous/flammable atmospheres at the project site, and/or environmental damage. As a general rule, Arcadis workers should never open a bulging container. They should retain the services of a specialty contractor that specializes in hazardous waste management. The procedure for opening drums and containers must incorporate the minimum safeguards listed below:

- Workers not directly involved in opening the drum or container must stay a safe distance from the drum or container during the process;

- PPE must be worn that is appropriate for exposure to the drum contents. If a drum of unknown contents is to be opened, workers may be required to wear Level A or Level B PPE. Contact Corporate H&S for additional guidance;
- If the potential for a flammable atmosphere exists or may develop onsite, all equipment and tools must be of a type to prevent sources of ignition (nonsparking, explosion proof, intrinsically safe), and grounding/ bonding of containers must be considered;
- Where possible, relieve pressure within a drum from a remote, safe location;
- If the pressure within a drum or container cannot be relieved from a remote location, the worker opening the drum or container must be protected by an appropriate shield to reduce the risk of injury;
- Drums and containers are not stepladders. Workers are not allowed to stand on or work off of drums or containers;
- Material handling equipment used to move drums and containers must be selected, positioned, and operated in a manner that minimizes the potential for the equipment to act as a source of ignition if a drum or container should rupture;
- When a drum or container exhibits signs of over-pressurization such as swelling or bulging, the drum or container will not be moved until the cause of the over-pressurization has been determined and proper containment procedures have been implemented;
- The number of areas where drums and containers are staged should be limited in order to identify and classify them; and,
- Areas where drums and containers are staged must be provided with adequate routes for access and egress from the staging area.

To safely open an open-top drum, remove the bolt from the lid ring, press your body against one of the ring ends, trapping it against the lid. With gloved hands, pry the other end of the ring from the lid, carefully removing it while keeping the other end trapped. Finally, remove the end of the ring that has been trapped by your body weight.

3.34.6 Use of Approved Drums or Containers

Drums and containers are required to meet the appropriate DOT, OSHA, and USEPA regulations and/or Canadian requirements for the materials they contain. Large containers or drums shall carry either a DOT approval, or a nationally recognized testing laboratory approval, or both. The use of approved drums and containers provides some assurance that the drum or container will not fail due to incompatibility with the stored material and that the drum or container is structurally suitable for designated duty.

3.34.7 Drum Condition

The following requirements apply to the assessment of the drum condition:

- When practical, inspect drums and containers and verify their integrity prior to being moved. Drums and containers that cannot be inspected prior to being moved due to storage conditions (e.g. buried, in a pile, stacked several tiers high) must be moved to an accessible location and inspected prior to further handling;
- Empty drums and containers that cannot be moved without risk of rupture, leakage, or spillage should be placed into a sound container using a device classified for use around the material being transferred (i.e. intrinsically safe or explosion proof for the class of flammable material);
- Open drums and containers in a manner that safely relieves excess internal pressure; and,
- If crystalline material is noted on any container, handle the contents of the container as a shock-sensitive waste until positive identification of the contents is determined.

3.34.8 Other Considerations

Unlabelled drums and containers must be considered to contain hazardous substances and will be handled accordingly until positive content identification has been made.

Polyethylene drums and containers are not equipped with a means for electrical grounding. When transferring flammable materials, the polyethylene container (or any other container for that matter) must be equipped with a mechanism that allows for grounding. A grounded suction pump (approved only) or a grounded metallic self-closing faucet can be used to accomplish safe transfer of flammable materials from these containers.

If leaking drums or containers may be present, or ruptures or spills may occur, salvage drums or containers must be available onsite along with suitable quantities of appropriate absorbent materials. Move drums and barrels with a drum trolley or forklift whenever possible. However, if they must be moved manually, follow these safety precautions:

- Before attempting to move a drum or barrel, identify its contents. Read the label on the drum and look for symbols, words, or other marks that indicate if contents are hazardous, corrosive, toxic, or flammable;
- Check for leaks in the drum or barrel. If leaks are detected, confirm that you have the correct materials to clean up the chemical. Make sure you have been trained in the hazards of the chemical and review the appropriate SDS if required;
- Roll the drums or barrels by pushing on the center rolling rings. Do not grasp the ends because this puts your hands in a position to be pinched between the barrel and another object. Never kick barrels with your feet; and,
- Never roll or push the barrel or drum off the back of a truck; use a low-angle ramp or a loading dock.

3.34.9 Pipe Handling

All workers involved in loading or unloading pipe from pipe racks or trucks must be competent and must follow these requirements:

- Never allow a worker to be on top of a load or in between the load and the racks during pipe handling operations;
- Do not remove load tie downs until lifting slings and the hoist line have been attached to the material and slack is taken up;
- Make sure that trailers used as pipe racks have guards that run the full length of both sides of the trailer;
- When unloading the pipe, position the truck so that the pipe can roll directly off the truck onto the pipe rack;
- If a picker truck is used to load or unload pipe, use tag lines so workers can work from the ends of the pipe well away from the swing radius of the boom; and,
- Refuse to unload unstable/unsafe loads.

3.34.10 Pipe Racking

Pipe racks shall be set on a level foundation designed to support the load placed on them and to prevent accidental rolling off of any tubular goods. Follow the procedures listed below when moving or otherwise handling pipe racks:

- Never rack piping more than 3.05 m (10 feet) high on ground-type racks;
- Keep the space around casing racks free of obstructions which might cause workers to stumble or fall during loading or unloading;
- Use spacers between the layers of pipe on a rack;
- Use 1-inch-thick blocks nailed to each strip to securely block all pipe measuring less than 7 inches in outside diameter. Other approved block systems are permissible; and,
- Use 2-inch-thick blocks nailed to each strip to securely block all pipe measuring 7 inches in outside diameter or more. Other approved block systems are permissible.

3.35 Ladders (Portable/Fixed)

When portable ladders are used to access an upper landing surface, the ladder side rails must extend at least 3 feet above the upper landing surface to which the ladder is used to gain access. Or, when such an extension is not possible because of the ladder's length, the ladder must be secured at its top to a rigid support that will not deflect, and a grasping device (such as a grab rail) must be provided to assist workers in mounting and

dismounting the ladder. In no case can the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.

Did You Know? Arcadis Standard HSFS016 “Ladder Safety” requirements and recommendations for use when working with ladders.

Additional ladder precautions include:

- Maintain ladders free of oil, grease, ice, snow, and other slipping hazards;
- Do not load ladders beyond the maximum intended load for which they were built or beyond the manufacturer’s rated capacity;
- Use ladders only for the purpose for which they were designed;
- Use non-self-supporting ladders at an angle such that the ladder is about ¼ of the working length of the ladder (the distance along the ladder between the foot and the top support). The ladder will be leaning at a 75 degree angle to the ground;
- Use wood-job-made ladders with spliced side rails at an angle such that the horizontal distance is 1/8 the working length of the ladder;
- Use fixed ladders at a pitch no greater than 90 degrees from the horizontal, as measured to the back side of the ladder;
- Use ladders only on stable and level surfaces unless secured to prevent accidental displacement;
- Do not use ladders on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement. Slip-resistant feet must not be used as a substitute for care in placing, lashing, or holding a ladder that is used on slippery surfaces, including, but not limited to, flat metal or concrete surfaces that are constructed so they cannot be prevented from becoming slippery;
- Secure ladders placed in any location where they can be displaced by workplace activities or traffic, such as in passageways, doorways, or driveways to prevent accidental displacement and use a barricade to keep the activities or traffic away from the ladder;

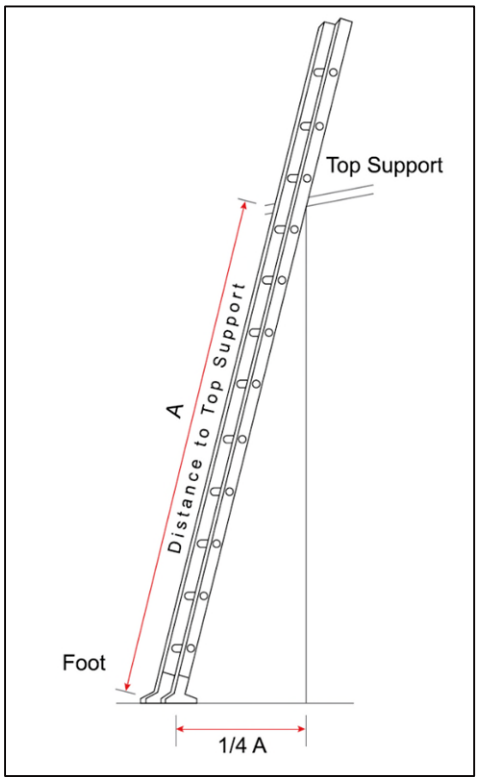


Figure 3 19 Proper extension ladder placement

- Keep the area clear around the top and bottom of ladders;
- Place the top of a non-self-supporting ladder with the two rails supported equally, unless it is equipped with a single-support attachment;
- Do not move, shift, or extend ladders while occupied;
- Do not use the top of the ladder as a step (or the step labelled that it or any step above it should not be used as a step);
- Do not use cross-bracing on the rear section of stepladders for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections;
- Have ladders inspected by a competent person for visible defects daily and after any occurrence that could affect their safe use;
- Immediately mark portable ladders with structural defects (e.g. broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components) in a manner that readily identifies them as defective or tag the defective ladders with “Do Not Use” or similar language and remove them from service;
- Make repairs to restore a tagged out ladder to a condition meeting its original design criteria before the ladder is returned to use. Only the individual that took the ladder out of service can remove the tag to return the ladder to service;
- Do not use single-rail ladders;
- Face the ladder when ascending or descending;
- Use three points of contact when progressing up and/or down the ladder;
- Do not carry any object or load that could cause a loss of balance or a fall from the ladder;
- Wood ladders must be free of splinters, wood decay, or sharp edges;
- All movable parts should move freely and without play;
- Ropes should not be frayed;
- Any slip resistant surface material must be in good condition;
- Do not use metal ladders or ladders with conductive material around exposed or energized electrical equipment. Always know where you and the ladder are in relation to power lines and/or energized equipment and if you are in doubt, get off or do not get on the ladder;
- Ladders must have nonconductive side rails if they are used where the worker or the ladder could contact exposed energized electrical equipment;
- Load limits must be conspicuously marked and legible on the ladder and these load limits cannot be exceeded;
- Only one person is allowed on a ladder at a time;
- Ladders will not be tied/fastened together or used as guys, braces, or skids;

- Ladders must not be placed adjacent to a door unless the door is locked or guarded;
- Ladders must not be placed on top of boxes, barrels, or other unstable/movable objects to add height; Ladders will be placed in position or tied into position to prevent slipping. The footing must be secure and placed on a firm, flat surface; and the top of the ladder must be placed so that the two side rails are supported, and the steps/rungs are level;
- Working from ladders is generally discouraged;
- Where work from ladders is necessary (e.g. changing light bulbs), three (3) points of contact must be maintained;
- Work should not be done on ladders during storms, high winds, or with snow or ice on the rungs/steps; and,
- Check for appropriate fall protection and if required and not available, do not use the equipment.

The Ladder Safety app covers straight/extension and step ladders and is based on ANSI A14 Ladder Safety standards. The app covers inspections, provides checklists and even a tool using your phone's inclinometer to determine if your ladder is set up properly.

General requirements regarding length of various portable ladders include:

- Stepladders will not be more than 20 feet long and will have a spreader or locking device that is intact and working properly;
- Single ladders will be no more than 30 feet long;
- Extension ladders with sliding sections will be no longer than 60 feet with minimal overlaps of:
  - 3 feet for a ladder up to 36 feet;
  - 4 feet for a 36- to 48-foot ladder; and,
  - 5 feet for a 48- to 60-foot ladder;
- Trestle ladders, or extension/base sections of extension trestle ladders, will not exceed 20 feet in length;
- Mason's ladders will not exceed 40 feet in length; and,
- Trolley and side-rolling ladders will not exceed 20 feet in length.

3.36 Signs, Signals, and Barricades

This section describes the proper selection and use of safety signs to increase awareness and ensure proper actions are taken to prevent injury/ illness.

3.36.1 General Requirements

Properly located and clearly understood safety signs provide a reminder to facility/location workers to take proper action or precautions.

The placement of such signs is dependent upon the following:

- Required by law, resulting in mandatory posting; and,
- Where facility/location workers believe that the posting of such signs may assist in the prevention of accidents and injuries.

3.36.2 Sign Selection

In addition to specifically worded signs to serve a particular purpose, there are generally four types of signs:

- Danger Sign/Tags are to be used only where an immediate hazard exists or to tag out defective equipment or equipment in need of repair. Signs and tags should have white background with the word ‘’Danger’’ in white letters on a red oval inside a black rectangular panel at the top of the sign. The specific hazard should be identified in black letters centered below the word “Danger”;

- Caution Sign/Tags are to be used to warn against potential hazards or to caution against unsafe practices. Signs and tags should be a yellow background with the word “Caution” in yellow letters on a black rectangular panel at the top of the sign. The specific hazard should be identified in black letters centerd below the word “Caution”;

- Warning Sign/Tags are to be used to indicate a potentially hazardous situation, capable of resulting in severe, but not irreversible injury. Signs and tags should be a white background with the word “Warning” in black letters on an orange rectangular panel at the top of the sign. The specific hazards should be identified in black letters centerd below the word “Warning”; and,

- Notice or Instructional Signs/Tags are to be used to convey information not necessarily of a safety nature, but often aimed at avoiding confusion and misunderstanding. Signs and tags can be of various colors, but not red, yellow or orange, often blue or green.

3.36.3 Sign Wording

General requirements for sign wording are summarized below:

- Concise and easy to read;
- Contain sufficient information to be easily understood;

- Make a positive, rather than negative, message and be accurate in fact;
- Be presented in English or language understood by all workers. In some cases, signs in additional languages may be necessary.
- Follow certain regulations such as OSHA, which requires specific wording for some signs (e.g., asbestos)

3.36.4 Sign Placement

General requirements for sign placement are presented below:

- Place signs properly so that the intended message is received by workers and visitors;
- Securely affix signs to prevent accidental displacement by weather and normal wear and tear; and,
- Promptly replace illegible or damaged signs.

3.36.5 Training

Training will be provided to aid workers in understanding signs posted at project sites, as summarized below:

- Workers will be trained to understand signs posted in their workplace and job sites; and,
- Such training is not difficult or time consuming and shall be documented. Often such training is accomplished via a safety meeting or as a part of new worker orientation.

3.36.6 Barricades

Barricades will be used at all Arcadis project sites to protect workers, pedestrians or property from hazardous conditions, such as work areas, open pits, excavations, manholes, trenches, dangerous traffic situations, etc.

3.36.7 Traffic Control Signs

All work performed in a roadway or public right-of way (e.g. parking lot) requires the development and implementation of a traffic safety plan (TSP) addressing traffic control devices to be used and work zone traffic control layout. Traffic control signs should be rented from a traffic control service provider. See Section 3.3.4 for more information regarding traffic control and TSPs.

3.37 Utility Location

***NOTE**: This section of the handbook is not meant to replace the requirements of the Arcadis Utility Location and Clearance Health and Safety Standard. The standard must be reviewed, and required actions followed. This section of the handbook is meant as a quick reference only.*

Did You Know? Arcadis Standard ARC HSFS019 “Utility Location Procedures” includes requirements and recommendations for identifying and controlling risk around utilities.

Arcadis encourages and empowers all workers to take all required actions they deem appropriate to comply with the Utility Location and Clearance standard both in project planning and during field site operations. Authority is delegated to everyone on project sites to immediately stop any subsurface investigation work or work in the vicinity of above ground utilities where the worker believes that injury to persons or damage to property could occur. Where necessary, such action should be taken without regard to costs or schedule. Workers will immediately notify their supervisor of any concerns that they have regarding any subsurface work or work in the vicinity of above ground utilities.

Project teams are required to complete the Utilities Clearance Checklist, found on the Arcadis Intranet site under Health and Safety – Content - Forms and Templates prior to undertaking any underground work or any above grade work in the vicinity of overhead utilities.

For all subsurface work, three reliable lines of evidence are required for each utility, at a minimum, for utility clearance. A reliable line of evidence provides sound utility clearance information specific to each area of intrusive work. Also, calling the 811 "DigSafe" state One-Call is required by law. It is a reliable line of evidence when working in the public Right of Way (ROW) or directly adjacent to the ROW..

Additional lines of evidence beyond three (3) may be required based on field conditions and client requirements for subsurface utility locating. The PM or Site Supervisor in cooperation with the subsurface contractor(s) (e.g. driller, excavation contractor, etc.) will determine what additional lines of evidence are required. Additional lines of evidence include, but are not limited to, the following:

- Detailed site utility maps, preferably “As-Built” drawings (drawn to scale);
- Hand auguring or digging;
- Hydro-knife;
- Air-knife;
- Private locates using direct connect or induced current line locating technology;
- Private locates using a radio frequency detector;
- Private locates using a beacon/sonde or tracer wire extended down a pipe or conduit; and,
- Private locates using ground-penetrating radar.

Colors used to identify utilities are referenced in **Table 3-11**.

Table 3 9 APWA Uniform Color Code for Marking Underground Utility Lines

APWA Uniform Color Code for Marking Underground Utility Lines	
Color	**Utility Type**
White	Proposed Excavation
Pink	Temporary Survey Markings
Red	Electric power lines, cables, conduits, and lighting cables
Yellow	Gas, oil, steam, petroleum or gaseous materials
Orange	Communications, alarms or signal lines, cables or conduits
Blue	Potable water
Purple	Reclaimed water, irrigation and slurry lines
Green	Sewers and drain lines

3.37.1 Overhead Electric Utilities

If activities take place in the vicinity of an aboveground utility or guy lines/wires that help support aboveground infrastructure, the utility line should be controlled (e.g. through LO/TO procedures) or protected from being contacted (e.g. covering overhead power lines). **Table 3.12** is used to develop acceptable separation work distances between machinery with high extensions (e.g. backhoes, drilling rig masts, cranes) and overhead power lines.

The distance may be lengthened if directed by the client or the electric company and any specified distances must be strictly followed. Work involving machinery, vehicles, or equipment that may come in contact with aboveground utilities and for which recommended clearances cannot be maintained should not be completed until those utilities are locked out, protected or control processes are in place to avoid contact with those utilities. If an aboveground utility is discovered that has not been previously identified prior to mobilizing to the field, the field staff must notify the PM, who will request the client to assist in identifying the utility and implementing control procedures, as appropriate. In addition, if a utility or subsurface structure is compromised, the field staff must initiate Emergency Action Plan Guidelines. Detailed emergency action procedures should be reviewed with the client and documented in the site-specific HASP prior to initiating work.

Table 3.10 Overhead Utility Line Safe Distances

Overhead Utility Line Safe Distances	
Power Line Voltage Phase to Phase (kV)	**Minimum Safe Clearance (feet)**
50 or below	10
Above 50 to 200	15
Above 200 to 350	20
Above 350 to 500	25
Above 500 to 750	35
Above 750 to 1,000	45

3.37.2 Product Lines and Underground Storage Tanks (all types)

Compromise of a product line or underground storage tank (UST) requires immediate action to mitigate the impact to the environment. For gasoline stations and similar facilities, the following guidelines should be followed during a line or UST breach:

- Immediately shut down equipment and turn off the emergency shutoff switch for the facility dispensers;
- If there are no injuries, attempt to contain any flowing product using absorbent materials and/or by physically pumping or bailing product out of the breached area;
- If product is flowing on the surface away from the break area, attempt to protect downgradient storm drains, sewer drains, and surface-water features from impact by the petroleum product using readily available materials including sorbent pads, sorbent socks, kitty litter, earth, sand, etc.;
- If the bottom of a UST has been breached, immediately contact a vacuum truck to remove product from the affected UST; and,
- Clear the area and arrange for prompt repair.

For industrial sites with lines or USTs containing multiple products with varying hazards, similar guidelines may be followed as above if the material encountered is known and workers have a fundamental understanding of the hazards associated with the material. Upon discovery of a line or UST breach due to work activities at these sites:

- Immediately stop work and notify the client representative or call the client-designated emergency number. For abandoned sites call 911; and,
- If the material is not known, promptly evacuate the area and allow HAZMAT teams to take care of the release.

4 General Field Construction Health & Safety

***NOTE**: For Arcadis work, government requirements for the country where the work is performed are always the minimum standards to follow. Where this handbook specifies more stringent requirements, those requirements must be followed.*

4.1 Elevated Work Surfaces

***NOTE:** This section of the handbook is not meant to replace requirements provided by the Arcadis Aerial Work Platforms Health and Safety Standard (ARC HSFS022). This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis Standard ARC HSFS022.*

4.1.1 Fixed Elevated Work Platforms

Fixed, elevated, work platforms present a fall hazard if the platform contains unguarded edges, floor, or wall openings, or openings for ladders. The best control on elevated work platforms is to eliminate the fall hazard. In most cases, the installation of guardrails is the most feasible and practical control. When guardrails cannot be installed or while they are being installed on a work platform, fall protection, or other protective means must be used to control the fall hazard.

Did You Know? Arcadis Standard ARC HSFS022 “Aerial Work Platforms” includes requirements and recommendations for use when using aerial lifts and other work platforms.

4.1.2 Guardrail Systems

The platform must include a guardrail system around the entire periphery. If the guardrail system is removable or can be lowered, the means used to secure it in the normal operating position shall be readily accessible for inspection and maintenance. The guardrail system must include a top rail around the upper periphery. The height of the top rail above the platform must be 42 inches +/- 3 inches (1.07 meters +/- 0.08 meter). The guardrail must include a mid-rail approximately mid-way between the top rail and the platform surface. Guardrail systems must be capable of withstanding at least 200 pounds of force.

Flexible materials such as cables, chains, and ropes may not be used in the guardrail system; however, they may be used as a mid-rail at access openings of 30 inches (0.76 meter) wide or less. The platform must include toeboards on all sides. The minimum toeboard height is 4 inches. Toeboards may be omitted at the access opening(s).

4.1.3 Self-Propelled Aerial Lift Platforms

***NOTE**: This section of the handbook is not meant to replace requirements provided by the Arcadis standard. This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis standard.*

Self-propelled elevated work platforms pose similar hazards to fixed platforms with the additional characteristic of being power operated with primary functions (including drive controls) located on the platform. These platforms use guardrail systems, including top rail, mid-rail, and toeboards, as the primary engineering control to protect workers from falls.

The platform must include a guardrail system around its periphery. The requirements for these guardrails are the same as those presented for fixed elevated work platforms. All workers on an elevating work platform must be attached to an adequate anchorage point on the elevating work platform by a method of fall protection. Never tie a safety lanyard to an adjacent structure.

Workers operating self-propelled elevated work platforms must be properly trained.

4.1.4 Boom-Supported Elevating Work Platforms

***NOTE**: This section of the handbook is not meant to replace requirements provided by the Arcadis standard. This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis standard.*

Boom-supported elevating work platforms are self-propelled units having a platform that can be positioned completely beyond the base. These platforms are used to position workers, along with their necessary tools and materials at work locations. Primary functions (including drive controls) are located on the platform.

Guardrail systems, inclusive of top rail, mid-rail, and toeboards, are the primary engineering control for the protection of workers from falls while using boom-supported elevating work platforms. All workers on a boom-supported elevating work platform must be attached to an adequate anchorage point on the boom-supported elevating work platform by a method of fall protection. Never tie a safety lanyard to an adjacent structure.

All elevated work will be performed in a safe manner and in compliance with all regulations governing such work and the requirements of the project HASP. All workers exposed to fall hazards will be trained regarding the nature of the hazards of elevated work prior to assignment.

4.1.5 Aerial Lifts

When working on man lifts or elevating platforms, workers must meet the following operating requirements:

- Only trained workers shall operate aerial lifts or elevating platforms (e.g., scissor lifts).
- Manufacturer's operating instructions will be followed, and their rated load limits will not be exceeded.
- When aloft, fall protection systems shall be used. Never tie a safety lanyard to an adjacent structure.

4.2 Scaffolds

NOTE: *This section of the handbook is not meant to replace requirements provided by the Arcadis Scaffolds Health and Safety Standard (ARC HSFS015). This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis standard ARC HSFS015.*

Scaffolding is defined as a temporary platform or structure used to support personnel and materials used in the construction or maintenance industry.

All scaffold systems will be erected under the direction of a competent person qualified in scaffold erection, and should be designed, constructed, and maintained in accordance with the manufacturer's instructions and OSHA sections 1926.451 and 1926.500.

Did You Know? Arcadis Standard ARC HSFS015 "Scaffolds" includes includes requirements and recommendations for use when working on scaffolds.

These systems will be inspected each day prior to work activities and these inspections will be recorded and kept in the project files. Scaffolding systems will:

- Be erected to provide safe access and egress to work areas; provide safe work platforms from which to work, and to protect workers below the platforms. Safe access will include provisions for stairways, ladders, or ramps;
- Include permanently installed access ladders;

- Be made of steel (except platform planks);
- Be constructed so the footing or anchorage for scaffolds are sound, rigid, and capable of carrying the maximum intended load without settling or displacement;
- Be placed on a firm surface that is level and not subject to subsidence:
  - Unstable objects such as blocks will not be used to support scaffolds;
  - Poles, legs, or uprights of scaffolds shall be plumb and securely braced to prevent swaying and displacement;
  - Scaffolds will have a firm, level platform capable of bearing the maximum design load and have both mid- and top rails in place;
- Be capable of supporting, without failure, a minimum of four times the anticipated loads for platforms supported from the ground and six times the expected load for suspended platforms;
- Be maintained so scaffolding is in a safe condition and not altered or moved horizontally while in use or occupied;
- Be immediately repaired or replaced when damaged or weakened and not used until repairs have been completed; and,
- Use a tag line when hoisting materials onto a scaffold;
- Not be used during storms, high winds, or on ice or snow;

Additionally,

- All planking will be supported at each end and secured from movement;
- Bolts, pins, and keepers will be inspected by a supervisor prior to use by any workers; and,
- Wood planking shall be scaffold-rated lumber;
- Tools used on a scaffold should be tethered to prevent them from falling;
- The area around the scaffold should be kept clear of vehicle or pedestrian traffic;
- Tools, materials, and debris from scaffolds/scaffold work will be placed/discarded where they won't become a hazard; and,
- Only treated or protected fiber rope shall be used for or near any wok the use of corrosive substances or chemicals. Wire or fiber rope used for scaffold suspension shall be capable of supporting at least six times the intended load

4.3 Lifts

4.3.1 Workers Basket or Cage (Suspended)

Prior to hoisting workers in a workers basket or cage:

- The workers basket or cage must be certified by a professional engineer. Document the certification and label as such on the guardrail;
- All clevises used to attach cables to the cage will be properly secured;
- The workers basket or cage on the hoist will be suspended using two lines for redundant safety reasons. The first line, which is the main lift line, is attached to the hook assembly. The second line or the safety line must be capable of supporting the full load should the hook assembly fail. This second line must pass over the hoisting block and through the frame to the workers basket or cage;
- Each worker in the workers basket or cage must have a safety harness that is properly fitted and secured to a lanyard with a shock cord. The lanyard must be securely fastened to the anchor point on the workers basket; and,
- At least one tag line (¼- or 3/8-inch nylon rope or equivalent) will be attached to the cage and suspended to a worker below for control of the cage movement. The tag line can be retrieved by workers in the basket if entanglement occurs and relowered to the person controlling the line at ground level.

4.4 Excavation/Trenching

NOTE: *This section of the handbook is not meant to replace requirements provided by the Arcadis Excavation and Trenching Health and Safety Standard (ARC HSCS005). The Excavation and Trenching HSS must be reviewed and followed. This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis Standard ARC HSCS005.*

The following safe operating guidelines apply to open trenches or excavations exceeding 4 feet in depth or of any depth if in unstable soil conditions. An excavation is any cut, cavity, trench, or depression in an earth surface, formed by intentional earth removal; a trench is a narrow excavation (in relation to its length) made below the surface of the ground.

Did You Know? Arcadis Standard ARC HSCS005 “Excavation and Trenching” includes requirements and recommendations for use when completing excavation and trenching activities

4.4.1 Excavation Construction Guidelines

The following minimum requirements must be met before any workers are permitted to enter an excavation:

- Store excavated materials at least 2 feet from the edge of the excavation. (NOTE: This procedure must be observed even when excavation/trench entry will not occur.)
- Before excavation begins, remove, or make safe any trees, boulders, and other surface encumbrances that may create a hazard.
- Take special precautions in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.
- Confirm that, except in hard rock, excavations below the level of the base of the footing of any foundation or retaining wall are not permitted unless the wall is underpinned, and all other precautions have been taken to confirm the stability of the adjacent walls.
- Only use ladders for excavation operations that meet the requirements of 29 CFR 1926 Subpart L.
- All excavations are inspected by a competent person at least daily, or more often as conditions warrant, to confirm that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibrations, or nearby equipment operation has not caused weakening of sides, faces, and flows. The SSO will accompany the competent person and document this inspection in the daily safety log. Use diversion ditches, dikes, or other suitable means to prevent water from entering an excavation and for drainage of the excavation.
- Install stop logs or barricades when mobile equipment is used or allowed adjacent to excavations. The grade will always be away from the excavation.
- Keep dust generation during excavation to a minimum. Use wetting agents at the direction of the SSO.
- Make sure that field personnel do not enter any excavation without specific direction.
- Mark and protect all excavations at all times so that site personnel, visitors, or unauthorized personnel do not enter without permission or fall into the trench.
- Personnel must work in pairs when working around an excavation of 2 feet or more.
- When excavations are subjected to vibrations, additional precautions shall be taken by way of shoring and bracing to prevent slides or cave-ins.

4.4.2 Excavation Entry Requirements

The following requirements must be met before personnel are permitted to enter any excavation:

- Expected hazardous ground movement areas and banks more than 4 feet high (or less if soil is deemed unstable by the competent person) shall be shored, laid back to a stable slope, and shielded (or equivalent).
- Sides of trenches or excavations in unstable or soft material 4 feet or more in depth (or less if soil is deemed unstable by the competent person) shall be shored, sheeted, braced, sloped, or equivalent.
- A trench 4 feet or more in depth (less, if soil is deemed unstable by the qualified person), shall be shored or otherwise supported in hard compact soil, including embankments.

- Materials used for sheeting, sheet piling, bracing, shoring, and underpinning shall be in good, serviceable condition.
- A means of egress (e.g., ladder, ramps, stairways) shall be accessible at any location inside the excavation without requiring more than 25 feet of lateral travel distance.
- When excavations are subjected to vibrations, additional precautions shall be taken by way of shoring and bracing to prevent slides or cave-ins.

4.4.3 Atmosphere and Testing

Before a worker enters an excavation greater than 4 feet deep (or less if soil is deemed unstable by the competent person), the atmosphere must be tested to confirm that an oxygen-deficient or hazardous atmosphere does not exist. If the concentration of any airborne contaminant exceeds one-half its PEL or other applicable occupational exposure limit, the airborne oxygen concentration is less than 19.5 percent or explosivity exceeds 10 percent of the lower explosive limit (LEL), then no workers shall be permitted to enter the excavation until such engineering controls or other hazard controls are instituted to eliminate or control the hazard.

4.4.4 Soil and Waste Management

Whether soils are “live-loaded” to a dump truck, off-road truck or placed in roll-off containers for future pickup, consideration much be given to the final weight of the container. Project teams are expected to work closely with waste hauling providers to determine safe load limits. The weight of a yard of soil depends on the type of soil, its moisture content, and whether it is compacted or loose. Here are some estimates for the weight of a yard of soil:

Dry soil: A cubic yard (0.76 cubic meters) of dry topsoil weighs around 2,100 lb (950 kg) depending on its composition. If it’s dry and sandy, it can weigh around 2,600 lb (1,200 kg) per cubic yard. Clay soil is lighter at around 1,700 lb (770 kg) per cubic yard.

Damp soil: The weight of damp soil varies depending on how much moisture it contains. A yard of topsoil can weigh between 1,400 and 2,000 pounds depending on the type of soil.

Wet soil: Wet dirt weighs more than dry dirt. One yard of wet dirt can weigh about 3,000 pounds or 1.5 tons.

Please note that these are just estimates and the exact weight varies based on the type of soil, how wet it is, and what kinds of debris, rocks, or mulch are present.

4.5 Heavy Equipment

NOTE: This section of the handbook is not meant to replace requirements provided by the Arcadis Heavy and Mechanized Equipment Health and Safety Standard (ARC HSCS006). This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis Standard ARC HSCS006.

4.5.1 General

Field operations that involve heavy equipment represent a significant hazard to ground workers as well as heavy equipment operators. Heavy equipment may cause serious injury or death as a result of rollover, contact with ground workers, contact with utilities and pinch/crush points. All workers working at or visiting a site where heavy equipment operations occur must read and abide by the requirements of Arcadis Standard ARC HSCS006 Heavy and Mechanized Equipment and this section.

Mechanized equipment such as skid steers, trackhoes, bulldozers, and backhoes represent serious hazards to site workers. Personnel must exercise caution when working with mechanized equipment to prevent clothing from being caught in moving parts, placing body parts near pinch points on equipment or using the equipment on slopes or unstable surfaces in excess of the manufacturer's recommendations. Site personnel, visitors, or other persons who are not performing necessary work shall remain at a distance of at least 15 feet from any moving part of the mechanized equipment and all workers within 15 feet of the equipment are required to wear, at a minimum, hard hats, minimum Class II safety vests, safety glasses, safety toe boots, and hearing protection. All heavy equipment shall be equipped with functional back-up alarms.

4.5.2 Inspections

All mechanized equipment will be inspected by the subcontractor (for non-company-owned equipment) and the operator (for Arcadis-operated equipment) prior to use for proper working condition and to confirm that all manufacturer-supplied safety cutoff switches and protective guards are in place. Equipment with deficiencies in these areas will not be used on the project until appropriate repairs are made by a properly trained individual.

All equipment will be inspected daily to confirm the absence of any fluid leaks, absence of damaged hoses or cables, and in general, the absence of any damage that could affect the proper operation of the equipment.

Additional requirements for heavy equipment operation and inspections are presented below:

- Heavy equipment operators must be trained to operate the specific pieces of equipment they will be operating;
- The owner/operator will inspect equipment daily and will maintain daily logs. All discrepancies will be corrected prior to placing the equipment in service;
- Inspections will include but are not limited to: all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, drill controls; and emergency shut off switches;
- Preventive maintenance will be conducted on all equipment according to the manufacturer's recommendations and/or the subcontractor's internal policies, schedules, and equipment maintenance procedures;

- Only designated, qualified persons will operate machinery and mechanized equipment;
- The contractor will maintain records of tests and inspections onsite, will make these records available upon request by the designated authority, and upon request, the records may become part of the official project file;
- Equipment found to be unsafe for operation will immediately be taken out of service and its use prohibited until unsafe conditions have been corrected;
- All equipment that could become contaminated will be kept in the contaminant exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas; and,
- Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse. Spotters should be used when reversing heavy equipment.

4.5.3 Operation of Heavy Mechanized Equipment

All Arcadis workers must be trained and Authorized by an approved Arcadis Sponsor prior to operating heavy equipment. Additionally, equipment-specific approval is required by the Field Supervisor at the project level. Evidence of competency of subcontractor equipment operators should be obtained from the operator's employer and be maintained on-site.

Did You Know? Arcadis Standard ARC HSCS006 "Heavy and Mechanized Equipment" includes requirements and recommendations for use when operating and working around heavy equipment.

4.5.4 Hoisting and Rigging, Cranes, and Derricks

NOTE: *This section of the handbook is not meant to replace the requirements of Arcadis Hoisting and Rigging Health and Safety Standard (ARC HSCS003). The Arcadis Standard ARC HSCS003 and the core competency and training requirements stated in the procedure must be met before work is permitted in and around cranes and derricks.*

A crane is a movable machine used for lifting or moving heavy weights by means of a movable projecting arm or boom. A derrick is a fixed machine used for lifting or moving heavy weights by means of a movable projecting arm or boom. Requirements for crane and derrick operation are provided below:

- Cranes and derricks having ratings that vary with boom length; radius (outreach) and other variables and will have a durable rating chart visible to the operator covering the complete range of the manufacturer's capacity ratings;
- The rating chart will include all operating radii for all permissible boom lengths and jib lengths and optional ratings for optional equipment affecting such ratings. Precautions or warnings specified by the owner or manufacturer will be included along with the chart;
- The crane or derrick will be equipped with a boom angle or radius indicator, visible to the operator, when the rated load varies with the boom radius;
- Lifting devices will be used to hoist material and equipment only. Workers are prohibited from riding hoists except for authorized purposes of inspection and maintenance.
- All equipment will be maintained and operated in accordance with the manufacturer's-specified procedures and limits (e.g. maximum load, height restrictions) without exception;
- Designated persons shall visually inspect each crane or derrick and lifting devices on each day of use for defects or damage. Any defects found must be reported to the Site Supervisor and the device or equipment taken out of service until replaced or repaired by a competent repair person.
- A qualified person shall thoroughly inspect all functional components and accessible structural features of each crane or device at monthly intervals;
- A record of monthly inspections will be maintained for 6 months in or on the crane or derrick;
- A crane or derrick with a known or visible defect that affects its safe operation will not be used;
- A crane or derrick will not be used in a manner that exerts side loading stresses upon the boom;
- Designated workloads will not be increased beyond the manufacturer's ratings or original design limitations;
- Workers will not work or otherwise be located beneath suspended loads to prevent injury resulting from equipment failure. Additionally, workers will use hard hats, safety glasses, a safety vest, safety gloves and safety boots when working in lifting operations;
- The area where the lift or lifts are to be made will be marked with proper warning devices;
- When two or more cranes are used together to hoist a load in unison, a designated person will direct the operation and instruct all workers in positioning, rigging, and movement of the load being lifted;
- During operation, accessible areas within the swing radius of the body of a revolving crane will be physically guarded to prevent a worker from being caught between the body of the crane and any fixed structure or between parts of the crane;
- When possible, electrical distribution and transmission lines at the point of work will be de-energized and provided with visible grounding unless insulating barriers not part of or attached to the crane have been erected to prevent physical contact with the lines;
- When working around live power distribution lines, use the clearance guidelines provided in **Table 3.12**;

- While in transit, with no load on the equipment and the boom lowered, the clearance between the crane and power line at or below 50 kV will be a minimum of 4 feet;
- All material hoists will conform to the most current requirements of ANSI, Safety Requirements for Material Hoists.
- Workers are prohibited from riding material hoists except for authorized purposes of inspection and maintenance.
- Hoistway doors or gates of workers hoists will be at least 6 feet, 6 inches high, and will be protected with mechanical locks that cannot be operated from the landing side and are accessible only to persons on the car;
- Overhead protective coverings on the top of the hoist cage or platform will be provided;
- Prior to placing a hoist into service, functions and safety devices will be tested thoroughly under the supervision of the manufacturer's representative or other similarly qualified person. At frequencies specified by regulation or OSHA regulations, a full inspection and test must be made by the manufacturer's representative or other qualified individual. Keep records of such inspections and tests onsite;
- Rigging (ropes, chains, and cables) equipment must be handled and stored properly so that it is maintained in good condition and to maximize its service life. A competent person is responsible for:
  - Inspecting rigging equipment prior to use;
  - Tagging and reporting defective equipment to the Site Supervisor; and
  - Using and maintaining equipment as outlined in the applicable regulations, manufacturers' instructions, and industry-recognized practices.

Did You Know? Arcadis Standard ARC HSCS003 "Hoisting and Rigging" includes requirements and recommendations for use when hoisting and rigging is required.

4.5.5 Common Safety Measures for Crane Operation

The following common safety measures are required at project sites:

- Crane operators must be licensed and trained in the operation of the specific crane that is to be operated;

- A crane operator must move loads according to the established code of signals and use a signaler. Hand signals are preferred and commonly used;
- Only a qualified person will give signals to the crane operator. **Figure 4-1** references standard hand signals for crane operation;
- Only one person at a time will be designated to give crane signals;
- A crane operator will move loads only on crane signals from one person;
- A crane operator must obey STOP signals no matter who gives it;
- The person giving crane signals must be in clear view of the crane operator;
- The person giving crane signals must have a clear view of the load and the equipment;
- The person giving crane signals must keep persons outside the crane's operating area. Any requests or questions will be addressed to the signaler. The person giving crane signals will never direct a load over a person;
- As a general rule, no part of a crane or load should come within 15 feet of any power line. High voltage power transmission lines may require additional clearances;
- Each crane operator will be held directly responsible for the safe operation of the crane. Whenever there is any doubt as to safety, the crane operator must stop the crane and refuse to handle loads until safety has been assured; and,
- These safety rules will by no means be considered complete for all situations of crane operation

4.6 Powered Industrial Trucks (Forklifts)

NOTE: *This section of the handbook is not meant to replace requirements provided by the Arcadis Powered Industrial Trucks (Forklifts) Health and Safety Standard (ARC HSSP006). This section of the handbook is meant as a quick reference only. Persons using this section of the handbook must first have core competency and training as required by Arcadis Standard ARC HSSP006.*

Only trained and certified drivers are allowed to operate a powered industrial truck. The most common type of powered industrial truck is a forklift. Training must occur before the worker operates the truck as part of his or her workday. The training program must be based on:

- Operator's prior knowledge and skill in operating powered industrial trucks;
- Operator's demonstrated ability to operate a powered industrial truck safely; and,
- Hazards present at the project site.

Training must consist of both classroom-type and practical instruction in proper operation of the specific forklift that will be used, possible hazards encountered during forklift operation and other specific requirements such as operating instructions, engine and motor operation, and vehicle stability.

Did You Know? Arcadis Standard ARC HSSP006 “Powered Industrial Trucks (Forklifts)” includes requirements and recommendations for use when operating a forklift.

4.6.1 Certification

Anyone operating a forklift at an Arcadis office or project site must be adequately trained and be able to produce a Certificate that demonstrates their training. The certification will include the name of the operator, date of training and identity of the trainer (if an outside contractor who conducted the training, the name and address of the trainer will be included). Trained workers should submit their Certificate to HR Operations. The trained operator is responsible for maintaining a copy of their Certificate.

4.6.2 Forklift Operation Requirements for Safety Inspection

Requirements for safety inspections of forklifts include:

- Perform once per day or shift; and,
- Log all defects daily.

Things to check prior to and during use of a forklift:

- Weight of the load and forklift capacity;
- Stability of load;
- Height to which a load must be lifted;
- Obstacles both in the path and overhead where the forklift operator is operating;
- Blind spots;
- Individuals who might share workspace with the forklift operator; and,
- Vertical incline.

4.6.3 Operator Responsibility

Forklift operators have the following responsibilities:

- Safety inspection;
- Driving to pick up a load;
- Load pick-up;
- Driving the load; and,
- Setting down a load

Safety inspections are fundamental to safe operations of a forklift. In addition to knowing the load capacity, operators must be knowledgeable regarding the use of all forklift levers. Operators must be cautious of driving forklifts up or down inclines, whether or not they are carrying a load. Drivers will engage forks completely when picking up a load. Loads will only be lifted to a height that is sufficient to clear stacks and then lowered to a position that gives both maximal stability and clearance of obstacles. Operators must always be aware that they may have to share their space with pedestrians. Therefore, they will always use spotters when driving around blind corners or other areas where visibility is impaired.

4.6.4 Precautions

When operating a forklift, always take the following precautions:

- Be aware of obstacles, both ahead and overhead;
- Move materials only in the designated areas with adequate space; and,
- Do not block individuals into a stack

Forklift operators must always be aware of overhead obstacles. Electrical power lines are the leading cause of death in forklift operations. Confirm that the designated area for load placement is of adequate square footage and that no individuals will be trapped between the load and other obstacles if the load is placed in the designated area. Never place a load where an individual will be trapped.

4.6.5 Loading Docks

The following guidelines for working safely in a loading dock area are not meant to be all-inclusive. Arcadis workers working in a loading dock area will be briefed on safe work practices by the client or other responsible party.

Only properly trained, qualified persons will operate forklifts or any other motorized equipment. Authorization to operate forklifts or other motorized equipment at an Arcadis office or job site must be received from the Site Supervisor prior to initiating operation.

Motorized equipment such as forklifts, pallet movers, and pickers on loading docks must be equipped with reverse-gear audible warning alarms, lights, and horns. Clearly identified aisleways will be present for motorized equipment to move in and for pedestrians to walk in, and mirrors will be located at blind corners. Be aware of the movement of motorized vehicles, never assume that the operator can see you and move out of the way if a horn or back-up alarm sounds. Never stand under or ride on the “forks” of a piece of mechanized equipment such as a forklift or pallet mover, and do not distract the operator.

Verify that wheel chocks are in place to prevent movement of trucks, trailers, flatbeds, and other vehicles. A vehicle or trailer restraint must be used to prevent the trailer from separating from the dock during loading/unloading.

Delivery or receiving truck engines will be shut off during loading/unloading operations.

Dock edges and loading areas must be clearly marked and guarded as appropriate. Stay away from dock edges and loading areas. Do not enter a trailer, flatbed, or other equipment that is being loaded or unloaded. Do not place any part of your body outside the dock door while a vehicle is moving in the vicinity of the dock to avoid a crushing or pinning injury.

Emergency exits must be clearly marked and not blocked. Lighting will be adequate for the environment, time of day, and work being performed. General housekeeping will be conducted, such as having the area free of equipment, tools, and other trip hazards; and floors will be in good repair and dry or marked as a “wet” area. Hearing protection and eye protection will be worn as required by the client or as necessary based on the H&S assessment conducted by the Site Supervisor. Wear appropriate gloves when loading or unloading goods or material. A hard hat and safety vest should also be worn during activities taking place in a loading dock environment.

4.7 Vacuum Truck Operation

Arcadis often provides oversight of vacuum truck operations that include vacuum excavation, chemical or petroleum recovery, transfer of waste material and emergency response. Vacuum truck operations that involve extraction or transfer of flammable liquids must include system grounding to dissipate static electricity generated during the movement of fluid within the hoses. During turbulent movement of fluids within sections of hose and pipe, friction between the liquid surface and the surface of the hose or pipe will create an electrical charge. If the static charge on the surface of the fluid becomes significantly higher than the potential electrical energy on the hose, tank or truck frame, a static spark may result. If the vapor concentration at the point of static discharge is within the flammable range, an explosion will result. Hoses used to transfer flammable liquids must be rated for this task. There are multiple hose types designed for this application. Additionally, the hoses must be checked before use to ensure wiring designed within the hose structure is intact, thus capable of dissipating electricity.

The frame of the vacuum truck must be adequately grounded by connecting it to an installed ground rod or to a secondary ground, such as a water spigot. Vacuum trucks may not utilize the ground rod connected to an electric panel or other source of errant electricity. The preferred safety device available for vacuum trucks is a Mobile Ground Verification System. This device takes the guess work out of determining if the vacuum truck and overall system is adequately grounded. This device is not required if the vacuum truck operation does not involve the transfer of flammable liquids.

Figure 4-2 Vacuum Truck

Vacuum trucks that do not have automatic vacuum relief may implode if the vacuum is exceeds the operating limits of the vessel.

Vacuum tank implosion is also a concern. Each vacuum truck must have the ability to release vacuum either manually or with an automatic vacuum release. Excessive vacuum within the tank may result in a catastrophic failure of the tank itself. To prevent his from occurring, Arcadis personnel must ensure the following conditions are met:

- Verify the equipment operating limits are known prior to using the equipment.
- Confirm equipment inspections are completed.
- Confirm operator's proficiency with the equipment prior to use.
- Confirm emergency controls are present and working prior to operating.

Determine if truck exhaust and/or blower will be a discharge concern for surrounding personnel and/or structures. When possible, position truck exhaust downwind of workers. An exhaust filter may be required depending upon the nature and concentration of the exhaust as well as state or local ordinances.

Keep non-essential personnel away from the vacuum truck operation. The pumps utilized on vacuum trucks are typically very loud. If noise levels exceed 105 decibels for any amount of time, Arcadis employees are directed to wear "dual" hearing protection, consisting of earplugs along with earmuffs. Based on current OSHA policy, the wearing of earmuffs over ear plugs will boost the overall attenuation of the earplugs by 5 decibels.

There is a potential for extracted material to be accidentally released to the environment. Hoses should not be disconnected until they are air flushed to remove residual solids or liquids remaining within the hose. Additionally, all valves must be inspected to ensure they will not leak during operation or when the vacuum has been turned

off. Spill kits appropriate for the work activity and potential impact to the environment must be readily available during vacuum truck operation.

4.8 Concrete and Masonry – General Requirements

4.8.1 Construction Loads

No construction loads will be placed on a concrete structure or portion of a concrete structure unless a qualified person determines, based on information received from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the loads.

4.8.2 Reinforcing Steel

All protruding reinforcing steel, onto and into which workers could fall, will be guarded to eliminate the hazard of impalement.

4.8.3 Post-Tensioning Operations

No worker (except those essential to the post-tensioning operations) will be permitted to be behind the jack during tensioning operations. Signs and barriers will be erected to limit worker access to the post-tensioning area during tensioning operations.

4.8.4 Riding in Concrete Buckets

No worker will be permitted to ride in, or on, concrete buckets.

4.8.5 Working Under Loads

No worker will be permitted to work under concrete buckets while buckets are being elevated or lowered into position. To the extent practical, elevated concrete buckets will be routed so that no worker, or the fewest number of workers, is exposed to the hazards associated with falling concrete buckets.

4.8.6 Personal Protective Equipment

No worker will be permitted to apply a cement, sand, and water mixture through a pneumatic hose unless the worker is wearing protective head and face equipment, and masonry work gloves.

4.8.7 Health Effects

Cement can cause ill health by skin contact, eye contact, or inhalation. Risk of injury depends on duration and level of exposure and individual sensitivity.

Hazardous materials in wet concrete and mortar include:

- Alkaline compounds such as lime (calcium oxide) that are corrosive to human tissue;
- Trace amounts of crystalline silica, which is abrasive to the skin and can damage lungs; and,
- Trace amounts of chromium that can cause allergic reactions.

Did You Know? Arcadis Standard ARC HSIH012 “Respirable Crystalline Silica” includes requirements and recommendations for use when completing activities that generate breathable silica-containing dusts.

4.8.8 Skin Contact

The hazards of wet concrete are due to its caustic, abrasive, and drying properties. Wet concrete contacting the skin for a short period and then thoroughly washed off causes little irritation. But continuous contact between skin and wet concrete allows alkaline compounds to penetrate and burn the skin. When wet concrete or mortar is trapped against the skin, for instance, by falling inside a worker’s boots or gloves or by soaking through protective clothing, the result may be first-, second-, or third-degree burns or skin ulcers. These injuries can take several months to heal and may involve hospitalization and skin grafts.

4.8.9 Waste Management

Drums may not be utilized to mix concrete or store wet grout as liquid-separated material may become corrosive over time. This may lead to drum degradation and leaking, while also rendering the drum a classified hazardous waste material due to elevated pH levels.

4.9 Demolition

Equipment dismantlement and building demolition activities involve a potential for exposure to many physical and health hazards. In addition to equipment dismantlement and removal activities, construction and installation of temporary facilities, and selective demolition of building components may be conducted.

4.9.1 Hazards

Hazards may be associated with materials or equipment used in demolition, or the dismantlement and removal activities themselves. Arcadis requires subcontractors to address all physical and health hazards presented by the dismantlement, removal, demolition, and construction activities (hereafter collectively known as construction activities) in accordance with 29 CFR 1926. Subcontractors may use their company's standard safe operating procedures for construction activities as long as they meet the minimum requirements of this handbook and 29 CFR 1926.

Physical hazards involved with demolition activities relate to the work conducted with heavy equipment, hand and power tools, and the demolition environment itself. During demolition-related activities, the potential exists for incidents involving workers being struck by or against equipment or materials, which may result in fractures, lacerations, punctures, and abrasions. Walking and working surfaces during demolition activities may present slip, trip, or fall hazards. Slippery surfaces can increase the likelihood of slips and falls in addition to back and overexertion injuries. "Hot work" activities, such as cutting and welding, may present the risk of fire or an explosion hazard. Overhead hazards such as electrical conduit or process piping also present hazards.

Demolition activities pose the potential for workers being struck by debris and objects associated with the demolition activities and the equipment being used. Improper planning and procedures may place workers in unsafe situations that may result in body strains, serious injury or death.

Operations on elevated surfaces (e.g., roofs, catwalks, mezzanines) may expose workers to falls if they are not using the proper fall protection system. Work from ladders, scaffolding, and aerial lifts also exposes workers to fall hazards and injuries if the equipment is used improperly or workers are not trained in the equipment's safe use.

Electricity may pose a hazard to workers during the use of portable electrical equipment and lead cords, or when demolishing walls containing live electrical circuits. Sources of energy that are not locked out and/or tagged out expose workers to various forms of energy (e.g., electrical, mechanical, high pressure) that could be hazardous while performing demolition tasks. Additionally, workers installing temporary and permanent wiring are exposed to electrical hazards if proper precautions and procedures are not followed or inexperienced or unqualified workers conduct the work.

Improper operation of heavy equipment (e.g. forklifts, front end loaders, aerial lifts, cranes) may result in workers being struck by the equipment or by the loads being handled, resulting in contusions, fractures, lacerations, and even death. Workers may be injured, and equipment damaged, if it is not used for the purpose intended, is overloaded or is used improperly by inexperienced or unauthorized individuals. Loads being lifted by cranes may shift, causing them to fall and strike workers, causing serious injury or death.

Due to the type of work involved in many demolition activities, the primary health hazards involve repetitive motion injuries, and lifting strains and other ergonomic disorders. Noise may also present a hazard to workers exposed to high noise levels. Operation of heavy equipment, power tools, pneumatic tools, and powder-actuated tools often result in high noise levels. Exposure to construction materials that may release harmful dusts during demolition are also possible (e.g. lead, asbestos, mercury, silica containing concrete and brick). Workers may be exposed to hazardous or toxic vapors created during hot work activities.

4.9.2 Hazard Control – General

Prior to initiating any field activity, site conditions will be discussed with all workers (including subcontractors). Hazards will be identified, and protective measures will be explained. Equipment will be inspected prior to use and will be in proper working condition. Workers will receive training in the use and care of the equipment they will be expected to operate. Tasks will be scheduled in a manner that reduces the likelihood of performing a repetitive task for prolonged periods. Proper lifting techniques will be employed, and mechanical means will be used for lifting heavy objects.

4.9.3 Demolition Safety

Prior to permitting workers to start demolition activities, an “engineering survey” of the structure will be made by a competent person to determine the condition of the framing, floors, walls, and the possibility of an unplanned collapse of any portion of the structure. Any adjacent structure that could be affected by an unplanned collapse and where workers or the public may be exposed will also be similarly checked.

When workers are required to work within a structure that has been damaged by fire, flood, explosion, or other cause, the walls and floor shall be braced or shored as necessary. All electric, gas, water, steam, sewer, and other service lines shall be shut off, capped, or otherwise controlled outside the building before demolition work is started. In each case, any utility company that is involved shall be notified in advance.

If it is necessary to maintain any power, water, or other utilities during demolition, such lines shall be temporarily relocated as necessary and protected. It shall also be determined if any type of hazardous chemicals, gases, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment onsite. When the presence of any such substance is apparent or suspected, testing and purging shall be performed, and the hazard eliminated before demolition is initiated. Where a hazard exists from broken glass, such hazards shall be removed.

Where a hazard exists to workers from falling through floor openings, the openings shall be protected to a height of 42 inches. When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades that are not less than 42 inches high and not be less than 6 feet back from the edge of the opening above. Signs, warning of the hazard of falling materials, will

be posted at the lower (and ground) level. Removal shall not be allowed in this lower level until debris handling ceases above. Whenever materials are dropped more than 20 feet to any point lying outside the exterior walls of the building, an enclosed chute of wood, or equivalent material, shall be used.

4.9.4 Mechanical Demolition

Workers are not permitted in any area that can be adversely affected by mechanical demolition operations. Only those workers necessary for the performance of operations will be permitted in the area. The area should be barricaded as necessary to prevent unauthorized workers or anyone not associated with the demolition operation from entering the area.

When removing walls or portions thereof, all steel items affected shall be cut prior to wall removal. All roof cornices or other ornamental stonework shall be removed prior to removing the walls.

During demolition, a competent person shall continue to inspect the work progress to detect hazards resulting from the weakened or deteriorated floors, walls, or loosened material. No worker shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

Before the start of every demolition job, Arcadis will take several steps to safeguard the H&S of workers onsite. These preparatory operations involve overall planning of the demolition job, including methods to be used to bring the structure down, equipment necessary to do the job, and measures to be taken to perform the work safely. Planning for a demolition job is as important as actually doing the work. Therefore, a competent person experienced in all phases of the demolition work to be performed should lead all demolition planning work.

4.9.5 Engineering Survey

Prior to starting all demolition operations, an engineering survey of the structure should be undertaken. This survey will be conducted to determine the condition of the framing, floors, and walls so that measures can be taken, if necessary, to prevent the premature collapse of any portion of the structure. When the engineering survey identifies the need, any adjacent structure(s) or improvements that could be adversely affected during the demolition will also be similarly surveyed. Arcadis will maintain a written copy of this survey. Existing damage in neighboring structures which is present prior to the start of demolition will be photographed by the engineer conducting the survey.

The engineering survey provides Arcadis with the opportunity to evaluate the job in its entirety. Arcadis will plan for the demolition of the structure, the equipment to do the work, manpower requirements, and protection of the public. The safety of all workers onsite will be a prime consideration. While preparing the engineering survey, Arcadis will plan for potential hazards such as fires, cave-ins, and injuries. If the structure to be demolished has been damaged by fire, flood, explosion, or other cause, appropriate measures, including bracing and shoring of

walls and floors, will be taken to protect workers and any adjacent structures. A designated substance survey must be completed prior to the start of demolition to determine if any type of hazardous building materials, chemicals, gases, explosives, flammable materials, or similar dangerous substances are present on-site. If the nature of a substance cannot be easily determined, samples shall be taken and analyzed by a qualified person prior to demolition.

4.9.6 Utility Location

One of the most important elements of the pre-job planning is determining the locations of all above ground and underground utility services. All electric, gas, water, steam, sewer, and other service lines must be shut off, capped, or otherwise controlled, at or outside the building before demolition work is started. In each case, any utility company that is involved must be notified in advance, and its approval or services required to disconnect the utility must be obtained.

If it is necessary to maintain any power, water, or other utilities during demolition, such lines should be temporarily relocated as necessary and/or protected. The location of all overhead power sources should also be determined, because they can prove especially hazardous during any machine demolition. All workers must be informed of the location of any existing or relocated utility service. The telephone numbers of local police, ambulance, and fire departments must be available onsite. This information can prove useful to the Site Supervisor in the event of any emergency.

4.9.7 Medical Services and First Aid

Prior to starting work, provisions will be made for prompt medical attention in case of serious injury. The nearest hospital, infirmary, clinic, or physician must be located as part of project planning and HASP development. The Site Supervisor will provide with instructions for the most direct route to these facilities. Proper equipment for prompt transportation of an injured worker, as well as a communication system to contact any necessary ambulance service must be available onsite. The telephone numbers of hospitals, physicians, and ambulances will be conspicuously posted.

A properly stocked first-aid kit that meets regulatory requirements will be available on-site. The first-aid kit will contain approved supplies in a weatherproof container with individual sealed packages for each item. It will also include rubber gloves to prevent the transfer of infectious diseases. Provisions will also be made to provide for quick drenching or flushing of the eyes. Eye flushing will be done with clean water or saline eyewash solution. The contents of the kit should be checked before being sent out on each job and at least weekly to replace expended items.

4.10 Blasting and Explosives

***NOTE**: Blasting operations should be conducted under the direct control of authorized persons only,* subcontracted by Arcadis. Arcadis workers are not permitted to use explosives, regardless of their training and experience.

All subcontractors must adhere to this section. The transportation, handling, storage and use of explosives are subject to provisions of ANSI A10.7 - Safety Requirements for Transportation, Storage, Handling, and Use of Commercial Explosives and Blasting Agents; 29 CFR 1910.109 - Explosives and Blasting Agents; 29 CFR 1926, Subpart U - Blasting and the Use of Explosives (1926.900 to 1926.914); and 27 CFR Part 55 - Commerce in Explosives.

A blasting supervisor must be designated to direct and supervise all blasting operations. This includes the transportation, handling, storage, and use of explosives and blasting agents. The supervisor must provide written records of past experience to the appropriate person as evidence of competency.
It should be noted, that many provinces, territories, and municipalities have a range of legislation, regulations and by-laws that relate to the use of explosives within their respective jurisdictions. If blasting is to be a component of Arcadis field activities, involve Arcadis H&S early in the planning stages of the work.

4.11 Welding and Cutting

Welding and cutting is an activity that requires extreme caution and proper procedures, as described below:

- Welding, cutting, burning, and heating operations have a high potential for personal injuries and fires. Take precautions to ensure a safe work environment;
- The Site Supervisor will issue a Hot Work Permit prior to the start of welding/cutting activities;
- Workers will be instructed in the safe use of welding equipment. Workers who have not received instructions will not be allowed to use the equipment;
- Proper precautions (e.g. isolating welding and cutting, removing fire hazards from the work area, providing a fire watch, etc.) for fire prevention will be taken in areas where welding or other hot work is being conducted. If the necessary safeguards cannot be implemented (e.g. flammable painted surfaces are present, the presence of other flammable compounds or heavy dust concentrations creates a fire hazard), no welding, cutting, or heating will be undertaken. Suitable fire extinguishing equipment must be available at all locations where hot work is to be undertaken;

- Arc welding and cutting operations must be shielded by noncombustible or flameproof shields, barriers, or screens (i.e. welders mask or goggles) to protect workers from direct arc rays;
- When burning or welding, employees will wear approved eye protection with suitable filter lenses. Appropriate eye protection may also be required for other personnel in the area. See Table 4-1. If employees' eyes are exposed to flying objects from chipping slag or other weld-cleaning activity, employees must wear approved eye protection that includes side shields.
- When electrode holders must be left unattended, the electrodes will be removed, and the holder placed or protected so they cannot make electrical contact with workers or conducting objects;
- All arc welding and cutting cables must be completely insulated and be capable of handling the maximum current requirements for the job. There will be no repairs or splices within 10 feet of the electrode holder, except where splices are insulated equal to the insulation of the cable. Defective cables will be repaired or replaced;
- Fuel gas and oxygen hoses will be easily distinguishable and will not be interchangeable. Hoses will be inspected at the beginning of each shift and will be repaired or replaced if necessary;
- No welding or burning is allowed in a hazardous area (e.g. locations where combustible/flammable materials exist);
- Burning or welding equipment will be maintained in a safe operating condition;
- All welding leads and burning hoses will be kept off floors, walkways, and stairways and appropriately protected;
- Barrels, tanks, piping, or other systems that may have contained either combustible or unknown products will not be welded or burned without first properly purging and venting the container and obtaining approval from the appropriate supervisor;

Table 4-1 Welding Lens Shade List

Welding Operation	Arc Current (Amperes)	OSHA Minimum Protective Shade Number	ANSI & AWS Shade Number Recommendations*
Shielded metal-arc welding – 1/16-, 3/32-, 1/8-, 5/32" electrodes			
Electrode Size (inch): <3/32	<60	7	-
Electrode Size (inch): 3/32-5/32	60-160	8	10
Electrode Size (inch): <3/32	>160-250	10	12
Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW)	<60 60-160 >160-250 >250-500	7 10 10 10	- 11 12 14
Gas Tungsten Arc Welding (GTAW)	<50 50-150 >150-500	8 8 10	10 12 14
Air Carbon Arc Cutting (CAC-A) (Light)	<500	10	12
Air Carbon Arc Cutting (CAC-A) (Heavy)	500-1,000	11	14
Plasma Arc Welding (PAW)	<20 20-100 >100-400 >400-800	6 8 10 11	6-8 10 12 14
Plasma Arc Cutting (PAC) (Light)**	<300	8	9
Plasma Arc Cutting (PAC) (Medium)**	300-400	9	12
Plasma Arc Cutting (PAC) (Heavy)**	>400-800	10	14
Torch Brazing (TB)		3	3 or 4
Torch Soldering (TS)		2	2
Carbon Arc Welding (CAW)		14	14

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then, go to a lighter shade which gives a sufficient view of the weld zone without going below the minimum. During oxygen gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light (spectrum) of the operation.

** Values apply where the actual arc is clearly seen. Lighter filters may be used when the arc is hidden by the workpiece.

Welding Operation	Plat Thickness (Inches)	OSHA Minimum Protective Shade Number	ANSI & AWS Shade Number Recommendations*
Gas Welding	<1/8	4	5
	¼ to ½	5	6
	<1/2	6	8
Oxygen Cutting	<1	3	4
	1 to 6	4	5
	>6	5	6

NOTE: When welding or oxygen cutting produces a bright yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.

4.12 Temporary Working Surfaces and Railings

Hazards from floor and wall openings, careless movements, protruding objects, debris, spills, and placement of materials on paths or foot traffic areas present the potential for slips, trips, and falls. If any such hazards are identified, correct them immediately. If that is not possible, report the hazard to your Site Supervisor or project manager as soon as possible.

4.12.1 Floor and Wall Openings

The Site Supervisor will identify all ground, floor and/or wall opening hazards and ensure that guarding is in place. The Site Supervisor will convey to workers the location of the openings and what guarding must be in place at the opening(s). If guarding is not in place, the Site Supervisor will:

- Not allow work to continue in the vicinity of the opening until the appropriate guarding is in place; and,
- Notify the PM and the client when guarding has been installed.

If Arcadis is responsible for floor and/or wall openings, the openings will be guarded in accordance with CFR 1926.1910.23 and 1926.502.

4.12.2 Other Slip, Trip, and Fall Hazards

Workers must stay alert at all times and, if tired or distracted, take this into account when working at the site. Take the following precautions to minimize the possibility of injury:

- Wear safety toe boots with oil-resistant soles as required according to ANSI Z-41.1-1999.
- Do not walk up or down steep embankments or hills if possible. If not possible, walk at an angle when going up and/or down embankments and hills;

- Do not carry items that block your vision;
- Use handrails or grips when available and maintain three-point contact whenever possible;
- Do not jump down from equipment; look down before you step down;
- Use appropriate fall protection when working at elevation;
- Report any floor openings that are not clearly marked and/or guarded to the Site Supervisor or PM;
- Do not use ladders or scaffolds during high winds or when ice or snow is on the rungs or the work surface;
- Do not use ladder substitutes (e.g. box or truck tailgate) and do not use ladders or scaffolding that are not in good condition;
- Keep paths and work areas clear (e.g. tools, equipment, boxes, cords).
- Secure items that must cross floors or aisles (e.g. cords, wires) to minimize trip and fall hazards;
- If a protruding object cannot be moved, make sure the object can be easily seen. Guard/pad the object if possible; and,
- Use ancillary lighting such as flashlights and headband lights when necessary.

4.12.3 Walkways and Steps

Stairways and walkways must be kept free of debris and tripping hazards, as well as snow and ice. Use anti-slip material if required. Keep handrails clean and free of splinters or burrs. Avoid carrying tools or materials in a way that prevents the free use of hands while going up or down stairways or ladders; use handrails.

OSHA defines ladders, steps, stairs, and ramps based on riser angle:

- 90 degrees to 60 degrees: ladders
- 70 degrees to 50 degrees: alternating tread type stairs
- 70 degrees to 50 degrees: ship stairs
- 50 degrees to 30 degrees: standard stairs
- 30 degrees to 0 degrees: ramps

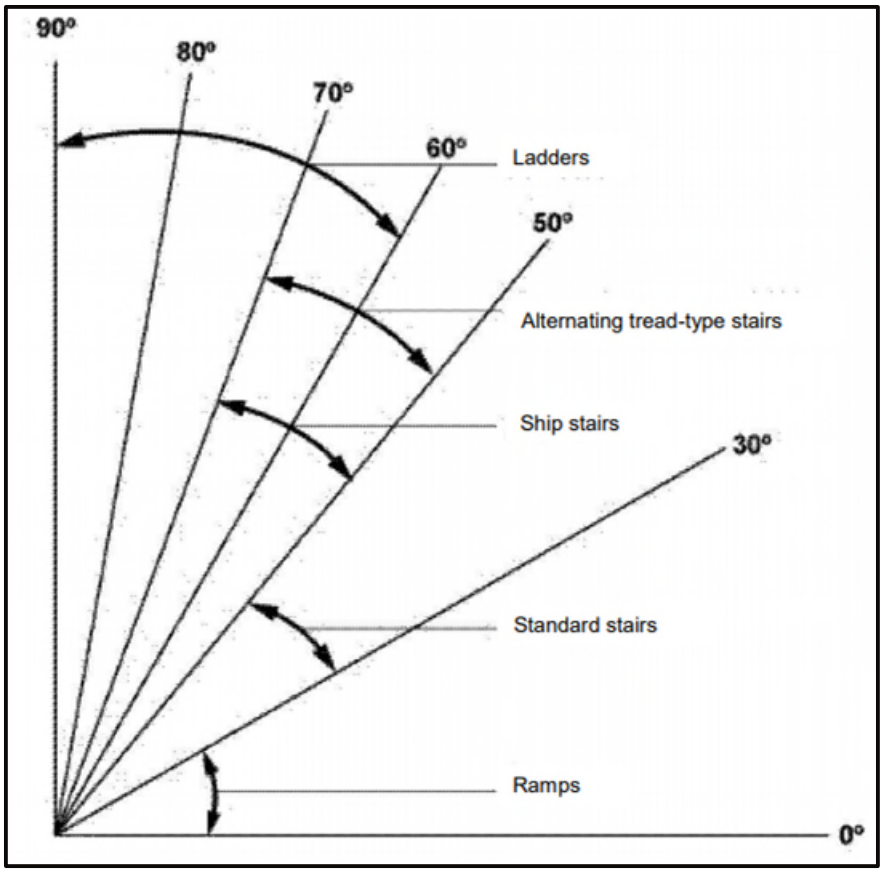


Figure 4-3 Riser Angles per OSHA

At construction sites, temporary stairs are often constructed for access to office trailers, sheds, remediation systems, etc. The stairs must be constructed with an angle of 30-50 degrees from horizonal. Variations in riser height or tread depth may not be over 1/4-inch (0.6 cm) in any stairway system. Stairways having four or more risers or rising more than 30 inches (76 cm), whichever is less, shall be equipped with at least one handrail; and one stair rail system along each unprotected side or edge.

4.13 Underground Construction (Work Conducted in Tunnels or Shafts)

4.13.1 Check In/Check Out

The Site Supervisor or other designated person specified by the Site Supervisor shall maintain a check-in/check-out procedure that determines an accurate count of workers working in a tunnel or shaft. The Site Supervisor or the designated person shall remain above ground and onsite anytime anyone is working in a tunnel or shaft.

4.13.2 Air Monitoring

A competent person will perform air monitoring activities related to tunnel and shaft work. Air monitoring will be performed prior to entry into the tunnel and shafts, and as often as necessary as determined by the competent person.

Oxygen testing of the underground atmosphere will be conducted prior to any other air measurements. The atmosphere in all underground areas will also be tested quantitatively for carbon monoxide, nitrogen dioxide, hydrogen sulfide and/or other toxic gases, dusts, vapors, mists, and fumes, which may be present based on the specific hazard(s) associated with the tunnel or shaft and the results compared to the prescribed limits of each contaminant to ensure these are not exceeded. Quantitative tests for methane and other flammable gases should be performed to verify the absence of these gases, and if present, to determine if underground activities should be classified as “potentially gassy” or “gassy” depending upon the following criteria:

- A potentially gassy operation exists when air monitoring shows, for more than 24 hours, 10 percent or more of the lower explosive limit (LEL) for methane or other flammable gases measured at 12 inches from the roof, floor, or walls in any part of the tunnel or shaft; and,
- A gassy operation exists when air monitoring shows, for 3 consecutive days, 10 percent or more of the LEL for methane or other flammable gases measured at 12 inches from the roof, floor, or walls in any part of the tunnel or shaft.

If potentially gassy or gassy conditions exist, the competent person shall implement more restrictive operating requirements including, but not limited to, more stringent ventilation requirements, use of specialized equipment designed for these types of conditions, smoking restrictions, collection of personal ignition sources, use of fire watches, and posting of warning signs at entrances. The competent person shall keep records of all air monitoring measurements.

If 10 percent or more of the lower explosive limit for methane or other flammable gases is detected in any underground work area or in the air return, all workers must be evacuated to a safe location above ground (except those workers required to eliminate the hazard). Electrical power (except for acceptable pumping and ventilation equipment) must be cut off to the area until concentrations reach less than 10 percent of the lower explosive limit.

4.13.3 Ventilation

Tunnel and shaft work areas shall be ventilated either by natural means, use of ventilation equipment or through a combined use of natural and forced ventilation. Fresh air shall be supplied in sufficient amounts to prevent the accumulation of toxic or flammable gases, mists, fumes, vapors, or dusts. A minimum of 200 cubic feet of fresh air shall be supplied to each worker in the tunnel or shaft continuously. If work activities generate dusts, fumes, or vapors in harmful amounts, the velocity of the airflow shall be at least 30 feet per minute.

4.14 Steel Erection

Each worker engaged in steel erection activities that involve walking and/or working on a surface with an unprotected side or edge more than 6 feet above a lower level must be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems. Connectors (e.g. workers assembling steel girders) more than 6 feet above a lower level shall be protected with a personal fall arrest system, positioning device system or fall restraint, or be provided with other means of protection from fall hazards. (Arcadis staff must be approved by Arcadis H&S to do this type of work);

- Training will be provided for all workers exposed to fall hazards. Special training will be provided to connectors, workers in controlled decking zones, and those rigging for multiple lifts;
- Steel erection may begin only when written notification that the concrete in the footings, piers, and walls or the mortar in the masonry piers and walls has attained the strength to support the loads that will be imposed during steel erection;
- Columns will be anchored using a minimum of four anchor bolts;
- Solid web structural members will be secured with at least two bolts per connection before being released from the hoisting line;
- Open web joists must be field bolted at each end of the bottom chord before being released from the hoisting line;
- Decking shall be laid tightly and secured; and,
- Controlled decking zones will be clearly marked; only those workers engaged in leading edge work (the unprotected side of a floor, decking, or the walking/working surface) are permitted to work in the area.

A competent person will inspect cranes used in steel erection prior to each shift. Plan routes for suspended loads so no worker is required to work directly under the load, except for connecting, hooking, or unhooking. Use hooks with self-closing latches. All loads shall be rigged by a qualified rigger. Lifts shall hoist a maximum of five members.

4.15 Rollover and Overhead Protection

Rollover protective structures (ROPSs) are required for the following equipment: rubber-tired vibratory compactors, self-propelled scrapers, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type loaders, and motor graders (with or without attachments), which are used by Arcadis or Arcadis subcontractors. The ROPSs will be designed and built for the equipment by the equipment manufacturer or designed specifically for the equipment by a qualified engineer.

4.16 Hot Work

Hot work is any type of work that may produce uncontrollable sources of ignition. Hot work may include drilling, grinding, cutting, welding, or brazing operations that are conducted outside a controlled environment. Hot work permits are required to be issued anytime hot work is performed in areas where combustible hazards may exist. The Arcadis Hot Work Health and Safety Standard (ARC HSCS013) establishes the criteria for and proper method of obtaining and working under hot work permits.

In general, the permit to work procedure defines acceptable conditions under which hot work may be performed and the processes to be followed while conducting hot work operations. Under no circumstances will hot work proceed if the conditions set forth in the Hot Work Standard cannot be met.

Hot work will never take place in the presence of explosive atmospheres, or in atmospheres inside or around unclean or improperly prepared tanks that are or may become explosive, or in areas near the storage of large quantities of exposed, readily ignitable materials.

General precautions to take when conducting hot work are provided below:

- Verify that fire protection systems and equipment in the hot work area are in working condition;
- Be trained in the use of fire protection equipment;
- Clean area of all debris;
- Know all potential hazards of the system or equipment you are working on before you start;
- Eliminate or control all potential hazards of the system or equipment you are working on before you start;
- Prepare the hot work area through maximum use of engineering controls before you start;
- Use proper clothing, tools, and PPE for the job; and,
- Confine hot work to the permitted area.

Did You Know? Arcadis Standard ARC HSCS013 “Hot Work” includes requirements and recommendations for use when completing hot work activities.

5 Specific Project Sites, Hazards, and Activities

5.1 Chartering and Use of Aircraft (Fixed-Wing and Rotary)

The following information is designed to help charter an airplane or helicopter and provide guidance on selecting a safe, suitable, country-specific Civil Aviation Authority (CAA) certified air taxi operator. Selecting an air taxi operator is not difficult and does not require a vast knowledge of the air taxi industry or the CAA.

This section presents some general questions you should ask an air taxi operator prior to arranging for a flight. Table 5-1 describes different types of aircraft, passenger seating capacity, and some of the comfort items you may expect on the aircraft. Some of the applicable regulations that operators must meet are also discussed.

5.1.1 Selecting an Air Carrier

Any air taxi operator that offers services to the public must by law be certified by the CAA and meet stringent operational, maintenance, and safety rules. In addition, pilots must be specifically qualified.

The regulations for air taxis provide for a high level of safety and control. They address flight operations, maintenance requirements, and crew member training and testing. The CAA also addresses crew rest, physical examinations, and mandates a stringent anti-drug program for operators. The CAA closely monitors air taxi operators to make e sure they conform to established standards of performance. The safety of Arcadis employees depends on flying with a legally certified air taxi operator.

Asking a few basic questions of the air taxi operator will help be certain you are dealing with a CAA-Certificated Air Carrier (official name for an air taxi operator), and that the operator is authorized to provide the type and kind of service you require. The following questions may be helpful before arranging a flight:

1. Do you hold a current CAA Air Carrier Operating certificate?

_____ Yes _____ No

2. What is the name of the company as it appears on the certificate?

_____

_____

3. What is the certificate number?

_____

_____

4. What is the name and telephone number of the CAA Flight Standards District Office and who is the CAA Principal Operations Inspector overseeing your operation?

_____

_____

5. (For international trips) Is your company authorized by the CAA to conduct international operations to_____?

_____

_____

If the air taxi operator is unwilling or reluctant to provide answers to the above questions or does not want you to contact the CAA for verification of his or her Air Carrier Operating Certificate, you would be wise to consider another operator to fill your travel requirements.

Table 5-1 Aircraft Guidance Comparison

Aircraft	Single-Engine Airplane	Multi-Engine Airplane	Multi-Engine Turbo Prop Airplane	Multi-Engine Jet Airplane	Single- and Multi-Engine Helicopter
Passengers	1 to 9	1 to 9	1 to 30	1 to 30	1 to 12
Crew Requirements	1 pilot	1 pilot, 2 if requested	1 or 2, depending on aircraft requirements	2 pilots, flight attendant over 19 seats	1 pilot
Speed	115-200 mph	170-230 mph	200-300 mph	350-580 mph	120-160 mph
Food/Beverage	Catering, if requested	Catering, if requested	Catering, if requested	Catering, if requested, many have ovens on board	Catering, if requested
Comfort Items	May have A/C, reading lights, and tray tables	Most have A/C, reading lights, and tray tables, reclining seats, and club seating	In addition, may have stereo and inflight telephone	Features are similar to an airliner	Many have A/C, stereo, in-flight telephone, reading lights, and tray tables
Lavatories	No	Mostly no	Mostly yes	Yes	No
Pressurization	Mostly no	Mostly no	Almost all	All	None

5.1.2 Selecting the Right Aircraft

When making inquiries with Air Carriers, the operator will likely ask for the following information:

- Number of passengers;

- Amount of baggage;
- Time constraints; and,
- Your itinerary.

Also, tell the Air Carrier your passengers' preferred departure and ultimate destination locations so the most convenient airports and/or plane type can be selected.

Like everything, there are trade-offs between cost, aircraft speed, seating capacity, amenities, and weather capabilities. The Air Carrier is your best source of information for choosing an aircraft. Unless you have a specific preference, let the Air Carrier recommend the aircraft that is best suited to your needs.

5.1.3 Pressurized vs. Unpressurized Aircraft

Many Air Carriers use aircraft that are unpressurized. Cabin pressurization refers to an aircraft's ability to maintain a comfortable environment in the cabin as altitude increases and outside air becomes colder and thinner. There are differences in flying in a pressurized versus unpressurized aircraft. Pressurized aircraft can fly at higher altitudes than unpressurized aircraft. Unpressurized aircraft usually climb and descend slower than pressurized aircraft and fly around, rather than over, the weather. If weather is going to be a factor, the choice of aircraft can affect your flight plans. The Air Carrier you select can explain the options.

5.1.4 Helicopter Safety

Helicopters are not inherently dangerous machines. However, danger arises when people not familiar with helicopter hazards are suddenly required to use a helicopter. This section identifies where the potential dangers exist, and how to work around helicopters safely and effectively.

5.1.4.1 Approach Distance

No Arcadis worker should be permitted to approach within 50 feet of the helicopter when the rotor blades are turning, unless work duties require their presence in that area.

5.1.4.2 Approaching the Helicopter

Approach and depart the helicopter in a crouched position from the front or side of the helicopter, within view of the pilot. Never walk to the rear of the helicopter unless loading the rear cabin or baggage compartment, and only if the pilot is aware of your actions. Under no circumstances should you move rear of the baggage compartment. No worker should be permitted to work in the area from the cockpit or cabin rearward while blades are rotating, unless authorized by the helicopter pilot to work there.

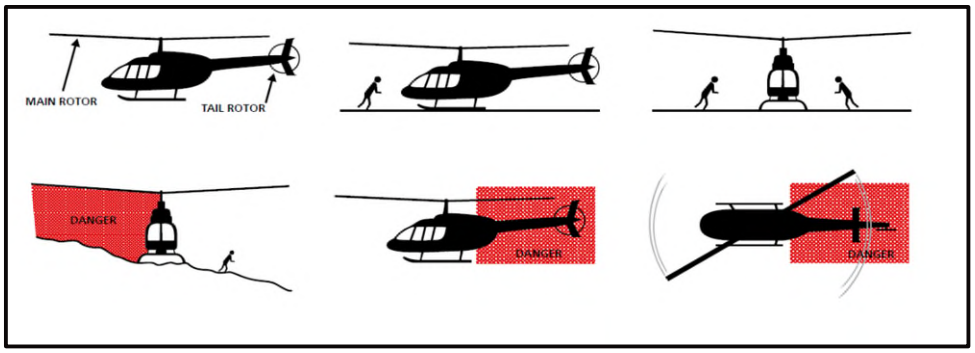


Figure 5-1 Danger Zones Around Helicopters

5.1.4.3 Rotor Blades

Helicopters generally have two sets of rotor blades: the main rotor (the large one on top) and the tail rotor (the smaller one at the tail of the helicopter).

The greatest threat when operating around a helicopter is the turning rotor blade. When the blades are turning, the high-speed tail rotor is virtually invisible. Physical contact with either of the blades when they are turning could result in serious or fatal injury. On uneven ground, always approach and depart the helicopter from the DOWNHILL side. As you approach the helicopter, carry long tools, rods, and other similar items horizontally to avoid possible contact with the main rotor blade. When rotating, the helicopter blades will produce a strong downward force that will blow dust and debris with considerable force. Employees must have eye protection working in areas with the potential for “rotar wash”.

5.1.4.4 Good Safety Practices

When in the helicopter, always keep your safety belt fastened until the pilot signals that it is safe to unfasten it. Wear eye and hearing protection when able. Never smoke in or near a helicopter on the ground. Your pilot will advise you if it is okay to smoke in flight. Smoking on EMS helicopters with an oxygen supply on board is never permitted.

5.1.4.5 Helicopter Landing Area

First, determine the dimensions of the area required for landing. At a minimum, the touchdown zone should be as follows:

- During daylight hours: 100 x 100 feet square; and,
- At night: 125 x 125 feet square.

The surface should be flat and firm, and free from debris that might blow up into the rotor system.

The landing area must be clear of people and obstructions such as trees, poles, and wires. Keep in mind that wires are very difficult to see from the air, especially at night. The landing area must also be free of stumps, brush, posts, and large rocks.

5.1.4.6 Visibility

Ground workers must be instructed that when visibility is reduced by dust or other conditions, they must exercise special caution to keep clear of main and tail rotors. Precautions should also be taken to eliminate, as far as practical, dust or other conditions that reduce visibility.

5.1.4.7 Requirements for Using Helicopters for Hoisting and Lifting

Prior to each day's operation, a briefing will be conducted. This briefing will identify the plan of operation for the pilot and ground workers. A helicopter safety plan must be completed in advance of an aerial lifting operation.

5.1.4.7.1 PPE

PPE will be provided to the worker receiving the load and the pilot will confirm its use. PPE will consist of complete eye protection and hard hats secured by chinstraps and may include hearing protection. Loose-fitting clothing likely to flap in rotor downwash and, thus, be snagged on the hoist line, will not be worn.

5.1.4.7.2 Workers

Sufficient ground personnel shall be provided to safely perform helicopter loading and unloading operations.

5.1.4.7.3 Loose Gear and Objects

Take all necessary precautions to protect workers from flying objects in the rotor downwash. All loose gear within 30 m (100 ft) of the location of lifting or depositing the load, or within all other areas susceptible to rotor downwash, must be secured or removed. Good housekeeping must be maintained in all helicopter loading and unloading areas.

5.1.4.7.4 Communications

There must be constant reliable communication between the pilot and a designated ground crew member who acts as a signalperson during loading and unloading. The signalperson must be clearly distinguishable from other ground workers.

5.1.4.7.5 Signal Systems

The Air Carrier will instruct the aircrew and ground workers on signal systems to be used and will review the system with workers prior to the start of hoisting operations. This applies to both radio and hand signal systems. Common hand signals, where used, are typically as shown in **Figure 5.2**.

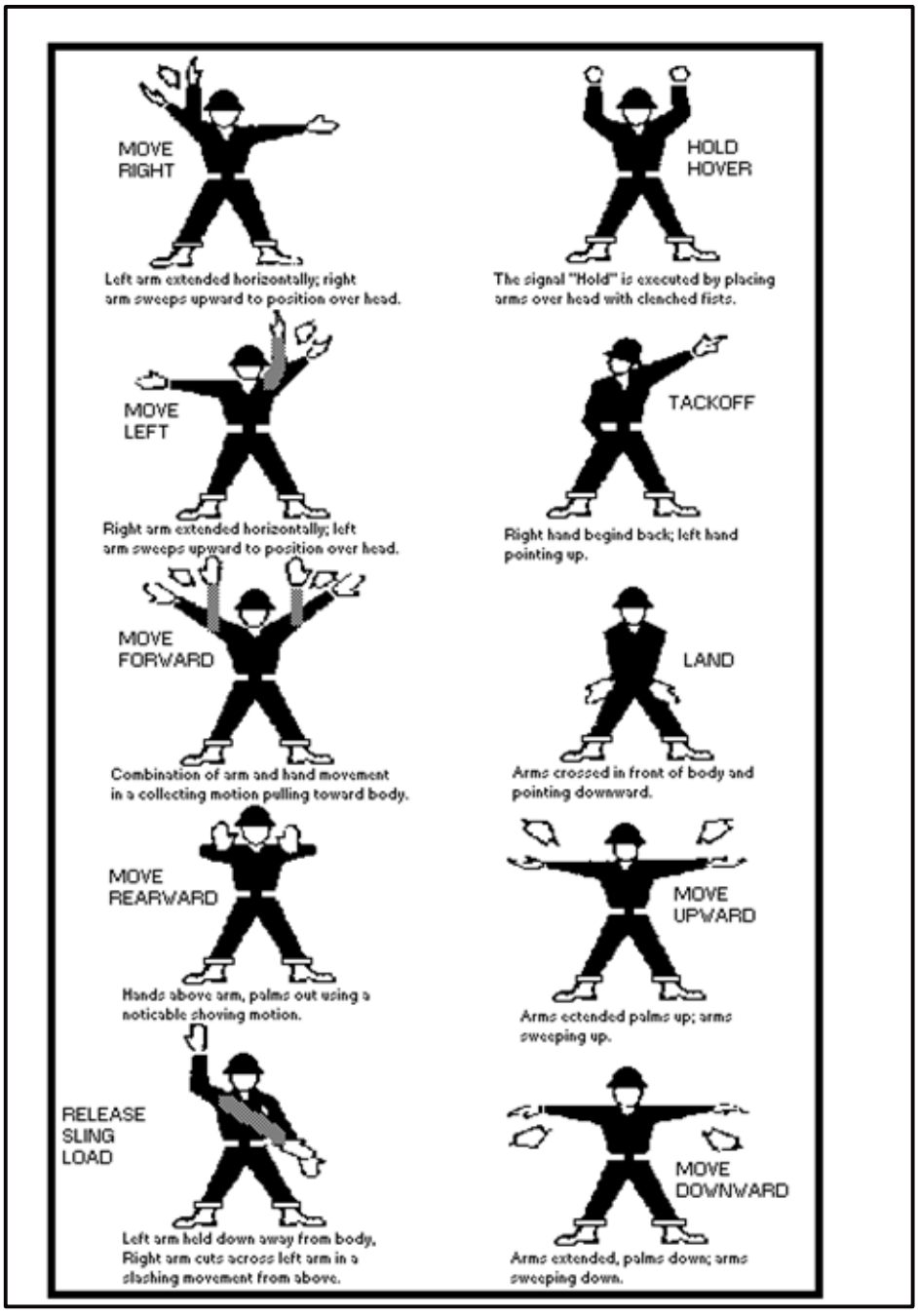


Figure 5-2 Helicopter Landing Hand Signals

5.1.4.7.6 Slings and Tag Lines

Loads should be properly slung. Tag lines must be of a length that will prevent them being drawn up into the rotors. Pressed sleeve, swedged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.

5.1.4.7.7 Cargo Hooks

All electrically operated cargo hooks must have the electrical activating device designed and installed to prevent inadvertent operation. In addition, these cargo hooks must be equipped with an emergency mechanical control for releasing the load. The operator will confirm that the hooks are tested prior to each day's operation by a competent person to determine that the release functions properly, both electrically and mechanically.

5.1.4.7.8 Load Safety

The size and weight of loads, and the manner in which loads are connected to the helicopter will be checked. A lift may not be made if the helicopter operator believes the lift cannot be made safely.

5.1.4.7.9 Hooking and Unhooking Loads

When workers perform work under a hovering helicopter, a safe means of access will be provided for workers to reach the hoist line hook and engage or disengage the cargo slings. Workers will not be permitted to perform work under hovering helicopters except when necessary to hook or unhook loads.

5.1.4.8 Static Charge

Static charge on the suspended load must be dissipated with a grounding device before ground workers touch the suspended load, unless protective rubber gloves are worn by ground workers who may be required to touch the suspended load.

5.1.4.9 Weight Limitation

The weight of an external load must not exceed the helicopter manufacturer's rating.

5.1.4.10 Ground Lines

Hoist wires or other gear, except for pulling lines or conductors that are allowed to "pay out" from a container or roll off a reel, must not be attached to any fixed ground structure, or allowed to foul on any fixed structure.

5.2 Opening and Closing Gates

Slide gates: Gates that slide on tracks or that have wheels often require significant effort to move. Older slide gates that have not been well maintained are even more difficult, often requiring several people to move the gate.

The apparent hazard with this gate type is the amount of exertion required to get them to move. This can result in pulled muscles and tendon/ligament issues. Any time we are exerting tremendous energy and putting most of our body weight in to moving an object, we are vulnerable to slip/fall injuries and cuts and bruises in the unfortunate event we fall into parts of the metal gate. Hand injuries are also common. Chain linked sections often have metal burs. Keeps hands away from bracing and coupling sections as they may be prone to move or slide along metal pole sections. These pieces can tear through glove material. Wearing good abrasion-resistant gloves is a must when opening and closing these gates. Ones with rubber palms are helpful in reducing slipping if they are clean and in good condition. The not-so-apparent injuries may be caused by our hands or arms being struck by, caught in, or crushed by the moving gate. The energy required to stop the gate is very similar to the energy required to move it in the first place so, once in motion, sliding gates are capable of causing serious lacerations and broken bones.

Automatic slide gates: Motor-assisted slide gates eliminate the energy required to open and close the gates when they are functioning properly. The primary hazard associated with these gates is being caught in the chain that opens/closes the gate or being caught in or crushed by the moving gate. Automatic opening and closing mechanism may not detect if a person is caught in the equipment so stay away from the gates when they are in motion. Avoid standing or parking a vehicle in the path of the slide gate. Avoid standing to the side of the gate in the event the chain breaks. The safest location is at least 10 feet perpendicular to the gate.

Swing gates: Swing gates in industrial or agricultural settings may be heavy, off center and require lifting the far end of the gate (opposite to the hinged end) to move it. Lifting when also walking the fence to an open or closed position may cause a back strain injury. These gates types are more unpredictable than slide gates, which are limited to parallel movement next to the fence. Swing gates with posts that are not plumb may be difficult to move at first and then reach a point where they are difficult to stop. Double hinged gates may open when a central chain or lock is removed. Gate sections moving freely may cause struck by injuries to people that in the way of the moving gate. Avoid placing hands near hinges. If the gate is unsteady in the closed position, get assistance steadying it to remove chains or locks. These gates may come with cane bolts or drop rods. These are moving parts that are capable of significant pinch injuries to the hands. Single-hinged gates, such as in residential areas, are usually easy to open and close but may also be equipped with a drop rod or metal clasp. As these are moving parts, keep hangs away from pinch points. Chain-linked gates may have sharp points protruding on the edges. Always wear abrasion and cut resistant gloves when opening and closing swing gates.

5.3 Wilderness Survival

This section of the handbook is a basic introduction on how to prepare for and react in a wilderness survival situation. Wilderness environments may include, arctic and northern areas, remote deserts, mountainous terrain, deep woods, etc., with limited infrastructure and resources, such as roads, communication, etc. These wilderness skills and techniques are provided for information purposes only and are not intended to take the place of a professional wilderness survival or first-aid training course. Rather, they are intended to increase your awareness of being adequately prepared and having an understanding of basic wilderness survival skills.

Before venturing into the wilderness, check weather forecasts and hazards. When venturing into a remote area, you must have a written communication plan that identifies emergency contacts, check-in frequency, location, and scope of work, expected return time, etc. Always have printed topographical or similar map when working in remote areas and make certain you are familiar with how to read a topographical or contour map. To deal with an emergency situation, one must be able to make decisions, improvise and remain calm.

5.3.1 Issues of Concern When Faced with a Survival Situation

For anyone faced with a wilderness emergency survival situation, fear is a normal reaction. Unless an emergency situation has been anticipated, fear is generally followed by panic then pain, cold, thirst, hunger, fatigue, etc. It is extremely important to calmly assess the situation.

Pain may often be ignored in a panic situation. Remember to deal with injuries immediately before they become more serious. Wash and treat all wounds to reduce the potential for infections. Cold lowers the ability to think, numbing the body and reducing the will to survive. Never allow yourself to stop moving or to fall asleep unless adequately sheltered. Dehydration is a common enemy in an emergency situation and may cause you to overlook important survival information. Always keep water with you when travelling through or working in a remote area.

5.3.2 How to Build a Fire

Building a fire is the most important task when dealing with survival in the wilderness. Be sure to build yours in a sandy or rocky area or near a supply of sand and water to avoid wildfires.

The most common mistakes made by those attempting to build a fire are choosing poor tinder, failing to shield precious matches from the wind and smothering the flames with pieces of fuel that are too large. The four most important factors when starting a fire are: spark, tinder, fuel, and oxygen.

The most common ways to create spark are:

- Waterproof, strike-anywhere matches are the best choice. Matches may be waterproofed by dipping them in nail polish. Store your matches in a waterproof container;
- A cigarette lighter is also a good way to produce a spark, with or without fuel;
- The flint and steel method is one of the oldest and most reliable methods in fire starting. Aim the sparks at a pile of dry tinder to produce a fire;
- The electric spark produced from a battery can ignite tinder; and,
- Allow the sun's rays to pass through a magnifying glass or clear, full water bottle onto the tinder.

Dry grass, paper, or cloth lint, gasoline-soaked rags, and dry bark are all forms of tinder. Place your tinder in a small pile resembling a tepee, with the driest pieces at the bottom. Use a fire starter or strip of pitch if it is available. Remember that smaller pieces of kindling such as twigs, bark, or shavings are necessary when trying to ignite larger pieces of fuel. Gather fuel before attempting to start your fire. Dry wood burns better, wet or pitchy wood will create more smoke. Dense, dry wood will burn slow and hot. A well-ventilated fire will burn best.

5.3.3 How to Build a Shelter

A small shelter that is insulated from the bottom, protected from wind and snow, and contains a fire is extremely important in wilderness survival. Before building your shelter, be sure that the surrounding area provides the materials needed to build a good fire, a good water source and gain shelter from the wind.

Wilderness shelters may include:

- Natural shelters such as caves and overhanging cliffs. When exploring a possible cave shelter, tie a piece of string to the outer mouth of the cave so that you will be able to find your way out. Keep in mind that these caves may already be occupied. If you do use a cave for shelter, build your fire near its mouth to prevent animals from entering;
- A natural pit under a fallen tree that may be enlarged and lined with bark or tree boughs;
- Near a rocky coastal area, a rock shelter can be built in the shape of a U, covering the roof with driftwood and a tarp or seaweed for protection;
- A lean-to made with poles or fallen trees and a covering of plastic, boughs, thick grasses, or bark is effective to shelter you from wind, rain, and snow;
- A wigwam that may be constructed using three long poles. Tie the tops of the poles together and upright them in an appropriate spot. Cover the sides with a tarp, boughs, raingear, or other suitable materials. Build a fire in the center of the wigwam, making a draft channel in the wall and a small hole in the top to allow smoke to escape; and,

- A snow cave will provide good shelter if you find yourself in open terrain. Find a drift and burrow a tunnel into the side for about 24 inches; then build your chamber. The entrance of the tunnel should lead to the lowest level of your chamber where cooking will be performed, and equipment will be stored. A minimum of two ventilating holes are necessary, preferably one in the roof and one in the door.

5.3.4 Clothing and Equipment

Clothing must provide warmth and offer protection from the elements. Layering of clothing to trap heat is preferred when preparing for adverse climate conditions. This allows for adjustment based on temperature, level of work effort, and perspiration. It is important to avoid sweating in cold weather as this can lead to hypothermia. Waterproof outer layers are strongly recommended.

Equipment must be easily manageable and promote survival in any situation. Items to carry in your pockets may include a fire starter, waterproof matches and/or lighter, safety cutting tools, compass, small first-aid kit, and portable, nonperishable food like trail mix.

5.3.5 Survival Kit

To assemble your kit, store items in airtight plastic bags and put your entire disaster supplies kit in one or two easy-to-carry containers such as plastic bins or a duffel bag. A basic emergency supply kit could include the following recommended items:

- Water - one gallon of water per person per day for at least three days, for drinking and sanitation;
- Food - at least a three-day supply of nonperishable food;
- Battery-powered or hand crank radio and a NOAA Weather Radio with tone alert;
- Flashlight;
- First aid kit;
- Extra batteries;
- Whistle to signal for help;
- Mirror or other signaling device;
- Moist towelettes, garbage bags and plastic ties for personal sanitation;
- Toilet paper;
- A LifeStraw™ or water filter;
- Local maps and compass;and,

- Cell phone with chargers and a backup battery.

Portability is important when travelling in the wilderness. Items from the survival kit may be placed in a small hip pack or carried as a backpack.

5.3.6 Travel in the Remote Areas

It would be very unusual for an Arcadis worker to become stranded in a wilderness setting, away from others and confronted with a lone survival situation. It is very important that others are aware of your location and anticipated return if you must work in a remote area for even a brief period or are travelling through a remote location alone. If you do become lost or stranded, it is best to stay where you are and attempt to contact others using a cell phone or satellite phone. If needed, you may need to find a clearing or move to higher ground to obtain a cell phone signal or to connect to a satellite. Even without service, attempt to send text messages to contacts and include the time you are attempting to send the message (this may be different than the time the message is received), your condition and the condition of others with you and, of course, your location. Your exact location may be found using map apps, compass features, etc. on your cell phone. Learning how to find your location or send your location to others is important before finding yourself in an emergency. If necessary, build a fire, find or build a shelter, and carefully assess the situation. Resist using energy by wandering aimlessly if you are confident others are expecting your return.

During winter months use game trails, which will help you avoid walking in deep snow. Frozen streams and rivers are also easy to follow but be aware of weak ice. Avoid getting wet in low temperature environments.

5.3.7 Methods of Navigation

There are three common methods of navigation:

1. Electronic devices including Global Positioning Systems (GPS);
2. Map reading is a common method used, particularly in developed areas. Maps and aerial photos may be used when landmarks are clear;
3. Using a compass in conjunction with maps and aerial photos is wise in areas without good landmarks; and,
4. Navigation by dead reckoning is common in areas where landmarks are nonexistent or inadequate. This method combines plotting and recording a series of courses, measured by distance and direction from a starting point.

***NOTE**: It is important to stay alert and observe all unusual landmarks.*

Difficulties in navigation may occur for several reasons. The most important thing to remember if you find yourself in this situation is not to panic. Provide for your basic needs: heat, shelter, water, and food. Then consult your map and compass and try to recognize or remember landmarks you may have passed.

To determine how many hours of daylight are left, face the sun and extend your arm toward it. Bend your wrist inward and place your fingers just below the sun. Disregarding your thumb, count how many fingers separate the sun from the horizon. Each finger will represent approximately 15 minutes. If it is nearing dark, build a shelter and fire on high ground and out of the wind. Avoid travelling at night.

What3Words is an app that uses a unique way of referencing locations. The world is divided in to 3-meter squares and each square is assigned a unique combination of three words. It is the easiest way to find and share exact locations.

5.3.7.1 Global Positioning Systems (GPS)

All handheld GPS models will provide basic navigation tools. Some basic models include a barometer/altimeter, which will let you gauge weather trends, while also showing your current elevation. An electronic compass is also a basic feature on GPS units. Most importantly, your GPS should include a base map. Cell phone apps are also now available for outdoor navigation. If a standard cell phone will serve as the primary GPS navigation device, the relevant map must be preloaded if the outdoor area does not have cell phone service or internet. This is the primary strike against using a cell phone for wilderness navigation. Battery life is a big concern for both stand-alone GPS units and cell phones. Having a backup power supply or additional batteries is critical.

5.3.7.2 Finding Direction Using a Compass

A magnetic compass is important in a wilderness survival kit. First, decide which direction you want to follow then aim over the center of your compass to the bearing you want to follow and find a landmark on this sighting. After arriving at this landmark, repeat the process. Using this pattern, you will follow a relatively straight line.

5.3.7.3 Using the Stars

If you do not have a compass, the star Polaris (aka the North Star) will identify a northern direction. To find this star, use the Big Dipper constellation. The pole star will be located off the two ends of the “dipper,” opposite the side of the “handle”.

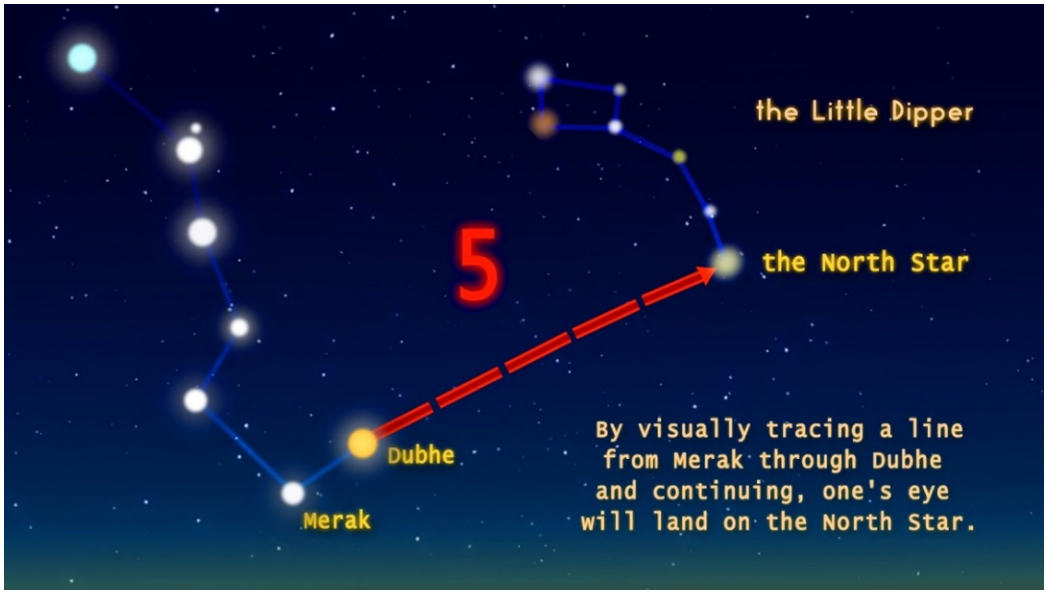


Figure 5-3 Identifying Polaris or the North Star

5.3.7.4 Using the Sun

You may also use an analog watch and the sun to determine direction in the northern hemisphere. Point the hour hand directly at the sun and then bisect the angle between the hour hand and 12 o’clock. This imaginary line will run north/south. In the northern hemisphere, if the sun is directly behind you, you are generally facing north.

5.3.7.5 Using the Moon

Mentally draw a line that connects the horns of a crescent moon and then extend this line down to the horizon. In northern latitudes this will give an approximate indication of south, in southern latitudes the line will give an approximate indication of north. It works best when the moon is high in the sky and not too near the horizon, when significant errors are possible.

5.3.8 Signals

During daylight hours it is important to find a way to signal to others—a fire is best. A signal mirror is effective for signaling aircraft. Flash the mirror along the horizon regardless of whether a plane is in view. If you must move, be sure to leave markers that searchers can follow. A distress signal can be three fires or piles of rocks in a triangle, three blasts on a whistle, or three flashes of a light, in succession followed by a one-minute pause and repeated until a response is received. Three blasts or flashes is the appropriate response.

The Morse Code emergency signal (SOS) may be sent with a flashlight and consists of three dots followed by three dashes followed by three dots. The dashes should be twice as long as the dots. Messages or signal letters may be drawn in the snow.

5.3.9 Food and Water

In a wilderness survival situation, it is possible to live for extended periods of time on little or no food. Research shows that a healthy individual can survive with no side effects on 500 calories a day, plenty of water and a comfortable resting place., During cold weather or periods of heightened activity, more food is required to maintain a normal body temperature. Water is extremely important. Two to 3 cups of water are required each day to stay healthy. It is wise to conserve the water in your body by reducing activities that may promote water loss.

Finding water during the summer months is easier than winter. Running water, such as remotely located springs or streams are preferred but should still be filtered or boiled before consuming. Water in stagnant areas such as sloughs and ponds MUST be boiled for at least 3 minutes or treated with appropriate purification or water filtration equipment. In areas where no surface water is available, dig into damp soil to below the water table and allow this muddy water to settle and become clear. Water may also be found on the dew of plants, by collecting rainwater or in fish juices.

During the winter months it is wise to look for water under ice. Melting ice, as opposed to snow, is more fuel efficient. Remember that hardpacked snow will yield more water than light, fluffy snow. Do not eat snow because it tends to dehydrate the body.

If water is not readily available, try to limit your food consumption to carbohydrates, because proteins use more water to digest. Keep in mind that all fur-bearing animals and grass seeds are edible. Avoid eating any plant without the proper training and knowledge of edible plant species. Remember, rescue is very likely, starvation is not.

Take extra care when consuming seafood. Try to avoid mussels during the summer months because they contain certain toxins that are not present during the winter. Sea urchins, a prickly purple or green sea creature, may be consumed by breaking them open and eating the red or yellow eggs inside. Steamed snails, clams and limpets,

frogs, snakes, lizards, and birds are also edible. Remove the head, entrails, and skin before adding them to the pot.

5.3.10 First Aid and Health

When journeying into the wilderness, it is important to carry a complete first-aid kit with a manual. It is also wise to take a first-aid course prior to departure. A good diet, cleanliness, and appropriate clothing will lower the risk of harmful situations. When setting out for your journey remember to pack a wide range of clothing and extra footwear.

5.4 Mining

Projects at mining sites may have site specific safety requirements and may require site-specific (client) training. Confirm the regulatory agency that has jurisdiction over your operations. Both active and inactive sites, as well as reclamation and tailings management, may fall under MSHA jurisdiction. This will determine training and oversight requirements. This training must be arranged by the PM prior to entry to the site. In addition, many mining sites are under the jurisdiction of MSHA and require additional training. See the PM or your H&S representative for these requirements. Depending on the type of mine and potential for exposure, additional medical surveillance may be needed if staff are potentially exposed to certain metals or radioactive materials. Contact Corp H&S if staff medical surveillance program needs modified.

5.5 Railroad

Requirements for safe work on rail projects are provided in the Arcadis Railroad Safety Handbook which should be consulted prior to commencing work within 25 ft of the center line of a railroad track. The following is a general summary of requirements applying to all work within 25 ft of a railroad track:

- Arcadis expects 100% compliance with all applicable railroad regulations and H&S standards related to railroad work, even if the work in the vicinity of the railroad track is not under contract to a railroad. Refer to the Arcadis Railroad Safety Handbook for details;
- Only properly trained staff are permitted to be within 4 ft of the rails. There are no exceptions to this rule. In addition to training, security clearance through eRailsafe may also be required when prescribed by the client or railroad having authority over the track where the work will be conducted;

Rail Crossing Locator is an app that identifies all rail crossings in the United States. This is an excellent tool for spill response and for railroad work permitting.

- Except as permitted by the railroad having authority over the track, use of personal electronic devices (e.g. cell phones, computer tablets, headphones) within 25 ft of the rails is prohibited;
- A ready method of communication with the railroad Point of Contact (POC) will be maintained when working within 25 ft of the rails;
- All required PPE will be worn at all times while on railroad property;
- All required badges will be worn and displayed at all times while on railroad property; and,
- Work on or in vicinity of railroad tracks will be subject to requirements specified in Section 8.0 of the Arcadis Railroad Safety Handbook unless a client rail safety program is in place and is being followed by Arcadis staff on the project.

Did You Know? Arcadis Standard ARC HSSP002 “Railroad Workplace” requirements and recommendations for use when working around railroads.

5.6 Water Operations Work

The potential for drowning is an additional hazard when working on a watercraft, water intake, water discharge structures, dock facilities, or any location over/near water. Arcadis worker working in areas unprotected by passive fall protection systems (OSHA-specified railings or nets), where the danger of drowning exists, must wear a U.S. Coast Guard-approved Type I (offshore) life jacket, Type II (near shore), or Type III (calm, inland water) buoyant work vest, commonly referred to as a personal flotation device (PFD). However, this requirement can be superseded with the use of 100 percent fall protection. If an worker cannot fall into the water as a result of use of active or passive fall protection, there is no danger of drowning, then a PFD is not required.

Did You Know? Arcadis Standard ARC HSFS002 “Water Operations” includes requirements and recommendations for working on or near water.

The following pre-planning and precautions must be taken where the danger of drowning exists:

- Complete a Water Operations Risk Assessment Form. The completion of the Water Operations Risk Assessment Form process will be used to assess the hazards, identify safety critical equipment requirements, outline training requirements and identify methods for prompt, safe rescue and notification methods.
- Every worker involved with water-based work will be required to take water awareness training which emphasizes the implementation of the contents of this standard. The operator/skipper of any Arcadis boat/vessel must complete a USCG boating safety training course prior to conducting boating work on the project.
- Arcadis workers must be provided with and use a Type I, II, or III PFD. The use of non-inherently buoyant and recreational PFDs is prohibited. These PFDs, where required, will be worn by each person while working on docks, barges, watercraft, or similar facilities.
- If working on the water in a boat, employee(s) must prepare a float plan. The float plan will be submitted daily to the PM or SSO, with a copy remaining onboard the vessel.
- If performing construction or demolition work over water, personal fall protection may be required. In cases where employees could fall in the water, regardless of fall protection equipment or the use of PFDs, OSHA requires At least one lifesaving skiff immediately available for prompt rescue.
- Equip each dock with throwable flotation devices capable of supporting an alert person in the water, with 90 feet of ½-inch nylon rope attached for every 200 feet of the length of the dock.
- Equip floating barges with safety equipment and emergency supplies to cope with any possible demooring. Minimum equipment shall include the following:
  - Mooring lines;
  - Signaling equipment;
  - Repair equipment; and,
  - Boat hooks

US Coast Guard is an app that is an excellent resource for boating regulations and boating safety. Includes the ability to prepare a float plan and share it, which is referenced in the Arcadis Standard ARC HSFS002 “Water Operations”.

5.6.1 Items Required

Watercraft must be equipped with safety equipment and emergency supplies to cope with any foreseeable problem. Minimum safety equipment and emergency supplies include the following:

- Mooring lines;
- Signaling equipment;
- Repair equipment;
- Boat hooks;
- Paddles or push poles;
- Spare parts (e.g., spark plugs, drive gear keys);
- Fire extinguisher;
- Flares;
- Air horn; and,
- Items listed by the watercraft operator

Each dock must be equipped with:

- Emergency first-aid kit
    - Basket-type stretcher with bridle and rope attached;
    - Appropriate firefighting equipment; and,
    - Sufficient numbers of throwable floatable devices;
- An observer will be assigned whenever work is being done around the dock from a watercraft. The observer must maintain communication with workers and with the operations supervisor; and,
- Adequate lighting must be provided at all times.

5.6.2 Equipment

The following apply to fall protection equipment that may be used when conducting project activities over/near water:

- No repair of safety harnesses and lanyards is allowed;

- Safety harnesses or lanyards must be a minimum of 1.3 cm diameter (½-inch) nylon or equivalent, with nominal breaking strength of 6,000 pounds;
- Lanyards will be no longer than 6 feet;
- Lanyards will have a locking snap hook on both ends;
- Lifelines will be a minimum of ¾-inch diameter or equivalent, with a maximum breaking strength of 6,000 pounds;

A personal fall arrest system must limit the maximum arresting force on an worker to 1,800 pounds. The following requirements apply to horizontal (static) anchor lines:

- Steel cables are recommended for horizontal (static) anchor lines;
- Steel cables must have a minimum breaking strength of 6,000 pounds or five times the live load, whichever is greater;
- Installation must be overseen by a qualified individual;
- The minimum diameter for steel cable static lines is 3/8 inch; and,
- Turnbuckles must be used to keep static lines taut.

5.6.3 Inspection of Equipment

5.6.3.1 Vessel Safety inspections

Vessel safety inspections are required prior to each day or shift of operations.

5.6.3.2 Completed Vessel Safety Inspection Forms

Completed Vessel Safety Inspection Forms will be provided to the Arcadis Site Supervisor and will be maintained in the project files.

Fall protection equipment used around water will be inspected before each use. Quarterly inspections will be documented. The following defects, as a minimum, are cause for destruction of the equipment:

- Cracked, dry, or rotten leather;
- Nylon or cord that has worn thin;
- Cuts or worn places deep enough to weaken the strap or belt;
- Broken stitches at buckles, D-rings, or snaps;
- A snap with weak springs behind the tongue or defective tongues that have been bent or sprung;
- Loose tongues in buckles;

- Cracked, bent, or heavily worn buckles; D-rings; or snaps; and,
- Other wear, damage, or defect that could affect the protection afforded by the assembly

5.6.4 Records

Records requirements for watercraft operations are presented below:

- Equipment inspection records should be retained for 1 year plus the current year.
- Watercraft operator qualifications and any required licenses will be kept onsite for as long as they are valid, plus 1 year.

5.6.5 Working Near or on Water/Ice

Due to the high-risk nature, cold-water work activities will need to be discussed directly with Corporate Health & Safety to confirm that proper planning and hazard controls are used.

Workers must wear U.S. Coast Guard-approved (Type I or II) PFD (e.g., life jacket) when:

- Working on travelling in or on floating equipment (e.g., boats, barges, rubber rafts, or other watercraft);
- Working close to fast-flowing water or water that is deeper than 4 feet (e.g., lakes or reservoirs), where the work could result in slipping or falling into the water (circumstances may require the use of lifelines);
- Working on ice near open water (circumstances may require the use of lifelines or cold-water immersion suits). Cold-water immersion gasp reflex is an involuntary response to being submerged in cold water. It can occur in water that is 60º F or colder, resulting in sudden drowning;
- Before travelling or working on river or lake ice, determine ice thickness and type (blue or white) using an ice auger; and,
- Only trained and experienced workers are permitted to calculate load limits for ice.

5.6.6 Boating Operations Safety

Requirements applicable to motorboats include the following:

- Persons operating motorboats must be trained in boating safety by a recognized organization.
- The maximum number of workers and weight that can safely be transported must be posted on all vessels used for Arcadis projects;
- Vessels must be inspected prior to use;

- The number of workers on a vessel should not exceed the number of personal flotation devices (PFDs) aboard;
- US Coast Guard approved, marine type fire extinguishers, are required on motorized boats. A fire extinguisher appropriate for the hazard will be maintained on the watercraft if open flames, gasoline-powered equipment, or heat-generating devices are used.
- Each boat will have sufficient room, freeboard, and stability to safely carry cargo and passengers, with consideration given to the weather and water conditions in which the boat is operated. The load should not exceed the rated limit of the vessel;
- A first-aid kit shall be maintained in the watercraft. The first-aid kit will have water-resistant housing to protect the kit contents.
- The following equipment is required on board a motorboat:
  - Two oars;
  - Oar locks attached to gunwales or the oars;
  - One ring buoy with at least 90 feet of 3/8-inch diameter solid braid polypropylene (or equivalent) line attached;
  - PFDs must be U.S. Coast Guard-approved Type I, II, and III. The use of non-inherently buoyant and recreational PFDs is prohibited.
  - Navigation lights (if a skiff lacks permanent mounted navigation lights, use portable battery-operated lights).

The following are general requirements for all manually operated watercraft:

- Workers operating watercraft will be sufficiently trained and have the experience necessary to safely operate the watercraft being used;
- The watercraft will be inspected and documented prior to use and/or daily by the worker designated to operate the watercraft;
- Where possible, select a watercraft for project work that has flotation integrated into the boat design capable of maintaining watercraft buoyancy in the event of capsize;
- All occupants of the watercraft will wear PFDs. PFDs must be US Coast Guard approved Type I, II, and III. The use of non-inherently buoyant and recreational PFDs is prohibited.
- When loading the watercraft, equipment and supplies must be evenly distributed. When possible, load the watercraft from the side instead of the end. Equipment and supplies should be secured in a manner that will

prevent shifting while the watercraft is in motion. Equipment and supplies loaded and secured should not exceed the maximum rated weight capacity of the vessel;

- Access and egress from watercraft should always be from the side instead of from the ends;
- Standing, changing places and sudden movement in the watercraft should be avoided. Go to the shore to make adjustments in position and equipment location;
- If anchors are used, attach them to the bow and stern of the watercraft, not the sides;
- Interior vessel bottoms of metal or plastic should be covered with an anti-slip coating;
- Adequate lighting must be available during night work. Navigation lighting is required if the watercraft is operated in navigable waters;
- Oars and oarlocks must be in good condition;
- A first-aid kit should be maintained in the watercraft. The first-aid kit will have water resistant housing to protect kit contents; and,
- A fire extinguisher appropriate for the hazard will be maintained on e watercraft if open flames, gasoline powered equipment, or heat-generating devices are used.

5.6.7 Additional Requirements for Inflatable Watercraft

The following requirements are applicable to inflatable watercraft:

- Equipment with sharp edges or points must be adequately protected while stored or used on the inflatable watercraft. Collecting fish using the hook-and-line method should not be employed while using inflatable watercraft;
- Equipment with hot surfaces should not be used with inflatable watercraft; and,
- Whenever possible, inflatable watercraft should be inflated using mechanical means.

5.7 Process Safety Management

NOTE: *This section of the handbook is not meant to replace requirements set forth in the Arcadis Process Safety Management Health and Safety Standard (ARC HSFS014). This section of the handbook is meant as a quick reference only. All requirements set forth in the procedure must be confirmed prior to working on a project involving the Process Safety Management (PSM) standard.*

Specific training is required to comply with ARC HSFS014. Target audiences include supervisors, operators, onsite workers, maintenance workers, engineers and contractors/visitors. The PSM standard will address required

training for each category of worker/contractor/visitor and describe how this training must be provided. All training will be documented and maintained onsite.

Did You Know? Arcadis Standard ARC HSFS014 “Process Safety Management” includes requirements and recommendations on identifying and controlling hazards associated with chemicals used in processes.

5.8 Industrial Hygiene and Monitoring Equipment

All work activities are to be evaluated using qualitative and/or quantitative methods, as appropriate, to reduce or eliminate exposure hazardous substances to the lowest feasible levels. Arcadis shall identify the most appropriate control mechanisms to adequately mitigate the risks identified following the hierarchy of controls.

Did You Know? Arcadis Standard ARC HSIH009 “Industrial Hygiene” includes guidance on Arcadis’ Industrial Hygiene processes, which includes worker exposure monitoring.

5.8.1 Personal and Workplace Exposure Monitoring

Air monitoring will be conducted to determine employee exposure to airborne constituents. The monitoring results will dictate work procedures and selection of PPE. The Arcadis SSO will be responsible for using air monitoring results to determine appropriate H&S precautions for Arcadis personnel and subcontractors. Air monitoring results will be recorded in field notebooks or in an air monitoring log provided in the HASP. The purpose of monitoring is to document the presence or absence of COCs. Therefore, it is as important to record zero value results, as it is to record any concentration greater than zero.

Workplace monitoring will be performed as needed to assess and obtain worker exposure levels to COCs. All records regarding occupational exposure measurements will be communicated to affected workers and maintained in the applicable project and corporate files.

5.8.2 Monitoring Equipment Maintenance and Calibration

All direct-reading instrumentation calibrations will be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated before use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibration details must be documented on a calibration log. The type and LOT number of calibration gases must be noted, as well. All completed H&S documentation/forms must be reviewed by the Site Supervisor and maintained in the project files.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturer's procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized workers will perform instrument repairs or preventive maintenance.

Workers operating air monitoring equipment must be aware of correction factors when in compound-specific environments. For example, a PID with a 10.6 eV bulb, calibrated with isobutylene, would need to be "corrected" by a factor of 6 in an acetaldehyde environment (a 100-ppm reading would actually be 600 ppm acetaldehyde). The Arcadis Standard HASP template auto calculates correction factors for chemicals LISTED in the workbook.

If an instrument is found to be inoperative or is suspected of giving erroneous readings, the Site Supervisor is responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The Site Supervisor will be responsible for confirming that a replacement unit is obtained and/or repairs are initiated on the defective equipment.

5.8.3 General Hazard Exposure Information

For all field work requiring air monitoring to assess worker exposure levels, the HASP will identify constituents of concern (COCs) and establish action levels and control measures. Action levels for COCs established in the HASP are based on sound industrial hygiene practices, following recognized standard-setting authorities. Table 5-2 shows the typical agencies and terminology used in HASPs.

5.8.4 COC and Radiation Exposure

Arcadis has established specific procedures for COCs and radiation exposures. This handbook will only make reference to these exposure potentials; therefore, all employees are directed to Arcadis standards to receive more information.

Table 5-2 Regulatory Acronyms

Hazard	Guideline	Explanation	Sources for Values
Inhalation of Airborne Contaminants	TLV: Threshold Limit Value	One of three categories of chemical exposure levels, defined as follows:	
	TLV-TWA: Threshold Limit Value-Time- Weighted Average	The time-weighted average concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed without adverse effect. Should be used as an exposure guide rather than an absolute threshold.	ACGIH
	TLV-STEL: Threshold Limit Value-Short-Term Exposure Limit	A 15-minute time-weighted average exposure that should not be exceeded at any time during the workday.	ACGIH
	TLV-C: Threshold Limit Value-Ceiling	The concentration that should not be exceeded, even instantaneously.	ACGIH
	PEL: Permissible Exposure Limit	Time-weighted average and ceiling concentrations similar to (and in many cases derived from) the threshold limit values published in 1968.	OSHA
	REL: Recommended Exposure Limit	Time-weighted averages and ceiling concentrations based on NIOSH evaluations.	NIOSH
	Immediately Dangerous to Life or Health	The maximum level from which a worker could escape without any escape-impairing symptoms or any irreversible health effects.	NIOSH
Dermal Absorption of Chemicals through Airborne or Direct Contact	Designation “skin”	The designation “skin” in the ACGIH, OSHA, and NIOSH references indicates that a substance may be readily absorbed through the intact skin; however, it is not a threshold for safe exposure. Direct contact with a substance designated “skin” should be avoided.	ACGIH /OSHA /NIOSH
Dermal Irritation		Many substances irritate skin. Consult standard references.	
Carcinogens	TLV: Threshold Limit Value	Some carcinogens have an assigned TLV.	ACGIH

Hazard	Guideline	Explanation	Sources for Values
	PEL: Permissible Exposure Limit	OSHA has individual standards for some specific carcinogens.	OSHA
	REL: Recommended Exposure Limit	NIOSH makes recommendations regarding exposures to carcinogens.	NIOSH

Did You Know? The project HASP will have important information relating to the chemicals of concern at a project site. Arcadis Standard ARC HSIH004 "Ionizing Radiation" includes requirements and recommendations for use when working around ionizing radioactive sources.

5.9 Scientific SCUBA Diving

Scientific SCUBA diving may be used as a field sampling method to collect sediments, organisms, or information on submerged habitats, or document underwater features (e.g., photography, videography, cartography). When considering scientific diving as a data collection method, several unique H&S issues must be considered. The Arcadis Scientific Diving Program (ASDP), and the Diving Control Board (DCB) which oversees ASDP operations, provide a framework that brings Arcadis's companywide attention to safety of the dynamic environments and hazards unique to working underwater.

The Arcadis DCB consists of experienced scientific divers and H&S specialists familiar with scientific SCUBA diving who are responsible for developing requirements and procedures for scientific diving work done at Arcadis. The DCB maintains a Diving Safety Manual (DSM) that establishes the organization of the ASDP; dictates standards for training, medical monitoring and equipment; and presents general diving procedures. The DCB evaluates potential risks and develops a strategy to safely complete scientific diving operations for Arcadis projects. Once approved by the DCB, a project involving scientific diving is carried out by qualified Arcadis workers enrolled in the ASDP.

Some general considerations and safety procedures for scientific SCUBA diving follow. All Arcadis scientific diving projects must:

- Be cleared by the DCB and carried out by members of the ASDP;

- Have a site-specific dive plan approved by the Diving Safety Officer;
- Have a safety diver ready to enter the water when diving operations are underway;
- Prepare JSAs specific to facilities and conditions onsite; and,
- Conduct a walk-through of diver rescue procedures prior to beginning work

All workers diving for Arcadis will meet the following requirements:

- Arcadis employees will be enrolled in the ASDP
- Have a diving certification from an internationally recognized dive training organization;
- Complete a physical exam specific to the Arcadis Scientific Diving Program;
- Complete in-water checkout procedures outlined in the DSM and observed by a member of the DCB;
- Be approved by the DCB;
- Maintain current first aid, CPR and AED training; and,
- Maintain a dive log of all work-related diving activity.

The minimum diving and safety-related equipment required at scientific diving project sites includes:

- Standard SCUBA gear, certified by a qualified technician with the last 12 months;
- Full face masks with communication capabilities, certified by a qualified technician;
- A cutting device for each diver (EMT shears, blunt-tipped knife with hard sheath) with lock-out/tag-out procedure (if necessary);
- DOT & CGA-compliant SCUBA cylinders containing a breathing matrix meeting CGA Grade E standards;
- Carbon monoxide test kit for SCUBA cylinders;
- First-aid kit;
- Automated external defibrillator; and,
- Emergency oxygen kit (at least one member of team must be trained in emergency oxygen administration)

5.9.1 Diving Procedures

The following general procedures have been established for scientific diving projects conducted by Arcadis:

- Before each dive, conduct a pre-dive briefing presenting tasks, hazards, anticipated depth and duration of the dive, and review the dive plan;
- Always maintain the buddy system (i.e., two divers in visual, voice, or physical contact);

- Follow site-specific JSAs (e.g., entering/exiting the water, donning/doffing gear, scientific diving);
- Before entering the water, perform a pre-dive buddy check (i.e., tank pressure, gear, and physical and mental state);
- Follow safe descent and ascent procedures;
- Maintain communications with dive buddy (and surface tender when using communications equipment); and,
- Conduct post-dive debriefing; review dive and identify new/unanticipated hazards; develop controls prior to next dive.

5.9.2 Emergency Preparedness

H&S procedures for scientific diving require a thorough hazard assessment of site and water conditions. The examples listed below represent a fraction of the procedures governing safe diving practices:

- Everyone has STOP WORK authority;
- A safety diver will be on standby when divers are in the water;
- A site-specific Diver Rescue JSA must be developed, and diver rescue drills conducted onsite to refine the JSA (at least one drill per field event);
- An emergency response plan must be developed that includes the nearest decompression chamber capable of treating decompression injuries and a transport plan.
- In most cases, notification of diving activities should be provided to local emergency responders to facilitate a coordinated response effort.

Project-specific requirements will be developed by the project team in conjunction with the DCB, and documented in the HASP and site-specific dive plan, where appropriate. The ASDP operates under the Guidelines for Scientific Diving, established by OSHA (29CFR1910 Subpart T Appendix B), and is not qualified or insured to operate as a commercial diving program. Commercial diving firms are subcontracted on Arcadis projects requiring commercial diving. On these projects, the DCB will serve as the diving safety reviewer on the subcontractor's dive plan and the site-specific HASP (at a minimum). Please engage the DCB on Arcadis projects with a commercial diving component.

More information on the ASDP, procedures for bringing a project to the DCB for review, the DSM, and representative project examples are available from the Dive Control Board. For more information, please contact the Arcadis Corporate H&S Department (anacorphs@arcadis.com) to be connected with the appropriate member(s) of the Dive Control Board.

5.10 Oil and Gas Sector Work

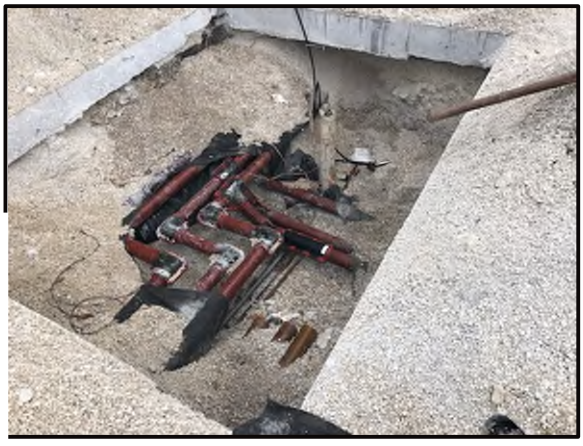
All work on oil and gas project sites requires detailed HASPs and may require specific client training or site training by the client. Depending on the job requirements and tasks performed, workers may be exposed to other hazards as presented in this handbook (e.g. PSM, Water Operations Work). In addition, special PPE may be required, including the use of flame-retardant clothing and protective footwear. COCs are site dependent, but often include benzene (possibly requiring special training and industrial hygiene monitoring) and hydrogen sulfide. Before work is conducted on oil and gas sector work, a detailed HASP must be developed and approved, and client requirements must be met.

5.10.1 Retail Petroleum Sites

Work for oil and gas clients often involves various activities at current and abandoned retail petroleum sites. Workers are often exposed to a high volume of motor vehicle traffic, which presents an elevated risk of being struck. Establishing a safe work zone is critical. The project team must be diligent in preparing an adequate TSP based upon site conditions. Utilizing work vehicles as barricades in heavy traffic flow conditions is often warranted.

Did You Know? Arcadis Standard ARC HSIH003 “Benzene” includes requirements and recommendations for use when working around benzene. Arcadis Standard ARC HSIH007 “Hydrogen Sulfide” includes requirements and recommendations for use when working around hydrogen sulfide.

Underground and overhead utilities must be considered when completing work at retail petroleum sites. Prior to performing intrusive work, teams must complete the Utilities Clearance Checklist, found in the Arcadis Health and Safety Standard ARC HSFS019 “Utility Location and Clearance”. See Section 3.36.2 Product Lines and Underground Storage Tanks for additional information.



Pea gravel is often used in trenches containing petroleum product piping. Piping networks are often located near or between product dispensers and/or underground storage tanks. If pea gravel is encountered during intrusive work, always Stop Work to determine if product piping is present.

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Attachment F
SDSs

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

Printing date: 31.12.2013 **Revision:** 31.12.2013

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

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** 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.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**

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

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

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

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· **Hazard pictograms**

GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate
· **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

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

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

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Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

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3 Composition/information on ingredients

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

· **Dangerous components:**

CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	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%
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 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **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:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **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.

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

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

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· **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.
· **Additional information:** No further relevant information available.

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.
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

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

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

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· **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:**
Not required under normal conditions of use.
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.
· **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 cannot 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

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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:	Not Determined.
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 self-igniting.
· **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.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition 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.

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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.

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.

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· **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, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)** · **DOT, ADR, IMDG, IATA, ICAO** · **Class**	Not Regulated
· **14.4 Packing group** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.5 Environmental hazards:** · **Marine pollutant:**	No
· **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":**	Not Regulated

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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.
· **IARC (International Agency for Research on Cancer)**
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.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **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.
H319: Causes serious eye irritation.

R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **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)

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid **CAS Number:** 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

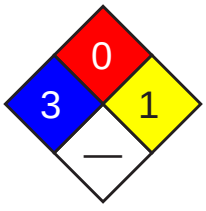
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
Ceiling: 2 ppm.

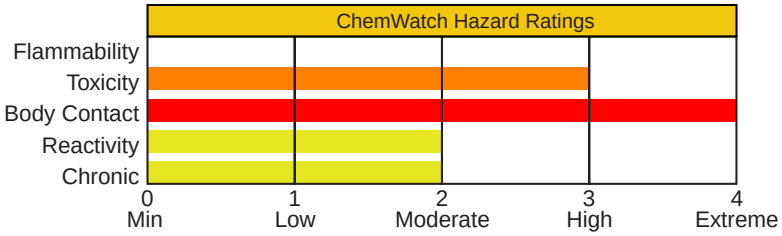
IDLH Level
50 ppm.

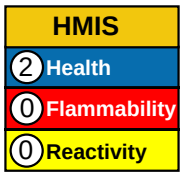
EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

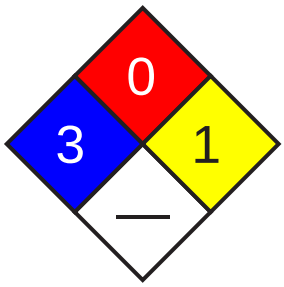
Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.
INGESTION:
1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.
SKIN:
1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.
EYE:
1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.
Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

See DOT ERG

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize.
Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.

Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white

Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.

Glove Selection Index:

BUTYL ..... Best selection
BUTYL/NEOPRENE ..... Best selection
HYPALON ..... Best selection
NEOPRENE..... Best selection
NEOPRENE/NATURAL..... Best selection
NITRILE+PVC ..... Best selection
PE/EVAL/PE ..... Best selection
SARANEX-23 ..... Best selection
VITON/NEOPRENE ..... Best selection
PVC..... Best selection

NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Nitric Acid **CAS Number:** 7697-37-2
Chemical Formula: HNO_3
Structural Chemical Formula: HNO_3
EINECS Number: 231-714-2
ACX Number: X1002177-5
Synonyms: ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRICACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)
General Use: Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.
Used for etching and cleaning metals.
Operators should be trained in procedures for safe use of this material.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95

OSHA PEL
TWA: 2 ppm; 5 mg/m^3.

ACGIH TLV
TWA: 2 ppm; STEL: 4 ppm.

EU OEL
STEL: 2.6 mg/m^3 (1 ppm).

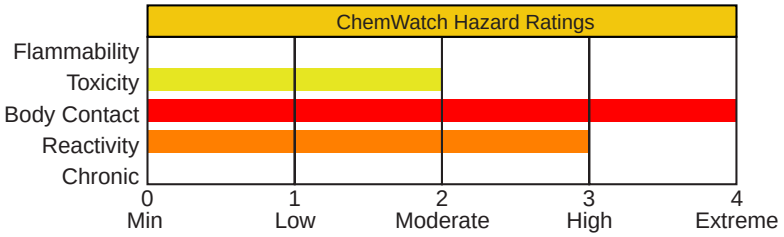
NIOSH REL
TWA: 2 ppm (5 mg/m^3); STEL: 4 ppm (10 mg/m^3).

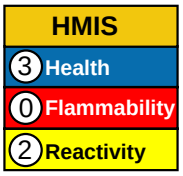
IDLH Level
25 ppm.

DFG (Germany) MAK
TWA: 2 ppm; PEAK: 2 ppm.

Section 3 - Hazards Identification

Fire Diamond





ANSI Signal Word

Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear to yellow fuming liquid; acrid, suffocating odor. Corrosive. Other Acute Effects: lung damage. Chronic Effects: tooth erosion, bronchitis. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, teeth
Primary Entry Routes: inhalation, ingestion, skin contact, eye contact
Acute Effects
Inhalation: The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods.
Inhalation hazard is increased at higher temperatures.
Reactions may occur following a single acute exposure or may only appear after repeated exposures.

Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.
Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.
Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.
Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

Eye: The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.
The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce moderate eye irritation leading to inflammation.
Repeated or prolonged exposure to irritants may produce conjunctivitis.
Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

Skin: The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.
Bare unprotected skin should not be exposed to this material.
The vapor is highly discomforting to the skin.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.
Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Immediately transport to hospital or doctor. DO NOT delay.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
Immediately transport to hospital or doctor. DO NOT delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.
3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

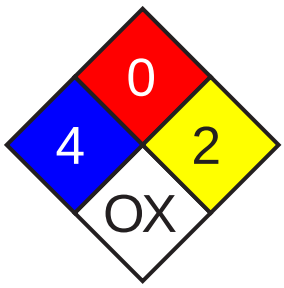
1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).
Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.
Heating may cause expansion or decomposition leading to violent rupture of containers.
Heat affected containers remain hazardous.
Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.
May emit irritating, poisonous or corrosive fumes.
Decomposes on heating and produces toxic fumes of nitrogen oxides (NO_x) and nitric acid.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.
Reacts vigorously with water and alkali.
Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H_2S) as ignition may result.
Reacts with metals producing flammable/explosive hydrogen gas.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
Extinguishers should be used only by trained personnel.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
If fire gets out of control withdraw personnel and warn against entry.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Dangerous levels of nitrogen oxides may form during spills of nitric acid.
Wear fully protective PVC clothing and breathing apparatus.
Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.
Use soda ash or slaked lime to neutralize.

See DOT ERG

Large Spills: DO NOT touch the spill material. Restrict access to area.
Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials.
NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.
Use spark-free and explosion-proof equipment.
Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.
Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.
Avoid smoking, bare lights or ignition sources.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Stainless steel drum. Check that containers are clearly labeled.
Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.

Wear safety footwear or safety gumboots, e.g. Rubber.

Respiratory Protection:

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Other: Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

Glove Selection Index:

BUTYL ..... Best selection
HYPALON ..... Best selection
NEOPRENE..... Best selection
NEOPRENE/NATURAL..... Best selection
PE/EVAL/PE ..... Best selection
SARANEX-23 ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
PVC..... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to slightly yellow liquid. Sharp strong odor.
CAUTION: exothermic dilution hazard.
HIGHLY CORROSIVE. Corrosive to most metals. Powerful oxidizing agent.
Darkens to brownish color on aging and exposure to light.

Physical State: Liquid
Odor Threshold: 0.75 to 2.50 mg/m^3
Vapor Pressure (kPa): 8.26
Vapor Density (Air=1): 1.5
Formula Weight: 63.02
Specific Gravity (H_2O=1, at 4 °C): 1.3-1.42
pH: < 1

pH (1% Solution): 1
Boiling Point: 83 °C (181 °F) at 760 mm Hg
Freezing/Melting Point: -42 °C (-43.6 °F)
Volatile Component (% Vol): 100 (nominal)
Decomposition Temperature (°C): Not applicable
Water Solubility: Soluble in all proportions

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 430 mg/kg
Inhalation (rat) LC_{50}: 2500 ppm/1 hr
Unreported (man) LD_{Lo}: 110 mg/kg

Irritation

Nil reported

See *RTECS* QU 5775000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC_{50} Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC_{50} Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC_{50} Cockle 330-1000 mg/l/48 hr /Aerated water conditions

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Nitric acid *other than red fuming, with more than 70 percent nitric acid*

ID: UN2031
Hazard Class: 8 - Corrosive material
Packing Group: I - Great Danger
Symbols:
Label Codes: 8 - Corrosive, 5.1 - Oxidizer
Special Provisions: B47, B53, T10, TP2, TP12, TP13
Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 2.5 L
Vessel Stowage: **Location:** D **Other:** 44, 66, 89, 90, 110, 111

Shipping Name and Description: Nitric acid *other than red fuming, with not more than 70 percent nitric acid*

ID: UN2031
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: B2, B47, B53, IB2, T8, TP2, TP12
Packaging: **Exceptions:** None **Non-bulk:** 158 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** D **Other:**

Shipping Name and Description: Nitric acid, red fuming

ID: UN2032
Hazard Class: 8 - Corrosive material
Packing Group: I - Great Danger
Symbols: + - Override definitions
Label Codes: 8 - Corrosive, 5.1 - Oxidizer, 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: 2, B9, B32, B74, T20, TP2, TP12, TP13, TP38, TP45
Packaging: **Exceptions:** None **Non-bulk:** 227 **Bulk:** 244
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
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1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Sodium Hydroxide
SOD4950

Section 1 - Chemical Product and Company Identification 61

Material Name: Sodium Hydroxide
CAS Number: 1310-73-2
Chemical Formula: HNaO
Structural Chemical Formula: NaOH
EINECS Number: 215-185-5
ACX Number: X1000118-8
Synonyms: CAUSTIC SODA; CAUSTIC SODA,BEAD; CAUSTIC SODA,DRY; CAUSTIC SODA,FLAKE; CAUSTIC SODA,GRANULAR; CAUSTIC SODA,SOLID; HYDROXYDE DE SODIUM; LEWIS-RED DEVIL LYE; LYE; NATRIUMHYDROXID; NATRIUMHYDROXYDE; SODA LYE; SODA,CAUSTIC; SODA,HYDRATE; SODIO(IDROSSIDO DI); SODIUM HYDRATE; SODIUM HYDROXIDE; SODIUM HYDROXIDE,BEAD; SODIUM HYDROXIDE,DRY; SODIUM HYDROXIDE,FLAKE; SODIUM HYDROXIDE,GRANULAR; SODIUM HYDROXIDE,SOLID; SODIUM(HYDROXYDE DE); WHITE CAUSTIC
General Use: Component of alkali cleaners. Manufacture of soap, pulp and paper; rayon. Chemical manufacture. Neutralizing agent in petroleum refining; manufacture of aluminum, detergents, textile processing, refining of vegetable oils. Laboratory reagent, for organic fusion, etching of metal. Used for regenerating ion exchange resins, lye peeling of fruits and vegetables in the food industry.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
sodium hydroxide	1310-73-2	>98

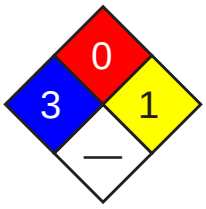
OSHA PEL
TWA: 2 mg/m^3.

NIOSH REL
Ceiling: 2 mg/m^3.

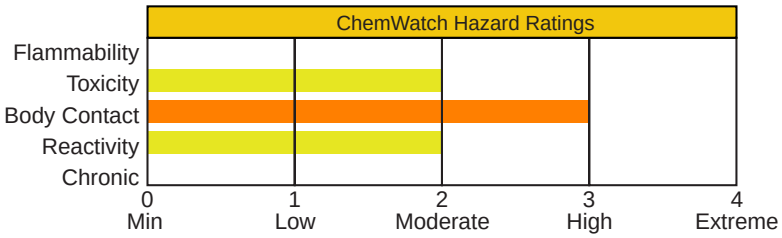
ACGIH TLV
Ceiling: 2 mg/m^3.

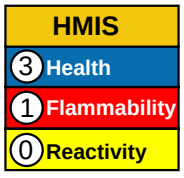
IDLH Level
10 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White, odorless, hydroscopic flakes, lumps, or pellets. Corrosive, causes severe burns to eyes/skin/respiratory tract. Chronic Effects: dermatitis. Reacts with water.

Potential Health Effects

Target Organs: eyes, digestive system, respiratory system, skin
Primary Entry Routes: ingestion, inhalation, skin contact, eye contact
Acute Effects
Inhalation: Generated dust may be highly discomforting and corrosive to the upper respiratory tract if inhaled and is capable of causing severe burns to the upper respiratory tract.

The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.

Severe acute dust inhalation exposure may be fatal due to spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and severe pulmonary edema.

Symptoms of overexposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.

Eye: The solid/dust is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight. The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The solid/dust is highly discomforting and extremely corrosive to the skin and is capable of causing severe burns and ulceration.

Bare unprotected skin should not be exposed to this material. The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Burns are not immediately painful; onset of pain may be delayed minutes or hours; thus care should be taken to avoid contamination of gloves and boots. A 5% aqueous solution applied to the skin of rabbits for 4 hours produced severe necrosis. Instillation of a 1% solution into the conjunctival sac failed to produce ocular or conjunctival injury in rabbits provided the eye was promptly irrigated with copious amounts of water.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The solid is extremely corrosive to the gastrointestinal tract and may be fatal if swallowed.

Ingestion may result in severe burns to the mouth, throat and stomach, pain, nausea and vomiting, swelling of the larynx and subsequent suffocation, perforation of the gastrointestinal tract.

A 1% aqueous solution (pH 13.4) failed to cause gastric, esophageal or other damage in rabbits.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.

Section 4 - First Aid Measures

Inhalation: If dust is inhaled, remove to fresh air. Encourage patient to blow nose to ensure clear breathing passages. Ask patient to rinse mouth with water but to not drink water. Seek immediate medical attention.

Eye Contact: DO NOT delay. Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: DO NOT delay. Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

In case of burns: Quickly immerse affected area in cold running water for 10 to 15 minutes. Bandage lightly with a sterile dressing. Treat for shock if required. Lay patient down. Keep warm and rested. Transport to hospital or doctor.

Ingestion: DO NOT delay. Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to highly alkaline materials:

1. Respiratory stress is uncommon but presents occasionally because of soft tissue edema.
2. Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
3. Oxygen is given as indicated.
4. The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
5. Alkali corrosives damage occurs by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue. Alkalis continue to cause damage after exposure.

INGESTION:

1. Milk and water are the preferred diluents. No more than 2 glasses of water should be given to an adult.
2. Neutralizing agents should never be given since exothermic heat reaction may compound injury.

* Catharsis and emesis are absolutely contra-indicated.

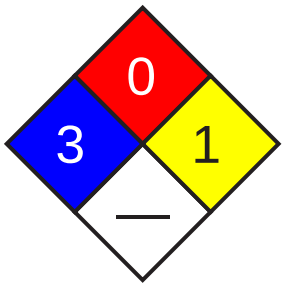
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.
Supportive care involves the following.
1. Withhold oral feedings initially.
2. If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
3. Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
4. Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).
SKIN AND EYE: Injury should be irrigated for 20-30 minutes. Eye injuries require saline.

Section 5 - Fire-Fighting Measures

Extinguishing Media: Use extinguishing media suitable for surrounding area.

See DOT ERG

General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk, however containers may burn.
Solid in contact with water or moisture reacts violently, and solutions are highly alkaline and may cause severe skin burns.



Fire Diamond

Fire Incompatibility: Avoid reaction with strong oxidizers, strong acids, organic materials/compounds.
In presence of moisture, the material is corrosive to aluminum, zinc and tin producing highly flammable hydrogen gas.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Avoid spraying water onto liquid pools.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: DO NOT touch the spill material. Slippery when spilt.
Clean up all spills immediately.
Control personal contact by using protective equipment.
Use dry clean up procedures and avoid generating dust.
Place in suitable containers for disposal.

See DOT ERG

Large Spills: DO NOT touch the spill material. Slippery when spilt.
Keep dry. Reacts violently with water.
Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
Shut off all possible sources of ignition and increase ventilation.
Stop leak if safe to do so.
Use dry clean up procedures and avoid generating dust. Collect recoverable product into labeled containers for recycling. Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
After clean up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing dust. Avoid contact with skin and eyes.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards, otherwise PPE is required.
Handle and open container with care.
Keep dry. Reacts violently with water.
WARNING: Contact with water generates heat.

Avoid contact with incompatible materials.
Avoid physical damage to containers.
Keep containers securely sealed when not in use.
Always wash hands with soap and water after handling. Work clothes should be laundered separately. Launder contaminated clothing before reuse. Use good occupational work practice. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Plastic bag or Packaging as recommended by manufacturer. Glass container. Polyethylene or polypropylene container or Polylined drum.
DO NOT use aluminum, galvanized or tin-plated containers.
Check that containers are clearly labeled.

Storage Requirements: Keep dry. Reacts violently with water.
Store in original containers. Keep containers securely sealed. Store in a cool, dry, well-ventilated area. Store away from incompatible materials and foodstuff containers. Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
DO NOT use aluminum, galvanized or tin-plated containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area DO NOT handle directly. Wear gloves and use scoop/tongs/tools. If risk of overexposure exists, wear NIOSH approved respirator.
If conditions are such that worker exposure potential is high, wear full-face air-supplied breathing apparatus and full protective suit.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: DO NOT handle directly. Wear gloves and use scoop/tongs/tools.
Elbow length PVC gloves or Butyl rubber gloves or Neoprene rubber gloves.
Safety footwear.

Respiratory Protection:
Exposure Range >2 to <10 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range 10 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.
Eyewash unit. Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: White hygroscopic, odorless, pellets, flakes, sticks or solid cast mass. Explosive boiling and spitting will occur if added to hot water. Reacts violently with acids. CAUSTIC alkali. Soluble in alcohol, ether, glycerol.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Formula Weight: 40
Specific Gravity (H_2O=1, at 4 °C): 2.12 at 20 °C
pH: Not applicable
pH (1% Solution): 12.7
Boiling Point: 1390 °C (2534 °F)
Freezing/Melting Point: 318.4 °C (605.12 °F)
Water Solubility: 1 g dissolves in 0.9 ml water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Vigorously exotherms when mixed with water. In the presence of moisture, highly corrosive to aluminum, zinc and tin.
HIGHLY reactive: with ammonium salts evolves ammonia gas. Rapidly picks up moisture from the air and with carbon dioxide in air forms sodium carbonate.
Presence of incompatible materials and storage in unsealed containers.
Product is considered stable under normal handling conditions.
Hazardous polymerization will not occur.

Storage Incompatibilities: Keep dry. Reacts violently with water.
Segregate from water, strong oxidizers, strong acids, organic materials, ammonium compounds, nitro compounds and trichlorethylene.

Section 11 - Toxicological Information

Toxicity
No data reported

Irritation
Skin (rabbit): 500 mg/24h SEVERE
Eye (rabbit): 0.05 mg/24h SEVERE
Eye(rabbit):1 mg/24h SEVERE
Eye(rabbit):1 mg/30s rinsed-SEVERE

See *RTECS* WB 4900000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: LC_{100} Cyprinus carpio 180 ppm/24 hr at 25 deg; TL_m mosquito fish 125 ppm/96 hr (freshwater) ; TL_m Bluegill 99 mg/L/48 hr (tap water)
Biochemical Oxygen Demand (BOD): none
Octanol/Water Partition Coefficient: log K_{ow} = too low to be measured

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible or consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize with dilute acid at an effluent treatment plant.
Recycle containers, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Sodium hydroxide, solid
ID: UN1823
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB8, IP2, IP4
Packaging: **Exceptions:** 154 **Non-bulk:** 212 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 15 kg **Cargo aircraft only:** 50 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

RUST-OLEUM CORP -- LABOR SAVER MARKING PAINTS, 2533 -- 8010-00N021794

========== Product Identification ==========

Product ID:LABOR SAVER MARKING PAINTS, 2533
MSDS Date:09/29/1987
FSC:8010
NIIN:00N021794
MSDS Number: BLRYV
=== Responsible Party ===
Company Name:RUST-OLEUM CORP
Address:11 HAWTHORN PARKWAY
City:VERNON HILLS
State:IL
ZIP:60061
Country:US
Info Phone Num:312-367-7700
Emergency Phone Num:312-864-8200
Preparer's Name:MJS
CAGE:08882
=== Contractor Identification ===
Company Name:RUST-OLEUM CORP
Address:11 HAWTHORN PARKWAY
Box:City:VERNON HILLS
State:IL
ZIP:60061-1583
Country:US
Phone:847-367-7700
CAGE:08882

========== Composition/Information on Ingredients ==========

Ingred Name:PROPANE
CAS:74-98-6
RTECS #:TX2275000
Fraction by Wt: 16-18%
OSHA PEL:1000 PPM
ACGIH TLV:ASPHYXIANT; 9192

Ingred Name:PROPANE, 2-METHYL-; (ISOBUTANE). VP: 40 PSIA. LEL: 1.9%
CAS:75-28-5
RTECS #:TZ4300000
Fraction by Wt: 10-12%

Ingred Name:TITANIUM DIOXIDE
CAS:13463-67-7
RTECS #:XR2275000
Fraction by Wt: 0-8%
OSHA PEL:15 MG/M3 TDUST
ACGIH TLV:10 MG/M3 TDUST; 9293

Ingred Name:SUPP DATA:CAUSE BLINDNESS IF INGESTED.
RTECS #:9999999ZZ

Ingred Name:METHYL ALCOHOL (METHANOL) (SARA III)
CAS:67-56-1
RTECS #:PC1400000
Fraction by Wt: 0-4%
OSHA PEL:S,200PPM/250STEL
ACGIH TLV:S,200PPM/250STEL; 93
EPA Rpt Qty:5000 LBS
DOT Rpt Qty:5000 LBS

Ingred Name:TOLUENE (SARA III)
CAS:108-88-3
RTECS #:XS5250000
Fraction by Wt: 0-18%
OSHA PEL:200 PPM/150 STEL
ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:HEXANE (N-HEXANE)
CAS:110-54-3
RTECS #:MN9275000
Fraction by Wt: 6-10%
OSHA PEL:500 PPM

ACGIH TLV:50 PPM; 9293
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:XYLENES (O-,M-,P- ISOMERS) (SARA III)
CAS:1330-20-7
RTECS #:ZE2100000
Fraction by Wt: 5-20%
OSHA PEL:100 PPM/150 STEL
ACGIH TLV:100 PPM/150STEL;9192
EPA Rpt Qty:1000 LBS
DOT Rpt Qty:1000 LBS

Ingred Name:ETHYLENE GLYCOL (SARA III)
CAS:107-21-1
RTECS #:KW2975000
Fraction by Wt: 0-4%
OSHA PEL:C 50 PPM
ACGIH TLV:C 50 PPM,VAPOR; 9192
EPA Rpt Qty:1 LB
DOT Rpt Qty:1 LB

Ingred Name:VM&P NAPHTHA. VP: 2 @ 20C. LEL: 0.9%
CAS:64742-89-8
Fraction by Wt: 1-3%
OSHA PEL:300 PPM;400 PPM STEL
ACGIH TLV:300 PPM

========== Hazards Identification ==========

LD50 LC50 Mixture:NONE SPECIFIED BY MANUFACTURER.
Routes of Entry: Inhalation:YES Skin:NO Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:(ACUTE) INHAL: ANESTHETIC, IRRIT OF RESP TRACT/ACUTE NERV SYS DEPRESS CHARACT BY HDCH, DIZZ, STAG, CONFUSN, UNCON/ COMA. SKIN/EYE: PRIMARY IRRITANT WHICH DEFATS SKIN & CAN LEAD TO DERMAT W/ RPTD OVERE XP. INGEST: GI IRRIT, NAUS, VOMIT & DIARR. (CHRONIC) RPTS HAVE SHOWN RPTD & PRLNGD OCCUP OVEREXP TO (SEE EFTS OF OVEREXP
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:HLTH HAZ: SOLV W/PERM BRAIN & NERV SYS DMG. OVEREXP TO XYLOL & TOLUENE IN LAB ANIMALS HAS SHOWN LIVER, KIDNEY, SPLEEN & EYE DMG AS WELL AS ANEMIA. IN HUMANS, OVEREXP HAS BEEN FOUND TO CAUSE LIVER & CA RDIAC ABNORMALITIES. OVEREXP TO HEXANE IN HIGH VAP CONC (1000-1500 PPM) OVER A PERIOD OF SEV MONTHS HAS BEEN (SUPP DATA)
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:INHAL: REMOVE FROM EXPOS, RESTORE BRTHG & NOTIFY MD. EYE: FLUSH IMMED W/LRG AMTS OF WATER FOR AT LEAST 15 MIN. NOTIFY MD. SKIN: WASH AFFECTED AREA W/SOAP & WATER, REMOVE CONTAM CLTHG & WASH BEFORE REU SE. WASH HANDS BEFORE EATING/SMOKING. INGEST: DO NOT INDUCE VOMIT. KEEP PERSON WARM, QUIET & GET MD. ASPIR OF MATL IN LUNGS CAN CAUSE CHEM PNEUM WHICH CAN BE FATAL.

========== Fire Fighting Measures ==========

Flash Point Method:TCC
Flash Point:<0F,<-18C
Lower Limits:SEE INGRED
Extinguishing Media:NFPA CLASS B EXTINGUISHERS (CO2, DRY CHEMICAL OR FOAM).
Fire Fighting Procedures:WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP . WATER SPRAY MAY BE INEFFECTIVE. WATER MAY BE USED TO COOL CLSD CNTNRS TO PVNT PRESS BUILDUP (SUPP DATA)
Unusual Fire/Explosion Hazard:KEEP CNTNRS TIGHTLY CLSD. ISOLATE FROM HEAT, ELEC EQUIP, SPARKS & OPEN FLAME. CLSD CNTNRS MAY EXPLODE WHEN EXPSD TO EXTREME HEAT. DO NOT APPLY TO HOT SURFACES.

========== Accidental Release Measures ==========

Spill Release Procedures:REMOVE ALL SOURCES OF IGNITION, VENTILATE AREA AND REMOVE WITH INERT ABSORBENT AND NONSPARKING TOOLS.
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

========== Handling and Storage ==========

Handling and Storage Precautions:DO NOT STORE ABOVE 120F. DO NOT PUNCTURE.
Other Precautions:INTENTIONAL MISUSE BY DELIBERATELY CONCENTRATING AND INHALING CONTENTS CAN BE HARMFUL OR FATAL.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:USE NIOSH/MSHA APPROVED CHEMICAL CARTRIDGE RESPIRATOR (TC23C) TO REMOVE SOLID AIRBORNE PARTICLES OF OVERSPRAY AND ORGANIC VAPORS DURING SPRAY APPLICATION. IN CONFINED AREAS: USE NIOSH/MSHA APPROVED SU PPLIED-AIR RESPIRATOR OR HOODS (TC19C).
Ventilation:PROVIDE GENERAL OR LOCAL EXHAUST VENT IN VOLUME & PATTERN TO KEEP TLV OF MOST HAZ INGREDS BELOW ACCEPTABLE LIMIT.
Protective Gloves:IMPERVIOUS GLOVES .
Eye Protection:CHEMICAL WORKERS GOGGLES .
Other Protective Equipment:NONE SPECIFIED BY MANUFACTURER.
Work Hygienic Practices:WASH HANDS BEFORE EATING OR SMOKING.
Supplemental Safety and Health
FIRE FIGHT PROC: AND POSSIBLE AUTOIGNITION OR EXPLOSION. IF WATER IS USED, FOG NOZZLES ARE PREFERRED. EFTS OF OVEREXP: SHOWN TO CAUSE PERIPHERAL POLYNEUROPATHY WHICH HAS THE POTENTIAL OF BECOMING IRRE VERSIBLE. OVEREXP TO METHYL ALCOHOL HASBEEN SHOWN TO AFFECT CNS, ESPECIALLY OPTIC NERVE. MAY BE FATAL OR (SEE ING 10)

========== Physical/Chemical Properties ==========

HCC:F2
Boiling Pt:B.P. Text:<0F,<-18C
Vapor Pres:SEE INGRED
Vapor Density:HVR/AIR
Evaporation Rate & Reference:SLOWER THAN ETHER
Appearance and Odor:NONE SPECIFIED BY MANUFACTURER.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:BY OPEN FLAME - CO AND CO2.

========== Disposal Considerations ==========

Waste Disposal Methods:DISPOSE OF ACCORDING TO LOCAL, STATE AND FEDERAL REGULATIONS. DO NOT INCINERATE CLOSED CONTAINERS.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Zinc Acetate
ZIN1180

Section 1 - Chemical Product and Company Identification 61

Material Name: Zinc Acetate **CAS Number:** 557-34-6
Chemical Formula: $C_4H_8O_4Zn$
Structural Chemical Formula: $Zn(C_2H_3O_2)_2$
EINECS Number: 209-170-2
ACX Number: X1013450-6
Synonyms: ACETIC ACID,ZINC SALT; ACETIC ACID,ZINC SALT (8CI,9CI); ACETIC ACID,ZINC(II) SALT; DICARBOMETHOXYZINC; ZINC ACETATE; ZINC DIACETATE
General Use: Preserving wood; as mordant in textile dyeing; manufacture of glazes for painting on porcelain; as a laboratory reagent in testing for albumin, tannin, urobilin, phosphate, blood; as an astringent.
Also as a cross-linking agent for polymers; and fuel additive.

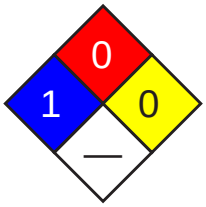
Section 2 - Composition / Information on Ingredients

Name	CAS	%
zinc acetate	557-34-6	98 min.

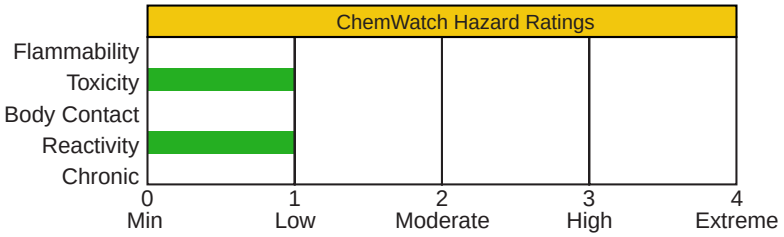
OSHA PEL **NIOSH REL**

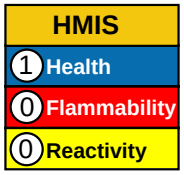
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White crystals; faint acetous (vinegar) odor. Irritating to eyes/skin/respiratory tract. Also causes: upon ingestion: nausea, vomiting, headache, abdominal pain.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, digestive system
Primary Entry Routes: ingestion, inhalation, skin contact, eye contact
Acute Effects

Inhalation: Not normally a hazard due to nonvolatile nature of product. The dust may be highly discomforting to the upper respiratory tract.
The heat decomposition products of zinc acetate cause irritation to mucous membranes, coughing. Severe and chronic exposure to zinc oxide fumes may result in "metal fume fever"; a disabling but transient disease.

Eye: The dust may be highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
Very dilute preparations of zinc acetate have been used as eye drops

Skin: The material is moderately discomforting to the skin if exposure is prolonged.
Open cuts, abraded or irritated skin should not be exposed to this material.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The material is highly discomforting to the gastrointestinal tract and may be harmful if swallowed.

Soluble zinc salts produces irritation and corrosion of the alimentary tract (in a manner similar to copper salts) with pain, vomiting, etc.
Delayed deaths have been ascribed to inanition (weakness and extreme weight loss resulting from prolonged and severe food insufficiency) following severe strictures of the esophagus, and pylorus.
Ingestion may cause irritation or burning of the digestive tract, nausea and vomiting, and watery or bloody diarrhea.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: No human exposure data available. For this reason, health effects described are based on experience with chemically-related materials.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.
Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians:

1.Absorption of zinc compounds occurs in the small intestine.
2.The metal is heavily protein bound.
3.Elimination results primarily from fecal excretion.
4.The usual measures for decontamination (Ipecac Syrup, lavage, charcoal or cathartics) may be administered, although patients usually have sufficient vomiting not to require them.
5.$CaNa_2EDTA$ has been used successfully to normalise zinc levels and is the agent of choice.

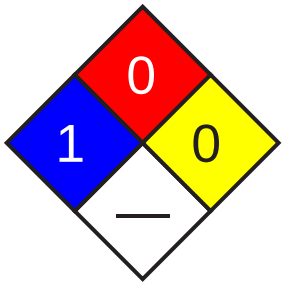
Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
LEL: Not applicable
UEL: Not applicable

Extinguishing Media: There is no restriction on the type of extinguisher which may be used.

General Fire Hazards/Hazardous Combustion Products: Noncombustible. Slight explosion hazard when exposed to strong oxidizers.
Decomposes on heating and produces acrid smoke and toxic fumes of carbon monoxide (CO), carbon dioxide (CO_2) and zinc oxide.

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
An exothermic reaction may occur in contact with sulfuric oleum.



Fire Diamond

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent spillage from entering drains or waterways.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Use dry clean-up procedures and avoid generating dust.
Vacuum up or sweep up.
Place spilled material in clean, dry, sealable, labeled container.

Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent spillage from entering drains or waterways.
Stop leak if safe to do so. Avoid generating dust.

Collect recoverable product into labeled containers for recycling.
Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing dust.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
Avoid contact with moisture.
Handle and open container with care.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use.
Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Recommended Storage Methods: Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. Check that all containers are clearly labeled and free from leaks. Packing as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: None required when handling small quantities. OTHERWISE: Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved dust respirator.
Correct fit is essential to obtain adequate protection.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream and PVC gloves.
Safety footwear.

Other: Overalls. Ensure there is ready access to a safety shower.
Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Available in both the anhydrous and more commonly the dihydrate form. Both forms are available as monoclinic crystals with an acetic acid odor. Both forms are very soluble in water and slightly soluble in alcohol.

Physical State: Divided solid
Vapor Pressure (kPa): Not applicable
Vapor Density (Air=1): Not applicable
Formula Weight: 183.5
Specific Gravity (H_2O=1, at 4 °C): 1.84
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): 5 - 6
Boiling Point: Decomposes at 200 °C (392 °F)
Freezing/Melting Point: 237 °C (458.6 °F)
Volatile Component (% Vol): Not applicable
Decomposition Temperature (°C): 250-400
Water Solubility: 1 g soluble in 23 ml water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 2510 mg/kg
Oral (rat) LD_{50}: 2170 mg/kg

Irritation
Skin (rabbit): 500 mg/24h - mild
Eye (rabbit): 20 mg/24h - moderate

See *RTECS* AK 1500000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Pimephales promelas (fathead minnow) 0.88 ppm/96 hr (soft water) /Conditions of bioassay not specified
BCF: zinc accumulates in some organisms

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible or consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Appendix D

Construction Quality Assurance Plan

National Grid

Construction Quality Assurance Plan

Interim Remedial Measure for
Fleet Building Addition
North Albany Former MGP Site
Albany, New York
NYSDEC Site #401040

March 2025

Construction Quality Assurance Plan

Interim Remedial Measure for

Fleet Building Addition

North Albany Former MGP Site

Albany, New York

NYSDEC Site #401040

March 2025

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Contents

1 Introduction

This *Construction Quality Assurance Plan* (CQAP) has been prepared on behalf of National Grid to support the implementation of the remedial action at the National Grid – North Albany former manufactured gas plant (MGP) site (the site) located in Albany, New York. This CQAP describes the materials, procedures, and testing necessary for the proper construction, evaluation, and documentation of the work to be performed during the remedial activities to be implemented in preparation for the construction of an addition onto the Feet Building, as specified in the Fleet Building Addition Interim Remedial Measure Design (IRM Design; Arcadis, 2025).

1.1 Site Description

The former MGP site is located in the norther portion of the National Grid North Albany Service Center in Albany, New York. Land use in the surrounding area is primarily commercial/industrial, with residential areas located to the west of the facility. The site is bordered by Interstate I-90 to the north, Bridge Street to the south, a Canadian Pacific (CP) Railroad right-of-way to the east, and Broadway to the west. The Hudson River is located approximately 0.5 miles east of the site. The site consists of the following areas:

- Former MGP Area (FMA) – consists of the paved area immediately north and east of Building #2 where the former MGP operations were located.
- Hazardous Waste Storage Tank Area (HWSTA) – consists of the aboveground storage tank area immediately south of Building #2.
- Yard Storage Area (YSA) – consists of the equipment storage area located south of Building #2.
- Off-Site/Downgradient Area (OSDA) – consists of the area east of the National Grid property to approximately 200 feet east of Erie Boulevard.

The site operates as an active utility service center that serves as the primary maintenance, supply, storage, and office support facility for National Grid's operations in Eastern New York State. The North Albany Service Center is located on an approximately 25-acre parcel that consists of several buildings, parking lots, and storage areas. A natural gas regulator station and an electrical substation (the Genesee Street Substation) are located in the northwestern corner of the property.

1.2 Remedial Action Overview

The New York State Department of Environmental Conservation- (NYSDEC-) selected site-wide remedy proposed in the Record of Decision (ROD; NYSDEC 2016) generally includes the following components:

- Removing approximately 12,600 cubic yards (CY) of surface material and subsurface soil in preparation for in-situ soil solidification (ISS) of underlying soils.
- Stabilizing approximately 36,200 CY of in-situ subsurface soil containing significant visual evidence of non-aqueous phase liquid (NAPL) and/or polycyclic aromatic hydrocarbons (PAHs) at concentrations greater than 1,000 parts per million (ppm).
- Excavating approximately 17,400 CY of highly viscous NAPL, heavily NAPL-impacted soil, and NAPL-coated wood chips located in the purifier waste area east/northeast of Building 2.

- Placing clean imported fill material within the purifier waste excavation area east/northeast of Building 2.
- Constructing (i.e., excavating and installing materials for) passive NAPL barrier walls east of Genesee Street substation and along the hydraulically downgradient portion of the FMA to: (1) facilitate NAPL collection and recovery; and (2) prevent further migration of NAPL beyond the FMA. If the Genesee Street substation is de-energized or relocated in the future, National Grid would re-evaluate potential alternatives for addressing NAPL and impacted soil in this area.
- Installing new NAPL recovery wells in the FMA and the HWSTA to facilitate collection and passive recovery of LNAPL and DNAPL. Additionally, new “sentinel” NAPL monitoring wells will be installed west of Broadway.
- Installing up to eight new NAPL recovery wells in the OSDA to facilitate collection and passive recovery of DNAPL.
- Removing approximately 6,600 CY of surface material (i.e., asphalt and gravel subbase at locations not subject to ISS treatment or excavation) to facilitate installation of a new asphalt cap.
- Constructing a new asphalt cap in the FMA to prevent potential future exposures to remaining impacted media.
- Treating (via low-temperature thermal desorption [LTTD]) and disposing of material excavated from the purifier waste area that is characteristically hazardous for benzene (assumed to be approximately 8,700 CY).
- Disposing approximately 21,200 tons of surface material and other debris as a non-hazardous waste at a construction and demolition (C&D) landfill.
- Disposing approximately 20,600 CY of material as a non-hazardous waste at a solid waste landfill. The material will be excavated from: (1) the purifier waste area; (2) the ISS treatment area (surface and shallow subsurface soil to facilitate ISS); and (3) the location where the passive NAPL barrier wall will be installed.
- Conducting quarterly NAPL monitoring in the FMA and OSDA to passively recover LNAPL and DNAPL that may accumulate in new and existing NAPL recovery wells.
- Conducting annual groundwater monitoring in the OSDA to evaluate the dissolved-phase concentrations of constituents of concern in OSDA groundwater.
- Conducting annual inspections of the asphalt cap (to identify cracks, deterioration, etc.) and implementing repairs to the cap, as necessary.
- Establishing institutional controls for the FMA and OSDA to prohibit use of groundwater and limit the future development and use of these areas. The institutional controls will include a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, in any currently unoccupied on-site buildings upon occupancy or when site-related chemicals of concern are no longer in use in areas inside the on-site buildings.

The portion of the remedy presented in the IRM Design that will be implemented prior to the Fleet Building addition construction includes completing the activities below within the proposed Fleet Building footprint, starting approximately 8 feet from the existing building and extending approximately 10-foot east, west, and south (to allow for excavation as part of the full-scale remedy to extend to the IRM remedial limits, and not be limited by the new building addition).

- Removing approximately 845 CY of surface material and subsurface soil to a depth of approximately 6 feet below ground surface in preparation for ISS of underlying soils and the removal of approximately 15 CY of stone/soil for the installation of a new sanitary sewer pipe from the oil-water separator inside the Fleet Building.
- Stabilizing approximately 2,632 CY of in-situ subsurface soil containing visual evidence of NAPL and/or PAHs at concentrations greater than 500 ppm, which is a lower cleanup value than that identified for the overall site remedy. The cleanup value for the IRM was reduced in response to NYSDEC's comments contained in a November 18, 2024 letter providing conditional approval of an October 17, 2024 conceptual work plan for soil remediation in support of the Fleet Building addition. The NYSDEC's comments were addressed in December 12, 2024 e-mail correspondence to the NYSDEC, which was accepted by the NYSDEC on December 13, 2024.
- Placing clean imported fill material within the excavation/ISS area to match surrounding grade.

1.3 Definitions and Terms

The following terms and abbreviations are used throughout this CQAP. The definition of each term or abbreviation is consistent throughout this plan.

ASTM American Society for Testing and Materials

Contractor The person or persons selected by National Grid to perform the remedial work, including the person or persons hired by the Contractor to install the components of the remedial work (e.g., ISS, excavation, etc.), and the person or persons designated by the Contractor to perform the remedial work.

CQA Construction quality assurance

CQC Construction quality control

Engineer The person or persons responsible for the design aspects of the project. The Engineer's duties include reviewing modifications to the IRM Design. In addition, the Engineer will be responsible for the quality assurance/quality control (QA/QC) aspects of the project. Duties will include CQA sampling, testing, determination of work limits, and measurement of work to assist with payment and final acceptance.

Manufacturer The person or persons designated by the Contractor to supply/provide construction materials to be used on the project.

Components of the IRM Design include the Design Report, Design Drawings; Specifications, this CQAP, Community Air Monitoring Plan (CAMP), and Health and Safety Plan (HASP).

1.4 CQAP Organization

The remainder of this CQAP has been organized into the following sections:

Section	Purpose
Section 1 – Introduction	Presents the purpose and contents of the CQAP and definition of terms used throughout the CQAP.
Section 2 – CQA Roles, Qualifications, and Responsibilities	Identifies the CQA roles, qualifications, and responsibilities of Engineer and Contractor personnel.
Section 3 – Documentation	Identifies the CQA documentation requirements for the project.
Section 4 – Pre-Construction and Site Preparation Activities	Summarizes the CQA requirements for pre-construction and site preparation activities.
Section 5 – Excavation, Dewatering, and Waste Handling/Management	Presents the CQA requirements for excavation, dewatering, and waste handling/management.
Section 6 – In-situ Soil Solidification	Presents the CQA requirements for ISS operations.
Section 7 – Decontamination	Identifies the CQA activities associated with decontamination of vehicles, equipment, and personnel.
Section 8 – Backfilling, Restoration, and Demobilization	Summarizes the CQA activities to be performed during backfilling, restoration, and demobilization activities.
Section 9 – References	Includes a list of reference documents used in the preparation of this CQAP.

2 CQA Roles, Qualifications, and Responsibilities

2.1 General

This section identifies the general CQA roles, qualifications, and responsibilities of Engineer and Contractor personnel. Additional requirements are specified elsewhere in the IRM Design.

2.2 Engineer

The Engineer will observe construction activities and document that the materials and workmanship delivered by the Contractor comply with the requirements of the IRM Design and are of sufficient quality to permit the development of such construction completion certifications as may be required by the NYSDEC. The observation, sampling, and/or documentation of construction activities and associated procedures will be performed by a person or persons familiar with construction procedures and materials. As discussed below, Engineer personnel will include a Project Manager, CQA Engineer, and CQA Observer(s). These individuals will operate under the direct supervision of a Professional Engineer licensed in the State of New York.

2.2.1 Project Manager

The Project Manager must have experience in a position of significant responsibility for construction projects similar in magnitude and complexity to the project being undertaken. The Project Manager must be familiar with the project requirements, objectives, and the IRM Design. The Project Manager's responsibilities include the following:

- Attending to routine daily topics related to the overall performance of the construction activities.
- Attending project meetings.
- Providing the appropriate technical review (i.e., by qualified representatives of the Engineer) of the IRM Design, modifications to the IRM Design, and construction summary reports.
- Maintaining contact with National Grid, the CQA Engineer/Observer(s), the Contractor, and subcontractors regarding conformance with the requirements in this CQAP.
- Assisting in the review and interpretation of field and laboratory testing results.
- Assisting in the review of shop drawings, product data, and other Contractor submittals.
- Performing periodic site visits/inspections to review the progress of the work.
- Identifying deficiencies or instances of non-compliance during the construction activities (based on QC testing results) so corrective actions can be taken.
- Reviewing weekly construction reports.
- Preparing an Engineering Certification Report or Construction Completion Report (as appropriate) at the end of the project.

National Grid will be responsible for coordinating with the NYSDEC and other public stakeholders, as outlined in Attachment A (Organization Chart) of the IRM Design, unless National Grid delegates such authority to the Engineer's Project Manager.

2.2.2 CQA Engineer

The CQA Engineer must demonstrate knowledge of construction procedures, materials, and CQA test methods through a combination of formal education, training, and experience. The CQA Engineer must be familiar with the project requirements, objectives, and the IRM Design. The CQA Engineer's responsibilities include the following:

- Overseeing and coordinating the CQA sampling and testing.
- Attending project meetings.
- Documenting activities that could result in damage to the site and reporting these activities to National Grid and the Project Manager.
- Reviewing daily construction reports with the CQA Observer(s).
- Serving as the daily contact person for the CQA Observer(s).
- Maintaining routine contact with National Grid and the Contractor regarding conformance with the requirements of this CQAP.
- Reviewing shop drawings, product data, and other Contractor submittals.
- Reviewing field and laboratory CQA testing results for conformance with the IRM Design.
- Identifying/determining areas that require re-work and/or repair.
- Monitoring the delivery of samples to the CQA Laboratory for testing.
- Coordinating the activities of the CQA Observer(s) to establish proper sampling procedures.
- Performing regular site visits to review CQA procedures and progress of the work.

2.2.3 CQA Observer(s)

The CQA Observer(s) must demonstrate knowledge of construction procedures, materials, and CQA test methods through a combination of formal education, training, and experience. The CQA Observer(s)'s responsibilities include the following:

- Attending project meetings.
- Preparing daily construction reports.
- Performing and documenting field and laboratory CQA testing at the frequencies established in the IRM Design.
- Arranging for/coordinating the delivery of samples to the CQA Laboratory.
- Identifying areas of non-conformance based on the results of CQA field and laboratory testing.
- Observing construction materials (e.g., soils, cement, geosynthetics, etc.) delivered to the site to determine general conformance with the IRM Design.
- Observing and recording procedures used for the:
    - Installation, maintenance, and removal of storm water diversion controls;
    - Excavation of soils;
    - ISS treatment;
    - Structural monitoring (i.e., vibration and settlement monitoring) of utilities and structures;
    - Collection, treatment, and discharge of project-related waters;
    - Suppression/control of noise, vapors, dust, and odors;
    - Implementation of the community air monitoring program;
    - Decontamination of equipment/personnel;
    - Handling, treatment, and disposal of waste materials;

  - Backfilling/restoration of excavated and disturbed areas; and
  - Demobilization of project equipment, materials, and personnel.
- Verifying that certificates, maintenance and operating manuals, and other data required to be assembled and furnished by the Contractor are in accordance with the IRM Design.

2.3 Contractor

The Contractor will be trained and experienced, and demonstrate that its superintendent, field crew foreman, and subcontractors have similar experience in the construction, installation, and performance of the remedial activities outlined in the IRM Design. The Contractor shall provide evidence of prior work on satisfactorily completed projects of similar magnitude and complexity to this project.

The Contractor's responsibilities include the following:

- Reviewing and familiarizing personnel with the IRM Design.
- Maintaining lines of communication with National Grid and the Engineer to identify and discuss field issues as they arise.
- Coordinating with all equipment suppliers to document compliance with the CQAP requirements.
- Providing National Grid and the Engineer written notice at least 5 days in advance of any tests or inspections required by the IRM Design; timely notice of all other tests and inspections; and an additional 48-hours' notice prior to the actual performance of any test or inspection.
- Preparing and submitting shop drawings, product data, and samples required by the IRM Design to the Engineer in a timely manner.
- Identifying potential design and/or construction issues as early as possible to allow resolution in a manner that will not impact the quality of the construction or the schedule of construction activities.
- Maintaining a continuous record of any approved changes or modifications to the IRM Design.

2.3.1 Contractor's Surveyor

The Contractor's surveyor will establish and maintain survey control and collect survey data necessary for the proper construction and documentation of the work. Survey activities will be carried out by personnel practiced in land survey techniques and under the direction of a Professional Land Surveyor licensed in the State of New York. The responsibilities of the Contractor's surveyor include (but are not limited to) the following:

- Surveying and documenting pre-construction site conditions.
- Surveying and documenting the locations, elevations, and alignments of existing utilities to be protected and/or removed/replaced during the project.
- Establishing excavation/ISS area survey control points and laying out excavation/ISS area limits.
- Once installed, surveying the excavation and ISS area locations, elevations, and limits.
- Establishing removal elevation tracking locations for each excavation area and monitoring excavation elevations throughout the work.
- Surveying and documenting the locations, elevations, and alignments of any subsurface structures/features encountered during the work.
- Surveying and documenting the final excavation and ISS elevations at each removal elevation tracking location.

- Surveying and documenting final fill (e.g., general soil fill, sub-base, topsoil, etc.) and demarcation layer at each fill elevation tracking location.
- Surveying the locations, elevations, and alignments of new utilities installed during the project.
- Surveying and documenting post-construction (final) site conditions.
- Providing survey data to the Contractor and Engineer on a periodic basis throughout the project.
- Developing as-built survey drawings.

2.3.2 Contractor's Community Air Monitoring Subcontractor

As indicated in Specification Section 01 35 49 (Community Air Monitoring Plan), the Contractor is required to provide a qualified third-party subcontractor to implement the community air monitoring program. Subcontractor field personnel will have at least five years' experience with similar activities at environmental sites and will operate under the supervision of an office-based Certified Industrial Hygienist (CIH). The responsibilities of the Contractor's community air monitoring subcontractor include (but are not limited to) the following:

- Calibrating community air monitoring equipment on a daily basis (or more frequently if recommended by the manufacturers).
- Establishing community air monitoring locations (upwind and downwind) on a daily basis.
- Monitoring meteorological conditions and modifying community air monitoring locations as necessary and appropriate.
- Notifying the Contractor of activities that cause elevated community air monitoring readings (to mitigate potential exceedances of community air monitoring action levels before they occur).
- Performing periodic inspections of community air monitoring equipment to verify that equipment is operating properly.
- Maintaining and archiving community air monitoring data at the site.
- Summarizing community air monitoring data and preparing weekly community air monitoring reports.
- In the event of an exceedance, immediately notifying (in real-time) National Grid, the Contractor, and the Engineer.
- Documenting exceedances of community air monitoring action levels.

2.3.3 Contractor's Geotechnical Instrumentation Monitoring Subcontractor

As indicated in Specification Section 31 09 13 (Geotechnical Instrumentation and Monitoring), the Contractor is required to provide and implement the monitoring program including vibration and settlement monitoring. Field personnel will have at least three years' experience with similar activities and will operate under the supervision of an office-based Professional Engineer licensed in New York State. The responsibilities for the structural monitoring are set forth in Specification Section 31 09 13 (Geotechnical Instrumentation and Monitoring) and include (but are not limited to) the following:

- Performing baseline readings of all vibration monitors after the pre-construction structural survey, but before any construction work begins.
- Performing baseline readings of all settlement monitors before any excavation begins.
- Recording, reporting, and submitting daily readings of vibration and settlement monitors.
- Recording and reporting peak hourly vibration monitoring data.

2.3.4 Contractor's Structural Engineering Subcontractor

As indicated in the IRM Design, the Contractor is required to perform pre-remediation structural surveys of the Fleet Building and fueling station to document pre-remediation conditions and serve as the baseline for a post-remediation survey. The pre-remediation survey (and post-remediation survey) shall be conducted by a third-party Professional Engineer licensed in New York State and shall include, but not be limited to, visual inspection and photographic documentation of the existing conditions of the above-identified building and fueling station. The inspections shall document the condition of the foundation, basement/subsurface interior walls (if present), doors and windows (jambs, casings, and glass), and other signs of potential distress of structural components, as indicated in Specification Section 02 21 19 (Structural Surveys). The Professional Engineer that conducts the inspections shall prepare and submit a pre-remediation structural survey report to National Grid and the Engineer before Contractor mobilization. The report shall include written text, photographs, and any relevant measurements or descriptions to document the pre-remediation conditions of the Fleet Building and fueling station.

3 Documentation

3.1 General

The documentation of construction activities will support a determination of whether the work has been carried out in general conformance with the IRM Design. The documentation process includes recognition of construction tasks that will be observed and documented; assignment of responsibilities for the observation, testing, and documentation of these tasks; and the completion of the required reports, data sheets, forms, and checklists to provide an accurate record of the work performed during the Remedial Action.

3.2 Daily Construction Reports

The CQA Engineer and CQA Observer(s) will complete a daily summary report of each day's construction activities. The daily construction report will contain, at a minimum, the following information:

- Date, project name, location, and the number and names of people onsite.
- Time work starts and ends, in addition to the time of work stoppages related to inclement weather, or insufficient equipment or personnel or other reasons.
- Data on weather conditions, including temperature, humidity, wind direction and speed, cloud cover, and precipitation.
- Overview of community air monitoring activities being performed by the Contractor.
- Contractor's workforce, equipment, and materials delivered to or removed from the job site.
- Chronological description of work in progress, including notices to or requests from the Contractor and/or installer.
- Identification of any health and safety issues.
- Description and results of any CQA field testing performed by the CQA Observer(s) or Contractor.
- Documentation of any problems/deficiencies noted during construction (e.g., when construction materials or activities are observed or tested that do not meet the requirements of the IRM Design), and corrective actions taken by the Contractor to address or resolve the problems/deficiencies. The documentation of problems/ deficiencies and corrective actions may include the following information:
  - A description of the problem or deficiency, including reference to supplemental data or observations leading to the identification of the problem or deficiency.
  - Location of the problem or deficiency, including how and when the problem or deficiency was discovered.
  - Identification of corrective actions taken by the Contractor to address or resolve the problem/deficiency. If the corrective actions have already been taken by the Contractor, observations and documentation showing that the problem/deficiency was resolved should be included. If the problem/deficiency has not been resolved by the end of the day upon which it was discovered, the documentation will state that the deficiency was unresolved at the end of the day.
- A listing of CQA samples collected, marked, and delivered to the CQA Laboratory.
- A record of communications with other onsite parties, outside companies, regulatory agencies, or consultants regarding the day's construction activities.
- A record of calibrations or standardizations performed on field testing equipment, including actions related to the results of re-calibrations.

3.3 Photographs

The CQA Observer(s) will photograph work in progress, problems, and deficiencies throughout the project. Photographs will be in color print format and will be filed in chronological order in a permanent protective file and computer storage system.

The following information will be documented in the daily report or a logbook for each photograph:

- Date and time.
- Subject matter.
- Location where photograph was taken.

3.4 Contractor Submittals

The Contractor will be required to prepare and submit numerous plans, shop drawings, schedules, and other project data to the Engineer throughout the project. Submittals will be reviewed by the Engineer for general conformance with the IRM Design. The Contractor will not be permitted to perform any activity that directly or indirectly involves the item or items covered by a submittal until a “Reviewed” or “Reviewed and Noted” stamp is provided by the Engineer.

The Engineer’s review shall in no way be construed as permitting departure from the IRM Design, except where the written request by the Contractor and written approval by the Engineer and National Grid for such departure is provided. The Engineer’s review does not relieve the Contractor of any responsibility to comply with applicable laws, rules, regulations, or agreements.

The list of required Contractor submittals is provided as an attachment to Specification Section 01 33 00 (Submittal Procedures). Additional information regarding the submittal process and requirements is provided in Specification Section 01 33 00 (Submittal Procedures).

3.5 Project Meetings

Meetings will be held on a regular basis during the project. They include a pre-construction meeting, safety/tailgate meetings, progress and coordination meetings, pre-final inspection meeting, corrective measures inspection meeting, and/or pre-certification inspection and closeout meeting. A brief description of each project meeting is provided below and additional information is provided in Specification Sections 01 31 19.13 (Project Meetings) and 01 31 19.23 (Progress Meetings).

3.5.1 Pre-Construction Meeting

Following Contract award and prior to Contractor mobilization, a pre-construction meeting will be held at the site to: (1) introduce project team members representing National Grid, the Engineer, the Contractor, NYSDEC, and New York State Department of Health (NYSDOH); (2) review Contract requirements; (3) establish a detailed schedule of operations; and (4) resolve issues (if any) raised by the attending parties. Following the meeting, National Grid or its representative will prepare meeting minutes to document the proceedings and decisions made by those in attendance. Meeting minutes will be circulated to all attendees and other parties affected by the decisions made at the meeting. Failure by the Contractor to inform National Grid, within five business days of

receiving the minutes, of any discrepancies or inaccuracies contained therein indicates that the Contractor concurs with the Engineer's summary of the meeting.

3.5.2 Safety/Tailgate Meetings

Safety/tailgate meetings will be held at the site daily to discuss day-to-day operations, daily schedule, health and safety issues, Contractor coordination issues, and general project status. Daily safety/tailgate meetings will be attended by the Contractor's onsite project foreman, the Engineer's representative, National Grid (as necessary), and other parties to be onsite during the day.

3.5.3 Progress and Coordination Meetings

Progress and coordination meetings will be held onsite for the duration of the project (generally on a weekly basis). Participants at these meetings will include National Grid, the NYSDEC, NYSDOH, the Engineer, onsite representatives of the Contractor, and (if required by National Grid) officers of the Contractor's firm. Progress and coordination meetings will be held to discuss issues including (but not limited to) project status, schedule, scope of work, and overall project implementation.

Following each meeting, National Grid or its representative will prepare meeting minutes to document the proceedings and decisions made by those in attendance. Meeting minutes will be circulated to all attendees and other parties affected by the decisions made at the meeting. Failure by the Contractor to inform National Grid, within five business days of receiving the minutes, of any discrepancies or inaccuracies contained therein indicates that the Contractor concurs with National Grid's summary of the meeting.

3.5.4 Substantial Completion (Pre-Final) Inspection Meeting

A pre-final inspection shall be held at the site trailer at least fourteen (14) calendar days prior to completion of construction. The meeting shall be attended by National Grid, the Contractor (including the Project Manager and Project Supervisor), and the Engineer to evaluate the completion of the construction and consistency with the IRM Design, Consent Order, ROD, and applicable federal and state laws, rules, and regulations. The meeting will also be attended by NYSDEC and NYSDOH. A written summary of the pre-final inspection shall be prepared by the Engineer and distributed to the meeting attendees.

3.5.5 Corrective Measures Inspection Meeting

A corrective measures inspection shall be held at the site trailer (if needed, based on comments provided by the NYSDEC associated with the pre-final inspection) within fourteen (14) calendar days following completion of the corrective measures. The meeting shall be attended by NYSDEC, National Grid, the Contractor (including the Project Manager and Project Supervisor), and the Engineer to evaluate the completion of the corrective measures. The meeting will also be attended by NYSDEC and NYSDOH, as needed. A written summary of the corrective measures inspection shall be prepared by the Engineer and distributed to the meeting attendees.

3.5.6 Final Inspection and Close-out Meeting

A final inspection shall be held at the site within thirty (30) days after completion of construction. The meeting shall be attended by NYSDEC, National Grid, the Contractor (including the Project Manager and Project

Supervisor), and the Engineer to evaluate the completion of the remedial activities. The meeting will also be attended by NYSDEC and NYSDOH, as needed. A written summary of the pre-certification inspection shall be prepared by the Engineer and distributed to the meeting attendees.

3.6 Project Record Documents

Project record documents include the following:

- The IRM Design (and any addenda).
- Change Orders and other modifications to the IRM Design.
- Engineer's Field Orders or written instructions.
- Approved Contractor submittals (e.g., shop drawings, working drawings, samples, etc.).
- Meeting minutes.
- Field test records.
- Contractor's updated work schedule.
- As-built survey drawings.

These items will be maintained at the site (in an organized manner) and updated by the Contractor as work progresses and as items are approved. Additional information and requirements for project record documents are provided in Specification Section 01 78 39 (Project Record Documents).

3.7 Construction Completion Report

The Engineer will prepare a Construction Completion Report (CCR) in accordance with Section 5.8 of NYSDEC's Program Policy document titled "DER-10 / Technical Guidance for Site Investigation and Remediation", dated May 2010 (DER-10) and the 2003 Consent Order. The CCR will be submitted to the NYSDEC within approximately 60 days after construction is completed. The report will be organized as outlined in Section 5.8(b) of DER-10 and be prepared in a format based on available template on the NYSDEC's website. The CCR will generally present, but not be limited to, relevant background information, a step-by-step summary description of the activities undertaken to construct and implement the remedial action, a description of any issues encountered during construction and the resolution, changes made to the design and why the changes were made, quantities and concentrations of constituents removed or treated, an identification of the performance standards achieved by the remedy, a chronology of events, and a certification by a Professional Engineer licensed to practice in New York State. The report will be supported by tables, drawings, and attachments, such as the following:

- ISS mixing cell summary table identifying the following for each ISS cell: the cell ID, mixing date, top and bottom elevations, treated soil volume and mass, volumes/weights of grout reagents mixed into each cell, QA/QC sampling locations/intervals, and unconfined compressive strength (UCS) and permeability test results.
- Waste shipment summary table identifying manifest numbers, weights, and disposal locations for each waste load transported for offsite treatment and disposal.
- Data tables presenting laboratory analytical results for waste characterization samples and imported fill material samples.
- A summary sheet identifying quantities of materials recycled, re-used, treated, and disposed, and corresponding facility locations (as applicable).

- “As-built” drawings bearing the stamp and signature of a Professional Engineer licensed to practice in New York State and showing:
  - Surveyed excavation/ISS limits and elevations, demarcation layer locations and elevations, and geotechnical verification soil sampling locations/elevations.
  - Permanent survey markers for horizontal and vertical control for site management.
- Soil boring logs for core holes completed to confirm the integrity of the ISS mixing.
- Fully-executed manifests/certificates of disposal documenting the offsite transportation and treatment/disposal of waste materials generated as part of the remedial activities.
- Copies of weekly field reports and air monitoring logs documenting results of air monitoring performed in accordance with the CAMP.
- Laboratory analytical data reports and data validation reports.
- Key project documents summarizing previous investigation and remedial activities.
- Correspondence with NYSDEC and others documenting changes to the remedial construction and other information, as deemed relevant to the remedial activities.

4 Pre-Construction and Site Preparation Activities

4.1 General

This section identifies the initial activities to be performed at the site following Contractor mobilization. In general, those activities include: (1) the performance of pre-construction surveys; (2) the installation of erosion and sediment control measures; (3) the installation of temporary traffic control and site security measures; and (4) the construction of containment and decontamination areas. Additional information regarding each of these activities is provided below.

4.2 Pre-Construction Surveys

An initial site survey will be performed by the Contractor's surveyor to document existing (pre-construction) site conditions. During these activities, the surveyor will also establish survey control for the proper construction, documentation, and testing of subsequent work activities (e.g., excavation, ISS installation, etc.). The CQA Observer(s) will document, through visual observation, that survey activities are performed in accordance with Specification Sections 01 71 23 (Field Engineering) and 02 21 19 (Structural Surveys) and survey documentation conforms to the requirements of Specification Section 01 78 39 (Project Record Documents). The CQA Observer(s) will also obtain photographic documentation of pre-construction conditions prior to the initiation of construction activities.

Prior to initiating any construction activity that could generate vibrations, the Contractor's Third-party Professional Structural Engineer will perform pre-construction structural surveys of the Fleet Garage and fueling station. The results of the pre-construction structural surveys will be documented in a report (stamped/signed by the Contractor's Professional Structural Engineer) and provided to the National Grid/ Engineer within two weeks of completing the surveys. The CQA Observer(s) will document, through visual observation, that the structural engineer activities are performed in accordance with Specification Section 02 21 19 (Structural Surveys).

4.3 Erosion and Sediment Control Measures

Prior to initiating any intrusive activities, erosion and sediment control measures will be installed by the Contractor. The CQA Observer(s) will document, through visual observation, that erosion and sediment control measures are installed, inspected, and maintained by the Contractor in accordance with the Design Drawings, Specification Sections 01 35 43.13 (Environmental Procedures for Hazardous Materials), 01 41 26 (Storm Water Pollution Prevention Plan), and 01 57 05 (Temporary Controls).

4.4 Temporary Traffic Control and Site Security Measures

Temporary traffic control and site security measures (e.g., fencing, barriers, signage, etc.) will be installed by the Contractor to maintain vehicular and pedestrian traffic and preserve the safety of motorists, workers, and pedestrians during the project. The Contractor will provide and install traffic control measures to safely detour onsite traffic around the work area. The section of driveway and parking area south of the Fleet Building and east of the fueling station will be closed to vehicle and pedestrian traffic (i.e., closed to through traffic) during remedial

activities. Traffic control requirements for the proposed traffic detour are detailed in the IRM Design and 01 55 26 (Maintenance and Protection of Traffic).

Security around excavation, ISS, handling, decontamination, and storage areas shall be maintained during both work and non-work hours. The level of security shall be dependent on the activities being performed and location of activities. Security measures to be implemented include: (1) perimeter fencing; (2) temporary fencing and/or barriers; (3) warning tape and signs; (4) maintenance of sign-in/sign-out sheets; and (5) implementation of safe work practices. The CQA Observer(s) will document, through visual observation and written sign-in/sign-out documentation, that temporary traffic control and site security measures are installed, inspected, and maintained by the Contractor in accordance with the Design Drawings and Specification Section 01 57 33 (Security).

4.5 Containment and Decontamination Areas

The Contractor will construct containment and equipment/personnel decontamination areas in the locations shown on the Design Drawings, or in alternate locations proposed by the Contractor and approved by National Grid and the Engineer. The CQA Observer(s) will document, through visual observation, that: (1) containment and decontamination areas are constructed in accordance with the IRM Design; and (2) geosynthetics (i.e., geomembranes and geotextiles) used in the construction of containment and decontamination areas are not damaged during installation. The CQA Observer(s) will document, through visual observation, that all geosynthetics are installed, inspected, and maintained by the Contractor in accordance with the Design Drawings, Specification Sections 31 05 19.13 (Geotextiles for Earthwork) and 31 05 19.16 (Geomembranes for Earthwork).

Once constructed, the containment and decontamination areas will be partially filled with clean water and allowed to stand for a period of at least 48 hours. During this period, the CQA Observer(s) will document any observed leaks in these areas. If leaking is observed, the Contractor will investigate the source/cause of the leak and repair any damage to the containment or decontamination area.

During construction, the Contractor will be responsible for the maintenance of containment and decontamination areas. Maintenance activities may include the placement of additional stone (to maintain sufficient cover above the geosynthetics), the periodic pumping of accumulated liquids to the onsite wastewater storage (frac) tank(s), and the repair of any damage to the geosynthetics. In the event that the geosynthetics are damaged during the work, the Contractor will promptly notify National Grid and the Engineer and take immediate steps to repair such damage. The CQA Observer(s) will document that the geosynthetics are repaired by properly trained/qualified individuals in accordance with the manufacturer’s QA/QC manual and/or recommendations.

5 Excavation, Dewatering, and Waste Handling/ Management

5.1 General

This section identifies the general CQA activities specific to the excavation, dewatering, and handling/ management of waste materials during the Remedial Action. Additional information and requirements are provided in the Specifications.

5.2 Excavation Activities

The Contractor will excavate materials to the vertical and horizontal limits specified on the Design Drawings. During these activities, the CQA Observer(s) will document, through visual observation, that: (1) excavation activities are performed in accordance with Specification Section 31 00 00 (Earthwork); and (2) waste materials are handled/managed in accordance with Specification Section 02 81 00 (Transportation and Disposal of Waste Materials). Pile foundations constructed of timber, steel, and/or concrete may have formerly supported the 3 million cubic foot gas holder shown to be within the proposed excavation limits. If encountered, the pile foundations will be removed to the extent practical to facilitate ISS.

In certain instances, excavated soils and debris (e.g., concrete, timber piles) may be stockpiled on a temporary basis within the excavation limits or in a lined material staging area constructed by the Contractor in accordance with the Design Drawings and Specifications. Temporary stockpiles will be covered at all times (during both work and non-work hours) with minimum 10-mil thick polyethylene liners when not in use. Liners will be properly anchored to prevent uplift due to wind conditions and will be installed to minimize ponding of precipitation. The CQA Observer(s) will document, through visual observation, that: (1) excavated materials are stockpiled in approved locations; and (2) stockpiles are properly covered when not in use.

For each excavation area, the Contractor's surveyor will monitor excavation elevations and survey the final excavation elevation at each removal elevation tracking location (to document that the required vertical limit of excavation was achieved). The CQA Observer will: (1) document, through visual observation, that survey activities and documentation are in accordance with Specification Section 01 71 23 (Field Engineering); and (2) review survey data in the field (as generated) to confirm that the vertical limit of excavation was achieved.

Community air monitoring will be performed during all intrusive and/or potential dust-generating activities and the Contractor will implement vapor, odor, and dust control measures as required by the IRM Design. During excavation activities, the CQA Observer(s) will document, through visual observation, that: (1) community air monitoring is being performed in accordance with the CAMP and Specification Section 01 35 29 (Contractor's HASP); and (2) vapor, odor, and dust control measures are maintained onsite and implemented as required by the IRM Design.

5.3 Excavation and Material Dewatering

Based on available data, the groundwater table has historically been below the proposed 6-foot pre-excavation depth in the ISS area. During multiple gauging/sampling events, the groundwater table has been as much as 3 to

5 feet below the bottom of the proposed 6-foot pre-excavation. However, during one event, the groundwater table was above the proposed pre-excavation depth by approximately 1 to 2 feet. The Contractor will install/construct temporary extraction points within the excavation areas to collect and remove groundwater, if needed. The temporary extraction points will be used to lower the normal water table elevation and maintain the depressed water table elevation at a depth of approximately 2 feet below the target removal elevation. Alternatively, the pre-excavation depth in the ISS area may be raised to avoid excavation below the water table and associated water management. During these activities, the CQA Observer(s) will document, through visual observation, the effectiveness of the Contractor's dewatering activities according to the Specification Section 31 23 19 (Dewatering).

The Contractor will dewater/stabilize excavated materials as necessary to (at a minimum) pass Paint Filter testing procedures prior to leaving the site. The Contractor's means and methods of dewatering/ stabilizing excavated materials will conform to the requirements of the IRM Design. Those requirements prohibit the use of quick lime, lime kiln dust, or other lime-based stabilizing agents containing more than 50% calcium and/or magnesium oxide.

The CQA Observer(s) will document, through visual observation, that: (1) excavated materials are sufficiently dewatered/stabilized prior to transporting offsite; and (2) water generated during excavation and material dewatering activities is properly collected in the frac tank and transported offsite for treatment in accordance with the IRM Design. The Contractor will be responsible for meeting the discharge requirements of the treatment facility. The CQA Observer(s) will observe the frac tank installation/assembly at the support area. During construction, the Contractor will be responsible for collecting and analyzing samples of the project-related wastewater to document compliance with the requirements of the offsite treatment facility.

5.4 Waste Handling/Management

The Contractor will arrange for the proper handling, treatment, and disposal of all waste materials generated during the project. Such waste materials include (but are not limited to) soil, water, NAPL, and debris/refuse. Waste handling, management, transportation, disposal, and documentation requirements for each of these waste streams are set forth in Specification Section 02 81 00 (Transportation and Disposal of Waste Materials).

All waste profiles will be prepared by the Contractor and reviewed/signed by National Grid/Engineer. In preparing waste profiles, the Contractor will determine if the waste material can be transported/disposed of under an existing National Grid waste profile (if one exists) or if a new waste profile is required. Waste manifests (hazardous or non-hazardous, as appropriate) will be prepared by the Contractor and reviewed/signed by the Engineer and National Grid. The Contractor will provide copies of the completed waste profiles and countersigned manifests to National Grid and the Engineer for the project file.

All vehicles transporting excavated materials offsite for treatment/disposal will be fully lined, equipped with non-mesh tarpaulins, and have working turnbuckles to secure tailgates. Transporters will have up-to-date waste transporter permits (pursuant to Title 6 of the New York Code, Rules, and Regulations [6 NYCRR] Part 364) and copies of those permits will be maintained onsite for the duration of the project. Vehicles transporting waste materials will follow the approved truck route.

During the project, the Contractor is responsible for scheduling, coordinating, loading, and transporting waste materials to National Grid-approved offsite treatment/disposal facilities. As part of those activities, the Contractor will verify and ensure that:

- A waste manifest is prepared for each load of material to be transported offsite.

- Waste manifests are signed by National Grid or an authorized agent.
- Vehicles transporting waste materials are fully lined and equipped with non-mesh tarpaulins.
- Waste transporters have up-to-date waste transporter permits and truck numbers match those included on the permits.
- Countersigned waste manifests and disposal tickets are provided periodically (e.g., monthly or other mutually agreeable frequency) to National Grid and the Engineer.
- Waste transporters follow the approved truck route.

The CQA Observer(s) will document and/or verify that the Contractor performs the above activities in accordance with the Specification Section 02 81 00 (Transportation and Disposal of Waste Materials), and all applicable rules and regulations.

6 In-Situ Soil Solidification

ISS treatment will be conducted by the Contractor to homogenize and solidify impacted subsurface soil via bucket mixing using solidifying reagents (e.g., Portland cement, blast furnace slag cement, bentonite) that will encapsulate/immobilize impacted materials.

6.1 Treatment

The Contractor shall perform ISS treatment activities via excavator bucket mixing to the vertical and horizontal limits presented on the Design Drawings. The Contractor shall conduct pre-ISS excavation activities and/or manage ISS spoils (i.e., swell) such that the top of the solidified monolith is located at a maximum elevation of 15.6 feet North American Vertical Datum of 1988 (NAVD 88). The top of the ISS monolith surface shall be graded at an approximately 1.5% slope downward toward the south, to prevent potential ponding of water that infiltrates into the area (although anticipated to be limited due to the asphalt pavement surface). ISS treatment equipment shall be equipped with a global positioning system (GPS), or other methods approved by the Engineer, to document ISS treatment depths and extent.

As indicated in the IRM Design, where obstructions are encountered during ISS treatment activities (e.g., buried concrete/brick debris from a former holder or foundation, timber pile, etc.), the Contractor shall attempt to remove the obstruction using conventional excavation equipment. If an obstruction is encountered along the perimeter of the ISS treatment area, the Contractor shall remove the obstruction, or ISS around the obstruction to create a continuous barrier.

Any debris that will be incorporated into the ISS monolith will be inspected and evaluated for suitability prior to placement using the following guidelines:

- Debris material will be visually inspected prior to placement into the ISS column to ensure that it is free of obvious contamination or other impacts.
- Debris material will consist of rock fragments, concrete, or other inert material, with a size no greater than two feet in any dimension.
- Debris material will be free of vegetation or other organic material.

If the ISS treatment performance criteria (as described in the Specifications and IRM Design) are not achieved, the Contractor will be required to re-mix the material, with the approval of the Engineer and NYSDEC, until the performance criteria are achieved.

During ISS treatment, the Contractor shall provide daily and weekly performance submittals as required by Specification Section 02 55 00 (In-Situ Soil Solidification).

The CQA Observer(s) will observe the implementation of the remedial activities at the site to document that ISS treatment activities are being conducted in accordance with the IRM Design and Specification Section 02 55 00 (In-Situ Soil Solidification).

During ISS activities, the CQA Observer(s) will monitor the treatment area and surrounding areas daily for instability (e.g., settlement, cracking) and include observations in the daily field construction reports. Any visual observations of instability (e.g., cracking, settlement, sloughing) will be immediately reported to the Contractor. The Contractor shall propose to the CQA Observer(s) and implement appropriate temporary measures (e.g. backfilling) to mitigate any instability and protect installed construction. The Contractor shall also propose final

corrective actions for review by the Engineer following implementation of the temporary measures. A description of corrective actions will be included in weekly progress reports.

During ISS treatment, the CQA Observer(s) shall document, through visual inspection, the following:

- The Contractor is conducting geotechnical monitoring in accordance with Specification Section 31 09 13 (Geotechnical Instrumentation and Monitoring).
- Portland cement used in preparing the reagent will meet or exceed ASTM C150 for Type I/II or Type 1L and will require a manufacturer's certificate of compliance.
- Blast furnace slag cement used in preparing the reagent will meet ASTM C989 and will require manufacturer's certification of compliance.
- Fresh grout will be tested for slump, unit weight and viscosity (Marsh Funnel test) once per day in accordance with ASTM C143, ASTM D4380 and API 13B-1, respectively such that it meets the requirements provided in the ISS mix design.
- At the beginning of each shift, the Contractor calibrates the devices used to measure the amount of reagents and water used in the grout mix and documents the initial calibration.
- The Contractor documents ISS mix quantities in a daily log (hard-copy or electronic) for each batch and total number of batches for the workday and provides a copy of the log to the CQA Observer.
- Excess swell by visual observation during installation, as well as a survey of the spoils pile(s) after the ISS treatment to determine the percent of spoils vs. mixed material.
- The final depth of each treatment area is recorded by the CQA Observer(s) using manual measurement methods (e.g., markings placed on treatment equipment, weighted tape, etc.). The final depth of treatment and mixing volumes of each area will be documented by the Contractor, including material types and amounts used in each area.
- The top of the ISS monolith is located at a maximum elevation of 15.6 feet NAVD 88.

6.2 Performance Criteria and Monitoring

The Contractor will be responsible for conducting monitoring to ensure the performance of the remediated ISS area meets the requirements set forth in the IRM Design.

The target hydraulic conductivity for the treated soil matrix following addition of mixing reagents will be $1x10^{-6}$ centimeters per second (cm/sec) or less. The targeted 28-day UCS of the treated soil matrix is a minimum of 50 pounds per square-inch (psi). As indicated in Specification Section 02 55 00 (In-Situ Soil Solidification), no more than 20% of the performance samples shall be greater than $1.0x10^{-6}$ cm/sec and no samples shall be greater than $1.0x10^{-5}$ cm/sec, and the UCS of the treated soil matrix must be greater than 50 psi after 28 days.

Samples of freshly mixed, solidified soils will be collected by the Contractor, at locations determined by the CQA Engineer/Observer, using an in-situ wet sampler at a frequency of one sample per 500 CY of treated material (before swelling) or at least one per day if less than 500 CY are mixed. Based on the total anticipated ISS volume (2,632 CY), at least five samples will be collected. Samples will be collected from varying discrete depths (i.e., ISS monolith surface, midpoint, bottom and other depths as determined by the Engineer). Sufficient material will be collected to fill four (4) 6-inch-long by 3-inch-diameter cylinders per sample. Prior to filling the cylinders, the sample material will be passed through a ⅜-inch opening sieve and visually inspected by the Engineer to confirm the mix appears uniform and free of untreated soil clumps.

The soil/reagent samples will be collected, handled, packaged, and tested by the Contractor as indicated below and in accordance with the Specification Section 02 55 00 (In-Situ Soil Solidification):

- Samples will be placed in properly labeled boxes (including sample location, depth, and column).
- Samples will be wrapped in clear plastic wrap to prevent moisture loss.
- Samples will be stored in a cool, dry location and allowed to cure and solidify for a minimum of 48 hours, but not more than 96 hours, before transport to a testing laboratory.
- Samples will not be allowed to freeze.
- One cylinder will be tested after 7 days of curing for UCS of cylindrical concrete specimens (ASTM D1633).
- One cylinder will be tested after 28 days of curing for hydraulic permeability (ASTM D5084).
- The remaining cylinders will be stored at the laboratory for subsequent testing should the test criteria not be met in the first two sample cylinders, or should need arise to test samples earlier (at the direction of the CQA Engineer).
- Sample results will be reported no later than 3 days after testing has been performed.
- Any proposed changes to the submitted ISS mix design including, but not limited to, changes in reagent percentage, type, or water used will be submitted and approved by the Engineer, National Grid, and NYSDEC prior to implementation.

The CQA Observer(s) will verify that ISS areas are not covered for a period of 7 days following completion of ISS activities, unless approved by the Engineer. The Engineer shall verify that compressive strength and permeability test results achieve performance criteria prior to backfilling.

In addition to laboratory compliance samples described above, the CQA Observer(s) will conduct field tests including visual inspection and compressive strength testing using a pocket penetrometer to document sufficient curing is achieved throughout the 28-day period. Pocket penetrometer testing will be conducted as follows:

- Pocket penetrometer testing will be conducted daily for the first three days of curing to confirm that the compressive strength of the samples is increasing during each day of testing.
- Additional testing using the pocket penetrometer during the remainder of the 28-day period will be conducted at the Engineer's discretion.

The CQA Observer(s) shall oversee Contractor drilling of boreholes (core holes) within the treated ISS matrix from ground surface to the underlying bedrock layer within the ISS treatment areas, as required by the NYSDEC. Boring locations shall be selected in the field and subject to Engineer approval. At a minimum, borings shall be completed at the locations identified below.

- Areas where previous soil borings identified the greatest thickness of DNAPL [e.g., near boring VMB-2 (8-10')].
- Overlap of individual treatment areas or where difficulties in the ISS process (if any) were encountered.

The Contractor shall provide a minimum of 10 business days advance notice of drilling activities to the Engineer, who will notify the NYSDEC.

The first boring shall be installed when the ISS treatment area is no more than 25% completed. The borings shall be installed within a few days of mixing at the representative location, before the ISS monolith curing and full-strength development. Boring core samples shall not be longer than 5 feet long. The CQA Observer(s) shall document, through visual inspection, the following:

- At least one post-ISS boring is drilled per 5,000 square feet of ISS treatment area, with at least two borings total.
- Observations of the core samples and drilling tooling as outlined in the NYSDEC's Guidance for Post-ISS Coring (e.g., percent of core sample recovered and presence/absence of visible NAPL, non-mechanical induced cracking within the core, NAPL coating on drilling rods, and NAPL in the drill wash tub).

If less than 60% of the core material is recovered from any of the coring runs, then: (1) a down-hole video camera inspection will be performed to assess the integrity of the ISS mix; or (2) a new core hole will be drilled adjacent to the previous location.

The CQA Observer(s) will notify National Grid and the Engineer, who in turn will notify the NYSDEC of performance concerns (if any) based on the observations (e.g., continuous layer or seam of NAPL noted within the core, NAPL coating visible on drilling tools, or visible NAPL noted in the drill wash tub). National Grid/Engineer will propose potential follow-up/corrective actions, as appropriate, to the NYSDEC. Proposed follow-up/corrective actions proposed after visual observation of coring will require NYSDEC approval prior to implementing.

7 Decontamination

The Contractor will decontaminate (as necessary) all vehicles, equipment, and personnel that come into contact with excavated or potentially impacted materials at the site. The decontamination of Contractor equipment and personnel will be performed within dedicated decontamination area(s) constructed in accordance with the IRM Design. The Contractor is responsible for constructing and maintaining decontamination area(s) to accommodate all loads, vehicles, equipment, and migration scenarios. The Contractor will identify decontamination procedures for vehicles, equipment, and personnel in its Health and Safety Plan (HASP). These procedures will be reviewed by National Grid and the Engineer prior to the initiation of construction activities. The extent and method of decontamination will be at the discretion of the Contractor; however, National Grid and the Engineer reserve the right to require additional decontamination if deemed necessary.

The Contractor will provide appropriately-sized decontamination areas for its personnel. Personnel decontamination areas will be located within the contamination reduction zone and include those facilities necessary to decontaminate personnel upon exiting the work area (exclusion zone), in accordance with the Contractor's HASP, and in accordance with local, state, and federal laws and regulations. Vehicles and equipment will be positioned in a decontamination area and visually inspected by the Contractor prior to handling non-impacted materials or leaving the site. Any visible soils or other debris will be promptly removed and disposed of in a manner consistent with the materials excavated. Precautions will be taken to limit contact between the vehicle/equipment, personnel performing the decontamination activities, and any decontamination liquids that may accumulate in the decontamination area. Personnel engaged in vehicle decontamination activities will use personal protective equipment, including disposable clothing, as required by the Contractor's HASP. Wash water, solids, and other materials generated during decontamination activities will be collected by the Contractor and handled/managed in accordance with Specification Section 02 81 00 (Transportation and Disposal of Waste Materials).

The CQA Observer(s) will observe the Contractor's decontamination procedures and document that the following activities are completed in accordance with the IRM Design and/or Contractor's HASP (as appropriate):

- Vehicles, equipment, and materials (including excavation/ISS equipment, trucks, pumps, hand tools, etc.) that come in contact with excavated or potentially impacted materials are decontaminated prior to handling non-impacted materials or leaving the site.
- Vehicle and equipment surfaces (including tires) are free of visible soil, debris, or stains (to the satisfaction of the Engineer).
- Equipment such as pumps are flushed using clean water and appropriate cleaning agents, as necessary (to the satisfaction of the Engineer).
- Water treatment system components (e.g., influent tanks, piping, media vessels, etc.) are decontaminated as required by their respective vendors.
- Wash water, solids, and other materials generated during decontamination activities are collected by the Contractor and handled/managed in accordance with Specification Section 02 81 00 (Transportation and Disposal of Waste Materials).

8 Backfilling, Restoration, and Demobilization

8.1 General

Following completion of excavation and ISS activities (and confirmation that the target removal elevations have been achieved), the Contractor will backfill each area and restore excavated or otherwise disturbed areas as specified in the IRM Design. Once complete, the Contractor will demobilize labor, equipment, and materials from the site.

8.2 Fill Materials

Fill materials used to backfill and restore excavated or otherwise disturbed areas will conform (as appropriate) to the requirements of Specification Section 31 23 23 (Fill Materials). At the beginning of the project, the Contractor will select appropriate offsite fill sources and collect representative samples from those sources for geotechnical testing and laboratory analysis of chemical constituents, as needed. If the imported fill is gravel, rock or stone, consisting of virgin material from a permitted mine or quarry, with less than 10% (by weight) passing through a size 100 sieve, the fill is anticipated to meet the NYSDEC's sampling exemption outlined in Section 5.4(e)(5.)(i.) of DER-10. Chemical parameters include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs; including 1,4-dioxane), polychlorinated biphenyls (PCBs), pesticides, inorganics, and per- and polyfluoroalkyl substances (PFAS). The VOCs, SVOCs, PCBs, pesticides, and inorganics analyte lists are presented in Appendix 5 of DER-10. The PFAS analyte list is presented in Appendix G of the NYSDEC document titled “Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS Guidance) under NYSDEC's Part 375 Remedial Programs” (NYSDEC 2023). The analyses will be performed on samples collected from the Contractor’s proposed general soil fill source(s). Geotechnical parameters include grain size distribution, optimum moisture content, and maximum dry density. These analyses will be performed on samples collected from the Contractor’s proposed sources for General Fill and other proposed gravel-, rock-, or stone-based fill materials.

Analytical results will be provided to the Engineer a minimum of 2 weeks prior to use onsite. Analytical results for chemical parameters will be compared to the commercial or industrial use soil cleanup objectives (SCOs) as presented in DER-10 (Appendix 5) and in Appendix G of the NYSDEC PFAS Guidance. Sieve analysis results (for grain size distribution) will be compared to the appropriate material gradations specified in Specification Section 31 23 23 (Fill Materials). Modified proctor results (for optimum moisture content and maximum dry density) will be used as a point of comparison for in-place density tests. If sample results show that a proposed fill material does not meet the applicable requirements, the Contractor will be required identify and sample a new source of the material.

8.3 Backfilling

Before the excavation areas are backfilled, an orange geotextile demarcation layer will be installed on top of the graded ISS monolith surface or bottom of the utility trench (for new sanitary sewer piping), providing a clear visual marker between the ISS monolith or trench bottom and the clean imported fill material placed atop the monolith or new sewer pipe. The geotextile will be placed with appropriate edge and end seam overlaps over the entire sub-grade surface. Excavation areas will be backfilled with General Fill, after the demarcation layer is installed.

Backfill material will be placed and compacted within each excavation area to the required subgrade elevations in accordance with Specification Section 31 00 00 (Earthwork). In-place density tests will be performed by the Contractor at a frequency of one test per each lift of backfill placed or 1 passing test per 2,500 square feet of subgrade, 100 cubic yards of soil fill, or 25 linear feet of pipe (conduit) bedding, whichever results in the greatest frequency to document that compaction requirements are being achieved. A minimum of one test per lift shall be completed for the ISS area. Any areas not meeting the minimum compaction requirements will be re-rolled and/or moisture-conditioned (as necessary) by the Contractor until acceptable compaction is achieved and documented. Final sub-grade elevations (once achieved) will be surveyed/documented by the Contractor at each removal elevation tracking location.

During backfilling activities, the CQA Observer(s) will document and/or verify that the following activities are completed in accordance with the IRM Design:

- Backfill material is placed in lifts not exceeding those specified in Specification Section 31 00 00 (Earthwork).
- Backfill material contains the optimum moisture content or is otherwise conditioned (as necessary) to achieve optimum moisture content.
- Compacted surfaces are smooth and free of any loose stones, protrusions, and other sharp objects or foreign matter.
- In-place density tests are performed at a frequency of one test per each lift of backfill placed or 1 passing test per 2,500 square feet of subgrade or 100 cubic yards of soil fill, whichever results in the greatest frequency, or other frequencies deemed necessary by the Engineer to reliably and consistently determine the compaction level being achieved.
- In-place density test results meet the minimum compaction requirements specified in Specification Section 31 00 00 (Earthwork).
- Any settlement occurring in the backfilled areas is refilled, rolled, and compacted.
- Sub-grade elevations meet those required to accommodate final surface restoration.

8.4 Restoration

Following backfilling activities, excavation and other disturbed areas will be restored to the final grades and conditions indicated in the Design Drawings and Specification Sections 31 00 00 (Earthwork) and 31 23 23 (Fill Materials). Once complete, final (restored) site conditions will be surveyed and documented by the Contractor.

The backfilled excavations (above the ISS area and above the new sanitary sewer pipe) will be restored to final grade with 6 inches of gravel surface cover in accordance with the Design Drawings and Specification Section 31 00 00 (Earthwork). In-place density tests will be performed by the Contractor at a minimum frequency of one test per lift per 2,500 square feet. Any areas not meeting the minimum compaction requirements will be re-rolled by the Contractor until acceptable compaction is achieved and documented

The CQA Observer(s) will document and/or verify that the following activities are completed during the restoration of vegetated surfaces:

- The gravel will be placed to the minimum required thicknesses, shaped to line and grade, and compacted in accordance with the Design Drawings.
- Any depressions or ruts that develop are filled with acceptable materials and re-rolled prior to placement of subsequent courses.

- In-place density tests are performed at a minimum frequency of one test per lift per 2,500 square feet and in-place density test results meet the minimum compaction requirements specified in Specification Section 31 00 00 (Earthwork)
- No depressions remain in the final surface that could retain water.

8.5 Post-Construction Structural Surveys

Following the completion of all vibration-causing construction activities, the Contractor's Professional Structural Engineer will perform post-construction structural surveys of the previously surveyed properties, utilities, and all other items included in the pre-construction structural surveys. The results of the post-construction structural surveys will be documented in a report (stamped/signed by the Contractor's Professional Structural Engineer) and provided to the National Grid/Engineer within two weeks of completing the surveys. Additional survey and documentation requirements for the post-construction structural surveys are set forth in Specification Sections 01 71 23 (Field Engineering) and 02 21 19 (Structural Surveys).

8.6 Demobilization

Following the completion of restoration activities, the Contractor will demobilize all vehicles, equipment, and materials from the site. In general, these activities will include:

- Dismantling and properly disposing of all materials used in the construction of temporary access road(s), staging area(s), containment area(s), and equipment decontamination area(s).
- Dismantling and removing temporary fencing, gates, barriers, and signage.
- Cleaning/decontaminating vehicles, equipment, and materials of any visible soils or debris prior to removal from the site.

9 References

Arcadis. 2024. Vehicle Maintenance Building Addition Geotechnical/Environmental Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan, North Albany Service Center. Letter to NYSDEC dated October 17, 2024.

Arcadis. 2024. Response to NYSDEC Conditions: Conceptual Remedial Work Plan for Vehicle Maintenance Building Addition, National Grid, North Albany Former MGP. E-mail Correspondence to NYSDEC dated December 12, 2024.

Arcadis. 2025. Fleet Building Addition Interim Remedial Measure Design, North Albany Former MGP Site, Albany, New York. February 2025.

NYSDEC. 2003. Order on Consent, Index #A4-0473-000. November 2003.

NYSDEC. 2010. DEC Program, DER-10 / Technical Guidance for Site Investigation and Remediation. May 2010, last updated April 2019.

NYSDEC. 2016. New York State Standards and Specifications for Erosion and Sediment Control. July 2016.

NYSDEC. 2023. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances under NYSDEC's Part 375 Remedial Programs. April 2023.

NYSDEC. 2024. Vehicle Maintenance Building Addition Geotechnical/Environmental Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan – Conditional Approval, National Grid, North Albany Service Center. Letter from NYSDEC dated November 18, 2024.

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Attachments

Attachment 1

National Grid-Approved Disposal Facilities

NATIONAL GRID

ENVIRONMENTALLY APPROVED WASTE DISPOSAL FACILITIES

AS OF March 7th, 2025

(NOTE: FACILITIES ARE APPROVED TO RECEIVE SPECIFIC PERMITTED WASTES. THE RECOMMENDED WASTE STREAMS COLUMN IS NOT ALL INCLUSIVE. PLEASE CONSULT WITH ENVIRONMENTAL PROIR TO DISPOSING OF WASTES)

VENDOR	RECOMMENDED WASTE STREAMS	FACILITY LOCATION	STATE	PHONE	EPA ID NUMBER	DATE OF LAST APPROVAL	DATE OF LAST AUDIT	TYPE OF AUDIT
A-Line EDS	Transformer Services	808 Dearborn Avenue Waterloo, IA 50703	Iowa	(319) 232-3889	IAR000503078	12/12/2022	9/27/2022	CHWMEG audit
A-Line TDS	Transformer Services	1500 North Main St. Tonkawa, OK 74653	Oklahoma	(580) 628-5371	OKD987087020	12/12/2022	2/19/2020	CHWMEG audit
American Lamp Recycling, LLC	Universal Wastes/ Lamps/Bulbs/Mercury Regulators and equipment E-Waste, Electrical Ballasts	55 Riverview Drive Marlboro, NY 12542	New York	(800) 315-6262	NYR000192005	3/17/2021	8/13/2020	CHWMEG audit
American Recyclers Company (ARC)	Non-RCRA, Non-PCB waste including waste oils, oily water, petroleum contaminated solids	177 Wales Avenue Tonawanda, NY 14150	New York	(716) 695-6720	NYD986903904	3/18/2020	3/1/2020	On-site audit
Bayshore Soil Mgt. (ESMI of NJ)	Non-Haz. Petroleum Contaminated Soils Coal Tar Contaminated Soils	75 Crows Mill Road Keasbey, NJ 08832	New Jersey	(732) 738-6000	-	3/13/2019	7/11/2018	CHWMEG audit
Boston Battery (Interstate)	Lead acid battery recycling	235 E Main Street Milford, MA 01757	Massachusetts	(781) 232-5095	MAR000532960	8/7/2024	6/17/2024	On-site audit
Charter-Lynn Landfill Company, LLC	Soils meeting the requirements for unlined landfills of MA's DEP Policy COMM-97-001	Hanson Street Lynn, MA 01905	Massachusetts	(671) 594-4054	-	N/A	12/6/2021	On-site audit
Chemical Waste Management (Waste Management Inc.)	All Facility Permitted Waste Streams	Highway 17 North Emelle, AL 35459	Alabama	(205) 652-8086	ALD000622464	8/7/2024	5/8/2024	CHWMEG audit
CID (Chafee) Landfill, Inc.	Asbestos Waste	10860 Olean Road Chaffee, NY 14030	New York	(716) 496-5514	NYD000517458	N/A	N/A	Low Risk. No Further Audits
City of Albany Landfill	Petroleum Contaminated Soils, Constrcution and Demolition Debris Solid Waste	525 Rapp Road Albany, NY 12202	New York	(518) 869-3651	NYR000004424	N/A	N/A	Low Risk. No Further Audits
Clean Earth Connecticut	Non-Haz. Petroleum Contaminated Soils Coal Tar Contaminated Soils	58 North Washington Street Plainville, CT 06062	Connecticut	(860) 747-8888	-	6/28/2017	5/16/2017	On-site audit
Clean Earth of Carteret Inc.	Petroleum Contaminated Soils Urban Fills	24 Middlesex Avenue Carteret, NJ 07008	New Jersey	(215) 734-1400	-	10/25/2023	7/7/2023	On-site audit
Clean Earth of New Castle, Inc.	Petroleum Contaminated Soils Urban Fills	94 Pyles Lane New Castle, DE 19720	Delaware	(302) 427-6633	DED011019759	2/1/2022	3/1/2021	CHWMEG audit
Clean Earth of North Jersey	Petroleum Contaminated Soils Urban Fills	105 Jacobus Avenue South Kearny, NJ 07032	New Jersey	(973) 344-4004	NJD991291105	7/25/2023	3/7/2023	CHWMEG audit
Clean Earth of Philadelphia	Petroleum Contaminated Soils Coal Tar Contaminated Soils for thermal desorption only	3201 South Street Philadelphia, PA 19153	Pennsylvania	(215) 724-5520	PAD987396819	12/10/2019	5/16/2019	CHWMEG audit
Clean Earth of Southeast PA	Petroleum Contaminated Soils Coal Tar Contaminated Soils for thermal desorption only	7 Steel Road East Morrisville, PA 19067	Pennsylvania	(215) 428-1700	-	10/25/2023	3/15/2023	CHWMEG audit
Clean Harbors- Aragonite, UT	Hazardous/non-hazardous contaminated soil, sludges, and liquids; spent activated carbon, universal waste (mercury-containing lamps and ballasts; and batteries)	11600 North Aptus Rd. Aragonite, UT	Utah	435-884-8100	UTD981552177	4/25/2023	4/24/2023	CHWMEG audit
Clean Harbors – Cleveland	Wastewater Treatment	2900 Broadway Cleveland, OH 44115	Ohio	(216) 429-2401	OHD000724153	3/16/2021	8/20/2020	CHWMEG audit
Clean Harbors – Kimball	Coal Tar Soils Incineration	HC54 Box 28 Kimball, NE 69145	Nebraska	(308) 235-4012	NED981723513	3/13/2019	6/12/2018	CHWMEG Audit
Clean Harbors – Portland, ME	Waste Oil Non-Haz. WWT	37 Rumery Road South Portland, ME 04106	Maine	(207) 799-8111	MED980672182	7/25/2023	4/6/2023	CHWMEG Audit
Clean Harbors – Deer Park (Rollins Environmental Services)	Haz. Waste Incineration per Facility Permits	2027 Battleground Road Deer Park, TX 77536	Texas	(281) 930-2300	TXD055141378	3/13/2019	5/15/2018	CHWMEG Audit

NATIONAL GRID

ENVIRONMENTALLY APPROVED WASTE DISPOSAL FACILITIES

AS OF March 7th, 2025

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VENDOR	RECOMMENDED WASTE STREAMS	FACILITY LOCATION	STATE	PHONE	EPA ID NUMBER	DATE OF LAST APPROVAL	DATE OF LAST AUDIT	TYPE OF AUDIT
Clean Harbors - El Dorado	Incineration of Hazardous Waste Streams	309 American Circle El Dorado, AR 71730	Arkansas	(870) 864-3711	ARD069748192	9/25/2019	6/4/2019	CHWMEG Audit
Clean Harbors (Grassy Mountain)	Landfill –TSCA,RCRA Asbestos Waste	Grayback Hills Drive Knolls, UT 84083	Utah	(801) 323-8900	UTD991301748	12/30/2020	6/10/2019	CHWMEG audit
Clean Harbors - Baltimore	Industrial Wastewater	1910 Russell Street Baltimore, MD 21230	Maryland	(410) 244 8200	MDD980555189	1/25/2024	6/28/2023	CHWMEG audit
Clean Harbors - Braintree	Various Waste Streams per Facility Permits	1 Hill Avenue Braintree, MA 02184	Massachusetts	(781) 849-1807	MAD053452637	3/13/2019	4/13/2018	On-site audit
Clean Harbors - Connecticut	Non-Hazardous Solids Wastewater Treatment	51 Broderick Road Bristol, CT 06010	Connecticut	(860) 583-8917	CTD000604488	6/17/2020	9/18/2019	CHWMEG audit
Clean Water of New York	Waste Oils Waste Waters	3249 Richmond Terrace P.O. Box 030312 Staten Island, NY 10303	New York	(718) 981-4600	NY0000968545	10/26/2022	10/19/2020	On-site audit
Cleveland Industrial	Transformer Services	3325 Middle Rd. Ashtabula, OH 44004	Ohio	(440) 992-3783	OHD000821454	4/26/2023	3/3/2023	On-site audit
Colonie Landfill	Petroleum Contaminated Soils, Constrcution and Demolition Debris, Solid Waste	Memorial Town Hall Newtonville, NY 12128	New York	(518) 783-2827	-	N/A	N/A	Low Risk. No Further Audits
Complete Recycling Solutions, LLC	Mercury containing wastes Lighting ballasts and small capacitors (both PCB and non-PCB) Electronic waste	1075 Airport Road Fall River, MA 02720	Massachusetts	(508) 402-7700	MAD980915755	4/24/2024	2/7/2024	CHWMEG audit
County of Franklin Solid Waste Management Authority	Petroleum Contaminated Soils Solid Waste/C&D	828 County Route 20 Constable, NY 12926	New York	(518) 483-8270	NYN008021891		8/1/2008	On-site audit. Low Risk. No further audits
Cycle Chem (ACV Enviro)	Permitted RCRA & Non-RCRA Wastes including PCBs	217 S. First Street Elizabeth, NJ 07206	New Jersey	(908) 355-5800	NJD002200046	6/14/2022	3/16/2022	CHWMEG & On-site Audit
Cycle Chem (ACV Enviro)	Non-RCRA, Non-PCB waste including lab pack waste, petroleum contaminated solids & liquids	550 Industrial Drive Lewisberry, PA 17339	Pennsylvania	(717) 938-4700	PAD067098822	3/18/2020	1/29/2019	CHWMEG audit
Danvers Landfill	Non-Hazardous Soil	3 East Coast Road Danvers, MA 01923	Massachusetts	(978) 777-0001	-	6/22/2023	6/12/2023	On-site audit Low Risk. No Further Audits
Desotec	Carbon Recycling	118 Park Road, Darlington, PA 16115	Pennsylvania	(713) 822-8798	PAD987270725	8/7/2024	4/18/2023	CHWMEG audit
Emerald Transformer (Clean Harbors PCB Serv.)	TSCA Waste Materials	1672 East Highland Twinsburg, OH 44087	Ohio	(330) 425-3825	OHD986975399	1/25/2024	8/21/2023	CHWMEG audit
Emerald Transformer (Clean Harbors PPM)	TSCA/Non-TSCA Transformers and Oils	2474 Hwy 169 North Coffeyville, KS 67337	Kansas	(620) 251-6380	KSD981506025	6/28/2017	8/10/2016	CHWMEG audit
EMI (Environmental Management of KC, LLC)	Non-PCB MODF (0-49 ppm)	861 South 66th Terrace Kansas City, KS 66111	Kansas	(913) 287-1575		10/22/2024	7/31/2024	CHWMEG audit
EnerSys (GS YUASA)	Battery Recycling (Transfer)	16 Celina Ave. Nashua, NH 03060	New Hampshire	(800) 343-5526	-	6/13/2018	6/13/2018	Desk Top Audit
Environmental Soil Management, Inc. (ESMI - NY) (Clean Earth)	Coal Tar Contaminated Soils Oily Soils/Urban Fill - minimal PCBs per approval.	304 Towpath Road Fort Edward, NY 12828	New York	(518) 747-5500	-	4/26/2023	4/20/2023	CHWMEG audit
Environmental Soil Management, Inc. (ESMI - Loudon) (Clean Earth)	Coal Tar Contaminated Soils Oily Soils, Urban Fill	67 International Drive Loudon, NH 03301	New Hampshire	(603) 783-0228	NH5986485852	12/10/2019	7/30/2019	CHWMEG audit
Fulton County Landfill	Petroleum Contaminated Soils, Constrcution and Demolition Debris Solid Waste	47 Mud Rd, Johnstown, NY 12095	New York	(518) 736-5501	-	N/A	N/A	Low Risk. No Further Audits
Global Cycle	Non-hazardous waste water treatment (including excavation, decon, and purge water etc.) Specific Facility Acceptance Criteria/Contaminant Concentrations Apply	700 Richmond Street Taunton, MA 02718	Massachusetts	(508) 828-1005	-	9/13/2017	9/13/2017	On-site audit
G&S Technologies	Non-TSCA Equipment	1800 Harrison Ave. Kearny, NJ 07032	New Jersey	(201) 998-9244	NJD011370525	2/1/2023	2/1/2023	CHWMEG Audit
Hydrodec North America LLC	Non-Haz and Hazardous Oils and Particles for re-refining	2021 Steinway Blvd S.E Canton OH 44707	Ohio	1 (330) 454 8202	OHR000143263	2/27/2025	1/27/2025	On-site audit
Interstate Battery of Greater Albany	Battery Recycling	2 Interstate Ave Albany, New York 12205	New York	(518) 438 - 2288	-	2/1/2023	1/31/2023	On-site audit
Lakeview Landfill (Waste Managment)	Asbestos Waste	851 Robinson Road E. Erie, PA 16509	Pennsylvania	(814) 825-8588	-			Low Risk. No Further Audits

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VENDOR	RECOMMENDED WASTE STREAMS	FACILITY LOCATION	STATE	PHONE	EPA ID NUMBER	DATE OF LAST APPROVAL	DATE OF LAST AUDIT	TYPE OF AUDIT
Lehigh Cement (ESSROC)	Liquids/Sludge's	3084 West County Road 225 South Logansport, Indiana 46947	Indiana	(574) 753-5121	IND005081542	4/30/2019	8/30/2018	CHWMEG audit
Lewis County Solid Waste Department	Solid Waste	Trinity Avenue Lowville, NY 13367	New York	(315) 376-5394	-			Low Risk. No Further Audits
Metalico Aluminum Recovery (Syracuse)	Intact Lead Acid Batteries	6225 Thompson Road Syracuse, NY 13201	New York	(315) 414-6493	NYD006977086	11/21/2021	11/11/2021	On-site audit
Metalico Aluminum Recovery (Buffalo)	Intact Lead Acid Batteries	127 Filmore Ave Buffalo, NY 14310	New York	716-823-3788	NYR000157974	10/26/2022	10/20/2022	On-site audit
Miller Environmental Group (EPS of VT)	Non-hazardous solid wastes (Transfer Station)	532 State Fair Blvd Syracuse, NY 13204	New York	(315) 451-6666	NYR000115733	7/25/2023	2/18/2023	CHWMEG audit
Miller Environmental Group - Bohemia	Non-hazardous solid wastes (Transfer Station)	1599 Ocean Avenue Bohemia, NY 11716	New York	(631) 567-6545	NYD987023371	1/25/2024	1/10/2024	On-site audit
Miller Environmental Group - Newburgh (Waterworks)	Non-hazardous waste oil, waste water, oily debris	77 Stewart Avenue Newburgh, NY 12550	New York	(845) 561-4111	-	1/25/2024	1/24/2024	On-site audit
Minerva Enterprises	Asbestos Waste	8955 Minerva Road SE Waynesburg, OH 46888	Ohio	(330)866-3435	-	2/1/2023	2/1/2023	CHWMEG audit
Modern Disposal	Solid Waste	4746 Model City Road Model City, NY 14107	New York	(716) 754-8226	NY0986921237	N/A	N/A	On-site audit. Low Risk. No further audits
Montgomery County (MOSA)	Solid Waste	P.O. Box 160, Route 7 Howes Cave, NY 12092	New York	(518) 296-8884	-	N/A	N/A	Low Risk. No Further Audits
Murphy's Waste Oil (Clean Harbors)	Waste Oil Oil Filter Recycling	252 Salem Street Woburn, MA 01801	Massachusetts	(781) 935-9066	MAD066588005	3/19/2020	6/13/2019	CHWMEG audit
Northeast Transformer Services	Transformer Services	7201 NY-281 Preble, NY 13141	New York	(315) 238-7131	-	7/20/2007	7/20/2007	On-site audit
Ondrick Material and Recycling, LLC	Petroleum Contaminated Soil for Reclaimation Reuse	22 Industry Road Chicopee, MA 01020	Massachusetts	(413) 592-2566	MAR000529677	3/27/2023	4/27/2023	On-site audit
Oneida - Herkimer County Landfill	Solid Waste	7044 State Route 294 Boonville, NY 13309	New York	(315) 733-1224	-			Low Risk. No Further Audits
Ontario County Sanitary Landfill	Solid Waste	3555 Post Farm Road Stanley, NY 14561	New York	(585) 526-4420	-		8/17/2004	On-site audit. Low Risk. No further audits
Posillico Wash Plant	Petroleum Contaminated Soils, Brick, Concrete, rock, sand and Asphalt	1610 New Highway Farmingdale, NY 11735	New York	(631) 390-5777	-	10/26/2022	4/18/2022	On-site audit
Reworld (Covanta) Hempstead	Non Hazardous Incinerator, MSW, contaminated solids/liquids	600 Merchants Concourse Westbury, NY 11590	New York	(516) 683-5438	NYD980215511	8/7/2024	6/15/2023	CHWMEG audit
Reworld (Covanta) Huntington	Non-haz waste incinerator, MSW, contaminated solids/liquids	99 Town Line Rd East Northport, NY 11731	New York	(631) 754-1100	NY0000352708	8/7/2024	6/14/2024	CHWMEG audit
Reworld (Covanta) Niagara	MGP Remediation Soils Non-Hazardous Solids (Oil-impacted spill debris)	100 Energy Blvd at 56th St. Niagara Falls, NY 14304	New York	(716) 278-8500	NYD986930543	8/7/2024	6/29/2023	CHWMEG audit
Reworld (Covanta/Green Envirornmental) Niagara	Nonhazardous sludge's, Solids and liquids	8335 Quarry Road Niagara Falls, NY 14304	New York	(716) 298-5297	NYR000013086	9/21/2016	1/25/2016	CHWMEG Audit
Reworld (Covanta) Onondaga	Non Hazardous Incinerator	5801 Rock Cut Road Jamesville, NY 13078	New York	(315) 498-4111	NYR000003269	10/25/2023	10/24/2023	On-site audit
Reworld (CES Mohawk) Oriskany (Formerly Industrial Oil Tank)	Oily Water, Non-haz solids	120 Dry Road Oriskany, NY13424	New York	(315) 736-6080	NYR000005298	12/20/2020	7/1/2020	CHWMEG Audit
Safety-Kleen Systems Inc.	Part Washer Recycling all other waste streams permitted via permits	17 Green Mountain Road Cohoes, NY 12047	New York	(518) 783-8080	NYD986872869	2/1/2023	2/1/2023	CHWMEG audit
Safety-Kleen Systems Inc.	Part Washer Recycling	80 Seabro Ave. North Amityville, NY 11701	New York	(631) 842-6311	NYD000708198	Fall 2010		Low Risk. No Further Audits
Safety-Kleen Systems, Inc.	Oil Filters, Waste Oil, Transfer Facility	167 Mill Street Cranston, RI	Rhode Island	(401) 781-0808	RID084802842	12/12/2018	4/11/2018	CHWMEG audit

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Superior Greentree Landfill (ADS Greentree)	Landfill-Non Hazardous	635 Toby Road, Kersey, PA 15846	Pennsylvania	(814) 265-1975	PAD987398831	N/A	N/A	Low Risk. No Further Audits
Tradebe (Norlite Corporation)	Used Oil Coal Tar	628 South Saratoga Street Cohoes, NY 12047	New York	(518) 235-0401	NYD080469935	9/25/2019	2/22/2019	CHWMEG Audit
Tradebe - Bridgeport (Bridgeport United Recycling)	Used Oil, Waste Waters	50 Cross Street Bridgeport, CT 06610	Connecticut	(203) 334-4812	CTD002593887	1/17/2025	10/13/2022	CHWMEG Audit
Tradebe - Meriden (United Oil Recovery Inc.)	Used Oils, Waste Waters	136 Gracey Avenue Meriden, CT 06450	Connecticut	(203) 238-6745	CTD021816889	8/7/2024	4/16/2024	CHWMEG Audit
Trans-Cycle Industries (TCI)	TSCA Transformer and Lead/PCB Cable Disposal	101 Parkway, East Pell City, AL 35125	Alabama	(205) 338-9997	ALD983167891	10/25/2023	3/9/2022	CHWMEG audit
TCI of New York	Non-TSCA Transformer Disposal Approved for Surplus	99 Coeymans Industrial Park Lane Coeymans, NY 12045	New York	(518) 828-9997	NYD986899912	1/25/2024	1/24/2024	On-site audit
US Ecology - Michigan Disposal Waste Treatment (MDI)	Hazardous waste solids	49350 North I-94 Service Dr. Belleville, MI 48111	Michigan	(800) 592-5489	MID000724831	8/6/2019	9/18/2018	CHWMEG Audit
US Ecology - Wayne Disposal Inc (WDI)	Solid PCB Waste- Landfill NORM	49350 North I-94 Service Dr. Belleville, MI 48111	Michigan	(800) 592-5489	MID048090633	4/24/2024	10/2/2023	CHWMEG Audit
Veolia ES Technical Solutions – Port Arthur	Incineration: waste solvents, solvent/oil mixtures, organic and inorganic chemical wastes, pesticide wastes, petroleum wastes, aqueous wastes, contaminated soils, sludges, PCBs and capacitors	7665 Highway 73 Port Arthur, TX 77840	Texas	(409) 736-2821	TXD000838896	9/26/2018	3/29/2018	CHWMEG audit
Veolia ES Technical Solutions - Sauget	Incineration: Various Hazardous solids & liquids for treatment/incineration. PCB wastes <50ppm	7 Mobile Avenue Sauget, IL 62201	Illinois	(618) 271-2804	ILD098642424	4/25/2023	4/20/2023	On-site audit
Veolia ES Technical Solutions - West Bridgewater (Global Recycling)	Lighting ballasts Small capacitors (PCB and non-PCB) E-waste, Universal Waste	90 Pleasant St, West Bridgewater, MA 02379	Massachusetts	(774) 296-6030	MAC300017498	10/22/2024	3/13/2019	CHWEG Audit
Veolia ES Technical Solutions Flanders	Transfer Facility	1 Eden Lane Flanders, NJ 07836	New Jersey	(973) 347-7111	NJD980536593	3/16/2021	10/12/2020	On-site audit
Veolia ES Technical Solutions - Middlesex (Marisol)	Fuels Blending	125 Factory Lane Middlesex, NJ 08846	New Jersey	(732) 469-5100	NJD002454544	3/16/2021	10/13/2020	On-site audit
Veolia ES Technical Solutions - WI	Mercury, PCB Ballasts, Universal Waste	1275 Mineral Springs Drive Port Washington, WI 53074	Wisconsin	(262) 243-8900	WID988566543	2/1/2023	2/1/2021	CHWMEG Audit
Waste Management - Fairless Landfill	Construction & Demolition Debris Non- Hazardous Contaminated Soils Friable & Non-Friable Asbestos	1513 Bordentown Road Morrisville, PA 19067	Pennsylvania	(866) 909-4458	-	10/9/2019	10/1/2019	CHWMEG Audit
Waste Management - Greenridge RDF	Petroleum Contaminated Soils, C&D Debris, Clean soils	424 Peters Road Gansevoort, New York 12831	New York	(518) 636-2141	-	9/26/2018		Low Risk. No Further Audits
Waste Management - Mercury Waste Inc.	Mercury Waste	21211 Durand Avenue Union Grove, WI 53217	Wisconsin	(262) 878-2599	WIR000000356	12/10/2019	9/11/2019	CHWMEG Audit
Waste Management – Turnkey	Asbestos Waste, Non- Hazardous	97 Rochester Neck Road Rochester, NH 03867	New Hampshire	(603) 332-2386	NHD980914634	10/22/2024	5/22/2024	CHWMEG Audit
Waste Management - High Acres	Non-Haz Waste	425 Perinton Parkway Fairport, NY 14450	New York	(585) 223-6132		4/25/2024	7/26/2023	CHWMEG audit
Waste Management Disposal Services of Maine: BDS Waste Disposal Inc.	Asbestos Waste, Non-Hazardous	357 Mercer Road Norridgewock, ME 04957	Maine	(207) 634-2714	MED98254699	3/16/2016	12/18/2015	Desktop Audit
110 Sand & Gravel	C&D Debris Soaked Coal Tar Wrap Pipe	136 Spagnoli Road, Melville, NY	New York	(631) 694-2822	-			Low Risk. No Further Audits

* = Site has been reported closed, but has alternative uses.

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Attachment 2

NYSDEC Guidance for Post-ISS Coring QA/QC

1.0 GENERAL

1.1 Introduction

Technology Description

In-situ solidification (ISS) is an established remediation treatment technology which can prevent migration of and exposure of certain contaminants in media such as soil, sludge, and sediment. The ISS process is increasingly being used within remedial programs in the New York State Department of Environmental Conservation (Department).

ISS is a process that involves the mixing of reagents with contaminated soil to create a low permeability mass which encapsulates the soil in place. Bucket excavators or augers, among other technologies, are used to mix the contaminated soil and one or more reagents, entrapping the contaminated material within a low permeability mass. This reduces or eliminates non-aqueous phase liquid (NAPL) mobility and contaminant migration into groundwater, thus eliminating the treated area as a source of future groundwater contamination.

Complete mixing of the contaminated soil and the ISS reagents must be achieved for the process to be effective and protective of human health and the environment. Incomplete mixing can result in a non-homogenous mass, untreated areas, or large fractures within the ISS mass, which may allow mobility of NAPL and groundwater within the treated areas.

1.2 Document Purpose

The purpose of this document is to provide a method of Quality Assurance (QA)/Quality Control (QC) in the form of a coring program to ensure the effectiveness of ISS after field implementation is complete. The use of coring for QA/QC may not be suitable for all ISS projects and other QA/QC methods such as excavation/visual inspection should be considered an option on a case by case basis.

Incomplete mixing is of greatest concern when it occurs along the edges of the solidified mass. NYSDEC has noted a tendency for DNAPL to accumulate in permeable soils and sediments immediately above the bedrock surface, creating a potential pathway for DNAPL migration. Such zones can be quite difficult to mix adequately, particularly if augers are used for mixing. Thus, attention is required to ensure that “top of rock” zones are thoroughly solidified, and that this solidification is adequately documented.

To ensure the integrity of the treated material, the Department has identified QA/QC procedures, specifically coring, which are essential to ensure that ISS treatment processes are protective of the environment. This document has been developed to provide guidance on a coring program to be conducted to ensure confidence regarding complete mixing and ISS installation in the remedial area.

2.0 EQUIPMENT

2.1 Coring Drilling Method

To allow early coring information to be incorporated in adjusting ISS operations, it is recommended to conduct the coring operations prior to complete curing of the ISS material. Direct Push sampling (Geoprobe® or equivalent) may be used to collect core samples of the ISS material. If the ISS treatment area has adequately cured, the Department recommends a drilling method utilizing an HQ wire-line core barrel, or similar, and diamond drill bit. Rotosonic and compressed air drilling methods should not be used due to the inability to obtain representative core samples.

Cores must be no longer than five (5) feet. If less than 60% of the core material is recovered from any of the coring runs, one (1) new core hole must be drilled adjacent to the previous location. If the recovery from the adjacent core hole continues to be less than 60%, the contractor may abandon the location. Close communication with the Department's project manager (PM) is strongly encouraged to discuss and reach concurrence on the coring program.

3.0 EXECUTION

3.1 Coring Implementation

- One core borehole shall be completed for every 5,000 square feet of ISS treatment area, but not less than two bore holes per treatment area.
- To allow early coring information to be incorporated in adjusting ISS operations, the first coring location shall be completed when the ISS treatment project area is no more than 25 percent complete.
- Core borehole locations shall be biased towards areas with the greatest soil contamination, areas where contamination is in direct contact with the bedrock surface, and/or locations where difficulties in the ISS process were encountered.
- Core boreholes shall be placed in locations where individual treatment columns or cells overlap, to the extent possible.
- Cores shall be archived following coring activities, and may be discarded upon final inspection of the core by the Department.
- To allow any needed corrective actions to commence before the monolith cures to a point making corrective action difficult or impossible, core inspection by the Department will occur as soon as possible but not later than 48 hours of the core’s collection.
- In order to identify potential areas of concern for the coring program, documentation on the volume/shrinkage of grout obtained during ISS installation shall be reviewed. Areas where excessive grout was lost during ISS implementation should be targeted for coring.

3.2 Performance Evaluations

3.2.1 Visual Inspection

Core samples and related equipment will be visually inspected for the following criteria, and the results recorded:

- Visible NAPL
- Non-mechanical induced cracking within the core
- Percent of core sample recovered
- NAPL coating on drilling tools
- NAPL in drill wash tub

3.2.2 Performance Concerns

To ensure effectiveness of the ISS remedy, the following conditions will warrant further attention and will be documented during ISS implementation:

- A continuous layer or seam of NAPL is noted within the core.
- NAPL coating is visible on drilling tools
- Visible NAPL is noted in the drill wash tub

If one or more of the above conditions are noted, the Department must be notified to discuss the severity of the problem, the degree of concern, and whether any corrective action will be necessary. A notification, by itself, does not necessarily mean a corrective action or additional borings are warranted. For instance, small NAPL blebs may be present within properly mixed areas of the ISS monolith, and coring through such a bleb, especially before the monolith has achieved its maximum strength, could result in NAPL coating on drilling tools and/or NAPL in the drill wash water. The first step to determining whether corrective action is required will be to complete additional borings around the area of concern and determine if identified NAPL within the ISS mass is encapsulated, thus eliminating NAPL mobility and impact to the surrounding environment. If NAPL is detected in the additional borings, particularly on the edges of the ISS monolith, or at the bottom of the ISS monolith, corrective actions may be necessary in order to fully encapsulate the source area.

3.2.3 Corrective Actions

If the ISS installation is deemed unsatisfactory after a collaborative evaluation of the coring program, measures will be put in-place to address the deficiencies and ensure that the remedy is protective of human health and the environment. Such measures may include:

- Repair, re-mixing, or isolation of the concerned area using jet grouting or other suitable method
- Excavation and disposal of the concerned area, where feasible and practicable.

3.2.4 Core Hole Abandonment

When a core has been drilled from the top to the bottom elevation of the targeted ISS treatment zone, and samples collected, it will be considered complete. Following completion of each coring location, the borings will be filled with grout.

Electronic Attachments
(Not Part of Contract)

1. Existing Fleet Building Foundation Plan
2. Historical Aerial Photographs & Sanborn Fire Insurance Maps
3. Historical Soil Boring Locations and Logs
4. Historical Reports
    - 4.1. Feasibility Study Report (Arcadis 2016)
    - 4.2. Remedial Design Work Plan (Arcadis 2017)
    - 4.3. Pre-Design Investigation Summary Report (Arcadis 2018)
    - 4.4. Vehicle Maintenance Building Investigation Summary Report and Pull-Ahead Soil Removal Conceptual Plan (Arcadis 2024a)
    - 4.5. Response to NYSDEC Conditions: Conceptual Remedial Work Plan for Vehicle Maintenance Building Addition (Arcadis 2024b)
5. Historical Utility Figures & Drawings

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