Gowanus Canal Remedial Design Group

Prepared for

Gowanus Canal Remedial Design Group

HEALTH AND SAFETY PLAN

GOWANUS CANAL CONSTRUCTION ACTIVITIES BROOKLYN, NEW YORK

Prepared by

Emilcott Associates, Inc.
190 Park Avenue
Morristown, NJ 07960

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1. INTRODUCTION

This Site-Specific Health and Safety Plan (HASP) was prepared to address project-specific hazards known or suspected to be present or associated with the existing conditions and fieldwork activities to be performed and/or managed by Consultants and Contractors at the Gowanus Canal Superfund Site (the Site) located in Brooklyn, New York. This HASP was prepared to meet the requirements specified in Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations Emergency and Response (HAZWOPER) program per 29 CFR 1926.65. This HASP provides basic information on the health and safety hazards of Site operations and establishes the minimum requirements for each Consultant's and Contractor's Site-Specific Health and Safety Plan.

This HASP addresses safety program elements broadly applicable to the project, and a broad range of potential hazards and safety measures (Section 4, "Hazards and Controls, Process Hazard Analyses") that are anticipated or that may arise at the Site. As component work tasks are planned and executed for this project, a Process Hazard Analysis (PHA) will be prepared for each task, prior to its execution, describing the specific hazards and safety measures appropriate for that task (Section 4, "Hazards and Controls, Process Hazard Analyses"). This document, and the component PHAs prepared as the work progresses, constitutes the Health and Safety program for this project.

1.1 Background

Since the early 1980s, the Gowanus Canal has been the focus of numerous environmental studies and directives involving several public-sector entities, including the New York City Department of Environmental Protection (NYCDEP), the New York State Department of Environmental Conservation (NYSDEC), the United States Army Corps of Engineers (USACE), the United States Environmental Protection Agency (EPA), as well as numerous private entities, including National Grid, whose focus has been on the former manufactured gas plant (MGP) sites in the area.

In early 2010, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), EPA placed the Gowanus Canal on the National Priorities List (NPL) and entered into Administrative Orders of Consent with New York City and National Grid to perform work in support of EPA's remedial investigation/feasibility study (RI/FS).

The RI Report was completed in January 2011 and the draft FS Report was completed in December 2011. An FS addendum report was completed in December 2012. In accordance with EPA's Unilateral Administrative Order (UAO) for Remedial Design effective 24 March 2014,

1.2 Applicability

This HASP was prepared in accordance with the Gowanus Canal Remedial Design Group (RD Group) Health and Safety requirements for project staff. Consultants and Contractors may prepare their own Site-specific health and safety planning document (e.g. HASP, job safety analysis, process hazard analysis) specific for the task(s) to be conducted, and may use this HASP as a guide. If Consultants and Contractors adopt this document in its entirety, or any portion thereof, as their own, they do so after fully reviewing this document to ensure that their own requirements for ensuring the safety of themselves, their employees, and their subcontractors are met. All Consultants and Contractors will retain the responsibility of the safety and health of their employees. At a minimum, the safety practices, safety program elements, and related safety procedures for all Consultant's and Contractor's must adhere to the applicable requirements set forth in this HASP.

1.3 Site Orientation

An initial Safety Orientation will be provided by the GERT Project Safety Manager (PSM) or Construction Manager (CM). Consultants and Contractors are responsible for reviewing all sections of their Site-Specific HASP with their personnel. All site workers must review their company's HASP and acknowledge the review and understanding of the HASP by signing the HASP acknowledgement page. Attendance at the initial Safety Orientation meeting, plus review and acknowledgement of their company's HASP is required by each site worker prior to their commencing work.

1.4 Project Organization, Key Personnel, Health and Safety Responsibilities

Key project personnel for this project, and corresponding contact information, are listed in this HASP as follows:

1.4.1 Gowanus Canal Remedial Design Group

The Gowanus Canal Remedial Design Group (RD Group) is the project owner (Owner) and the work to which this HASP applies is conducted by entities under contract with the RD Group, which has overall responsibility for Site operations. The RD Group primary contacts for this project are:

Owner's Representative – William Lee, de maximis, Inc.

National Grid Project Manager - Andrew Prophete, National Grid

1.4.2 Consultant and Contractor Responsibilities

Consultants and Contractors shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with their work and the

subcontractor employees who will perform the work. Information or assistance provided by the RD Group will be for the purpose of coordinating efforts to observe and monitor Site operations and does not relieve the Consultant or Contractor from their safety responsibility for their work and their employees.

Consultants and Contractors are responsible for their personnel's field activities associated with this project, which includes, but is not limited to:

- Provide oversight of all aspects of their personnel's project work.
- Support high standards of safety.
- Monitor overall planning and progress of construction and fieldwork.
- Coordinate between the project General Contractor and their company's Site Health and Safety Officer (SHSO) so that emergency response procedures are implemented.
    - Take immediate action to correct at-risk or inappropriate behaviors on the part of their personnel, resolve safety concerns that may arise promptly, and verify that corrective actions are implemented.
- Verify that personnel have reviewed their Site-Specific HASP and are aware of its provisions and potential hazards associated with Site operations, and that they are instructed in safe work practices and familiar with emergency response procedures
- Participate in incident investigations of workplace injuries, illnesses, and near misses and ensure the completion of associated documentation.
- Verify use of appropriate monitoring, personal protective equipment (PPE), and decontamination materials.
- Conduct, or assign responsibility for, pre-entry briefing and daily tailgate safety meetings.
- Verify that monitoring equipment and PPE is operating correctly according to manufacturer's instructions and such equipment is utilized by Site personnel.
- Calibrate or verify calibration of monitoring equipment and record results.
- Monitor decontamination procedures.
- Periodically review their HASP and update as needed
- Provide project personnel with technical guidance for conducting fieldwork and construction activities in a safe and healthful manner.

- Assist with preparation, review and approval of health and safety documents.
- Conduct field safety audits as necessary and verify that action plans are developed to correct any deficiencies.

1.4.3 On-Site Project Personnel

It is the fundamental responsibility of On-Site personnel to become familiar with the provisions of this HASP and conduct all aspects of their work on-Site in accordance with its guidance and their own task-specific work practices.

- Take reasonable precautions to prevent injury to themselves and to fellow employees.
- Attend pre-entry H&S briefings and daily safety tailgate meetings.
- Immediately report the occurrence of work-related incidents, injuries, illnesses, near misses, or unsafe conditions to the SHSO.
- Inspect equipment, tools, and work areas and maintain safe working conditions by repairing and reporting deficiencies.
- Stop their work when unforeseen hazards are encountered.
- Notify their SHSO of any limitations in their ability to conduct their work safely, and any requirements for special accommodation while working on the Site.
- In an unknown situation, always assume the worst reasonable conditions.
- Be observant of their immediate surroundings and the surroundings of others. It is a team effort to notice and warn of dangerous situations. Stopping work to reassess a potentially hazardous situation or procedure is the preferred course of action.
- Conflicting situations may arise concerning safety requirements, procedures and/or working conditions. These issues must be addressed and resolved immediately by the SHSO and PM, through communication with other responsible parties, to ensure that work will be conducted safely, and established safety policies/protocols are followed.
- Unauthorized deviations from specified safety protocols are prohibited. Workers unwilling or unable to comply with the established procedures will be immediately dismissed and escorted from the Site.
- Minimize contact with project-derived materials (soil, sediments, water, debris from the canal, and related objects and materials) that may be impacted with hazardous substances. Refrain from placing equipment/tools on the ground. Do not sit or kneel on potentially contaminated surfaces.

- Smoking, eating, or drinking after entering the work zone and before decontamination is prohibited.

- Employees and/or subcontractors who are suspected of being under the influence of illegal drugs or alcohol will be removed from the Site. Workers taking prescribed medication that may cause drowsiness shall not operate heavy equipment and are prohibited from performing tasks where Level C or B PPE is required.

- Practice good housekeeping. Keep work zones orderly and take appropriate actions to mitigate potentially harmful situations.

- Use of contact lenses may not be allowed under certain hazardous working conditions, such as hot work or if corrosive materials are encountered.

2. SITE DESCRIPTION

A Site Map is presented in Figure 2. The following is a brief description of the Site, including information as to the location, approximate size, previous usage, and current usage.

- Site Location: Gowanus Canal, Brooklyn, New York
- Approximate Size of Site: 2-mi long canal, <1-21 feet deep
- Previous Site Usage: Conveyance canal
- Current Site Usage: Conveyance canal
- Description of Surrounding Property/Population:

North	Boerum Hill (residential neighborhood)	East	Park Slope (mixed industrial/residential neighborhood)
South	Gowanus Bay	West	Red Hook and Carroll Gardens (residential neighborhoods)

The Gowanus Canal is a publicly accessible man-made canal located in a mixed industrial, commercial, and residential section of South Brooklyn, with its approximate dimensions and adjacent communities and water body as noted above (see Figure 2). The 2-mile long man-made canal is built of both wooden timbercrib and metal sheet pile bulkheads. A majority of the bulkheads along the Canal are in need of repair with some sections of bulkhead already collapsed into the Canal. Several barge turning basins are connected to the main Canal channel on the eastern side of the Canal at 4th Street, 6th Street, 7th Street, and 11th Street. The Canal is spanned by five bridges including Hamilton Avenue/Gowanus Expressway, 9th Street, 3rd Street, Carroll Street, and Union Street. A known underground gas line transects the Canal between the former Manufactured Gas Plant Site (Citizens) and the National Grid Substation located on the southwest corner of the 6th Street Turning Basin.

The Canal is a tidal water body that has two tidal cycles each day. A flushing tunnel is located in the vicinity of Douglass Street at the head of the Canal, which discharges water from Buttermilk Channel into the Gowanus Canal. The Canal discharges southward into Gowanus Bay. Several Combined Sewer Overflows (CSOs) and additional permitted/unpermitted outfalls also discharge into the Canal. Depending on tidal conditions, Canal channel depths range from less than a foot within the turning basins and the head of the Canal to a maximum of 11 feet adjacent to the Carroll Gardens/Public Place Site. The channel depths within the

Gowanus Bay range between 9 feet at the mouth of the Gowanus Canal to approximately 21 feet near the Bay Ridge Channel.

The Canal was constructed in the 1860s in the location of the former Gowanus Creek as part of industrial development in the region. Based on information from historic maps, Sanborn Fire Insurance (Sanborn) maps, and other historic documents, its use as a conveyance canal associated with industrial development in the area, as well as varied current and former land uses, have contributed to the contamination of the Canal sediments. Past uses likely contributing to sediment contamination have included creosoting works, MGPs, fertilizer manufacturing, coal yards, asphalt manufacturing plants, tar processing facilities, and oil storage facilities, as well as having received sanitary sewage and storm water discharges for many decades.

Based on the above historic usage, chemical contaminants anticipated to be currently present, and likely encountered during fieldwork or construction activities include petroleum based compounds (including volatile organic compounds [VOCs] and semi-volatile organic compounds [SVOCs]), heavy metals, pesticides, herbicides, as well as various corrosive and reactive compounds (acids, bases, cyanides, sulfides). A more detailed description of chemical hazards as well as biological and physical hazards associated with fieldwork or construction activities is provided in Section 4 of this HASP.

Performing field activities associated with the construction phase of the remediation work, may require accessing all portions of the Canal as well as performing work overland along the Canal bulkheads. A naming system that divides the Canal into three Remediation Treatment Areas (RTAs) has been employed for ease of communication. These RTAs include RTA1, RTA2, and RTA3 (see Figure 2). A base of operation will be located at Citizens Gas Works Parcel III (Parcel III) at 459 Smith Street (Block 471, Lot 200) as depicted in Figure 2. The primary access point to the canal is a dock for small marine vessels along the bulkhead at Parcel III as illustrated in Figure 2. Tidal restrictions and low clearances under bridges spanning the canal must be considered in planning daily field activities. The operability of the bridges must be verified in planning daily field activities. Procedures for bridge openings must be set forth prior to any planned field activities that require bridge openings during routine activities as well as emergency evacuations from the canal. Emergency egress points are indicated in Figure 2 and are described in detail in Appendix 3, “Emergency Response Procedures, Incident Reporting.”

3. DESCRIPTION OF WORK

(Note: Geosyntec and "Others" description of work combined below)

This section contains an overview of the project work to be performed:

- Water quality monitoring during on-water construction activities via turbidity monitoring buoys, handheld turbidity measurements, and surface water sampling.
- Collection of water samples from the dredge water treatment system.
- Installation of upland survey monuments to be used as benchmarks for bulkhead monitoring.
- Hydrographic surveys
- Upland surveys to monitor bulkheads and obtain further detail of Canal uplands for design purposes.
- Mobilization of equipment and staging of materials on the Staging Site located on Parcel III needed to perform the Work;
- Mechanical dredging along the entirety of the Canal;
- Installation of bulkhead supports and/or bulkhead replacements;
- In-situ stabilization in designated areas;
- Capping along the entirety of the Canal;
- Community air monitoring;
- Noise and vibration monitoring.

4. HAZARDS AND CONTROLS, TASK HAZARD ANALYSES

This section includes an overview of potential physical, chemical, and biological hazards associated with the Site and specifies safe work practices to be followed by site personnel conducting fieldwork for this project. For each component task to be conducted by the Consultant or Contractor for this project, a PHA will be prepared which will include a description of the task, an analysis of hazards, and a description of hazard controls necessary to complete that task safely. The PHA template is provided in Appendix 1. Completed PHAs

shall be compiled and stored at the field office and copies of active PHAs shall be in the possession of the field team leader during a given field event.

In Section 4.1, "General Hazard Preparedness," the most commonly encountered, and broadly applicable "baseline hazards and controls" are addressed, consisting of precautions, warnings and safety measures for the following:

- General personal protection.
- Weather and climate factors.
- Premises hazards and environmental conditions.
- Use of common hand tools, and work near equipment and machinery.
- General biological hazards (plants/animals/insects).
- General driving hazards.

Assessment of these baseline hazards and use of general hazard preparedness measures will often constitute sufficient safety planning for tasks that are primarily observational in nature, minimally hazardous, peripheral to an active work zone, or associated with preliminary work tasks such as mobilization/demobilization, Site reconnaissance, or on-Site coordination and planning activities. These baseline hazards and controls are also broadly applicable to most work on the project and constitute the foundation for additional analysis of component work activities of each task and associated hazards and controls.

Subsequent Sections 4.2 through 4.15 address hazards to which workers may be exposed through active engagement in specific work tasks and procedures to be executed within an active work zone. These sections address hazards and controls associated with direct use of, or close proximity to hazardous equipment, disturbance or use of hazardous materials, exposure to hazardous agents, or work in hazardous locations.

4.1 General Hazard Preparedness

Workers must anticipate commonly encountered workplace hazards and be prepared accordingly, even where such hazards may not have been specifically noted ahead of time. All work involves some degree of hazard, and workers shall at all times anticipate and be on the lookout for work-related hazards that may arise ("situational awareness") and utilize safe work practices accordingly.

4.1.1 Basic Personal Protection

For all work, workers shall always anticipate hazards that may cause injuries to eyes, head, hands, and feet, and shall be equipped with proper work clothes and basic PPE to prevent these injuries. This section discusses basic personal protection measures commonly required in many workplace situations, for protection of eyes, hands, head and feet. Where higher levels of personal protection may be warranted for specific work activities, and where work-specific protective equipment is necessary (such as special PPE for chemical hazard protection, arc flash protection, and other specific hazards), the protective equipment will be discussed in other sections of this HASP specific to the work hazard.

Use of common hand tools, and working in the vicinity of operating equipment and machinery, is common to many work activities, and may pose significant hazards to the worker. Workers must be aware of hazards and proper/safe procedures for their work at all times associated with use of tools, or hazards present when working in the vicinity of operating equipment and machinery, and take appropriate precautions. Standard tool safety practices shall be employed at all times, including:

- Always use the proper tool for the job.
- Use tools and equipment in accordance with standard procedures and/or manufacturers recommendations.
- Keep tools well maintained, sharpened, adjusted and in proper operating condition; discard or repair tools that are in unsatisfactory condition.
- Always position the work piece and tool to minimize or prevent injury; keep body parts out of the “tool use path” and point of operation (blade, jaws, rotating parts, etc.) of the tool.
- Never position a work piece on a portion of your body; use a workbench, other appropriate work surface, or the ground.
- Where possible, avoid using your hand to steady/hold a work piece; use a vise or other clamping device to hold and secure a work piece.

Use PPE that is appropriate for the specific tool and work operation, for the protection of eyes, head, hands, hearing and other body parts. Use a dust mask for dust-generating tools if the breathing zone dust levels cannot be mitigated by use of exhaust ventilation, dust containment device, or by locating the work in a ventilated environment or out-of-doors.

When working in the vicinity of operation equipment or machinery with rotating parts, pinch points, impact hazards, and other mechanical/chemical/physical hazards, always maintain a safe

distance from hazards, tuck away loose clothing, and minimize use of jewelry (especially loose-hanging jewelry) in the vicinity of moving equipment or machinery.

For work activities involving use of special hand tools, power tools, and/or equipment, and where workers may be engaged in direct use of such equipment, or working within an active work zone (in "line of fire") where such equipment is used, see Section 4.5, "Tools, Equipment, Machinery."

Eye Protection – Where the potential for eye injury exists from flying objects and debris, such as dust and debris generated during use of power tools, or where splash hazards exist from fuels, contaminants, reagents, and other liquid materials, eye protection shall be used that is appropriate for the tasks to be performed and hazards present. At a minimum, at all times when engaged in fieldwork, ANSI Z87.1 safety glasses (with side shield or wrap around, either clear or shaded for sun protection) shall be worn. As a general rule, safety glasses shall be worn by all workers and visitors on Parcel III. Standard safety glasses are considered appropriate for general impact hazards, dust and debris, and for mild, non-corrosive, chemical hazards. Where elevated hazards are present, such as a heat or spark hazard, hazardous chemicals (particularly corrosives), vented safety goggles, face shield and safety glasses, or full-face respirator shall be worn as appropriate for the hazard.

Additional eye-protection measures shall be utilized as appropriate for the hazards, as follows:

- Apply anti-fog product to face shield, goggles or full-face respirator lens if needed to prevent condensation build up.
- Minimize the amount of vapor or particulate matter generated, if possible.
- Avoid touching the face and eyes when the potential is present to rub dust, debris, or chemical hazards into the eyes.
- Do not wear contact lenses if a chemical or dust hazard is present, as material may become lodged beneath the contact lens resulting in more serious eye injury.

Head Protection - Head protection gear must be worn where overhead hazards are present, such as falling objects from scaffolds or overhead equipment/materials, low-hanging objects and structures, or working at heights (as on an aerial lift) where the risk of impacting overhead equipment is present. As a general rule, hard hats must be worn on Parcel III by all workers and visitors.

Hand Protection - As a general "rule of thumb," some type of work glove should be worn to protect the hands whenever manual work is performed with the hands. It is also recognized that circumstances will arise in which gloves are unnecessary, impractical, or represent a greater

hazard. Thus, the need for gloves, and the specific type of glove to be used, should be determined based on the work to be performed and related worksite conditions. For some work, a combination of more than one type of glove may be necessary, such as a chemical protective glove worn beneath a robust work glove. Refer to the relevant PHA for guidance on the glove required for each task. The following general guidelines will apply:

- Cut resistant gloves should be worn when using bladed/cutting tools and similar equipment.
- Robust work gloves, appropriate for the task and hazard, shall be used when performing general manual labor including use of tools and equipment, handling heavy or rough materials.
- Where general hand protection is warranted, and manual dexterity is necessary to perform the work task, a more flexible medium weight glove should be selected (such as close-fitting lightweight leather or synthetic mechanics gloves).
- When using a ladder, a work glove with rubber palms should be used to increase the grip on the ladder.
- Surgical-type nitrile or vinyl gloves may be used for routine protection from minimally hazardous residues of oil, grease, settled dust, un-sanitary materials, animal droppings, and similar hazards.

Foot Protection - Durable footwear appropriate for the task shall be worn at all times. Where rough terrain, heavy objects and similar hazards of ankle injury is present, boots that provide ankle support shall be worn. Steel-toed/steel-shanked safety boots must be worn whenever working around heavy objects and are required at Parcel III. Insulated and/or waterproof boots may also be warranted depending on weather conditions. Boots should be inspected periodically for signs of wear (e.g., cracks in rubber or along soles) and replaced as necessary.

Hearing Protection, Noise Hazards – Exposure to loud noise, either through acute exposure to intense or "impact" noise over short periods, or through chronic exposure over extended periods can result in physical damage to the ear, temporary and/or permanent hearing loss, pain and other symptoms. Other potential hazards include distraction/startling of workers and interference with worksite communications including inability of workers to hear audible emergency warnings of danger (alarms).

Where engineering controls, process modifications or administrative controls are not sufficient or feasible to control noise hazards, hearing protection (earplugs, earmuffs, or both) shall be used as appropriate for conditions. The Hearing Conservation Program shall be implemented where noise exposures equal or exceed an 8-hour, time-weighted average (TWA) sound level of 85 decibels on the A-weighed scale (dB). Hearing protection shall be worn when working near

heavy equipment, drilling rigs, and other equipment causing sustained noise hazards during the workday.

Personal Protection from Chemical or Biological Agents – Workers shall be prepared at all times to use "baseline" protective measures from commonly encountered minor chemical and biological agents in the workplace, such as residual dust and debris in a manufacturing or construction worksite, mold, bird guano, an similar hazards. Workers will also routinely encounter workplace situations where they are "passively" exposed to such hazards (e.g. working near where these hazards are present and not actively engaged in work that involves hazardous exposure). Baseline protective measures may include use of appropriate eye protection, use of chemically protective gloves (typically nitrile surgical type gloves), and disposable coveralls (such as Tyvek suit), shall be used, in combination with standard general hygiene procedures (hand washing). Where elevated hazards from chemical or infectious biological agents are present, or from radioactive agents, and where workers are actively engaged in work involving those hazards, the specific nature of those hazards shall be assessed and Site-specific protective measures developed (see Sections 4.12 through 4.15).

High-Visibility Apparel – The use of high-visibility and/or reflective apparel is necessary for personal protection where workers are performing work tasks in the vicinity of moving vehicles (such as near/on public or private roadways, parking lots, vehicle access ways, or on construction sites near operating construction vehicles). High visibility apparel may also be warranted in situations of limited visibility (fog, darkness) and other hazardous circumstances such as working remotely in a large open lot. As a general rule, high-visibility apparel is required to be worn by Site workers and visitors on Parcel III.

The primary guideline addressing use of high-visibility apparel is the voluntary American National Standard for High-Visibility Safety Apparel, ANSI[1]/ISEA[2] 107-2004, which recommends three classes (Class I, II and III) of high visibility garments for different working conditions. These classes differ in the surface area of fluorescent/high-visibility background material (typically orange or bright green) and reflective stripe materials (typically white or yellow):

- *Fluorescent Tee Shirts, Fluorescent Hats* - Acceptable in certain limited low hazard, off road, conditions, for the purpose of maintaining visual contact with coworkers, or for protection from slow moving equipment where personnel are located well away from the path of moving equipment. Fluorescent tee shirts and hats are generally considered

[1] American National Standards Institute

[2] International Safety Equipment Association

inappropriate for work on construction sites, near heavy equipment, and are not appropriate for work along roadways, or for night work or conditions of poor visibility.

- *Class I Garments* - (217 square inches background; 155 square inches reflective, 1 inch wide) - Intended for workers who have ample separation from vehicular traffic that does not exceed 25 miles per hour (mph), such as parking service attendants, workers in warehouses with equipment traffic, shopping cart retrievers, sidewalk maintenance workers and delivery vehicle drivers.

- *Class II Garments* - (775 square inches background; 201 square inches reflective, 1.375 inches wide) - For workers who need greater visibility in poor weather conditions and whose activities occur near roadways where traffic speeds exceed 25 mph. This class of garment is suitable for railway workers, school crossing guards, engineering personnel, survey crews, parking and tollgate personnel, airport ground crews and law enforcement personnel directing traffic.

- *Class III Garments* - (1240 square inches background; 310 square inches reflective, 2 inches wide) - The highest level of visibility for workers in high-risk environments that involve high task loads, a wide range of weather conditions and traffic exceeding 50 mph. Class III garments provide coverage to the arms and/or legs as well as the torso, and can include pants, jackets, and coveralls.

All project personnel shall meet the requirements of the Federal Highway Administration (FHWA) of the U.S. Department of Transportation (DOT) for use of high visibility apparel by all workers who perform work within the rights-of-way of federal-aid highways (which includes most roadways: interstate highways, main and secondary highways, county, township and rural roads, feeder routes, loops, belt highways, extensions, spurs). The required high-visibility apparel shall be in accordance with ANSI/ISEA 107-2004 standard, and its selection shall be based on an assessment of the many factors related to the work environment (speed and amount of traffic, time of day, complexity and clutter in the work zone, proximity of work to oncoming traffic, distractions to worker's attention, etc.). Apparel that has become faded from too many washings, or from sun bleaching, or that has become excessively soiled is not acceptable as high visibility apparel and should be replaced. In many fieldwork situations where high visibility apparel would not ordinarily be needed, field personnel shall use discretion and good judgment in determining the need for such apparel.

When working along roadways, high visibility vests will in many cases be used in conjunction with other work-zone safety devices (barriers, cones, signs, etc.) set up in accordance with FHWA's Manual on Uniform Traffic Control Devices (MUTCD). For requirements associated with worksites positioned in or near roadways, see Section 4.3, "Special Driving, Traffic and Transportation Hazards."

4.1.2 Premises Hazards, Illumination

"Premises hazards" include a broad range of hazard types, related either to existing conditions present in or near the worksite location (such as rough terrain, poor lighting, steep slopes, traffic/roadways, etc.), or by conditions that may be created by the work operation (such as accumulation of debris, slip hazards due to lubricant spill, trip hazards from equipment, and similar hazards). Employees shall always use "situational awareness" and good housekeeping practices when conducting work so that such hazards may be prevented, eliminated or controlled. General guidelines related to these types of "baseline hazards" include:

- Follow good housekeeping procedures. Never assume that someone else will clean up a spill, put away an object, dispose of accumulated debris.
- Use caution when walking on sloped areas (especially geosynthetics), particularly when moisture is present. Use caution when walking on soft or uneven surfaces; e.g., marsh areas. Watch for icy conditions in cold weather.
- Stay alert and maintain attention to the work environment and become aware of equipment and vehicles active on-Site and use caution when moving about.
- Follow the established designated safe paths for travel and keep these areas free from debris.
- Avoid steep or slippery slopes and paths near operation vehicles and equipment.
- Remove, stow away or clearly mark objects that pose tripping hazards.
- Prevent water accumulation where practicable.
- Cables and/or wiring should be taped down, when possible. Locate cables and/or wiring out of the commonly used areas.
- Mark or repair any opening or hole in the floor.
- Carry objects in a manner that allows you to see in the area you are moving in. Do not carry objects that are too large or bulky. Do not carry more weight than you can balance and keep stable.
- PPE can reduce or limit your field of vision and mobility; adjust PPE and use extra caution as necessary.
- Use the handrail when using stairs. Be aware of stairway blockages.
- If conditions are recognized that may be indicative of an unsafe condition, modify your work activity accordingly, and notify coworkers and your SHSO of this condition.

- Never jump over or into a trench or excavation.
- Walk, do not run.
- Maintain proper lighting so obstacles are clearly visible.
- Where workers may encounter traffic-related hazards, personnel shall wear, at a minimum, a high visibility/reflective vest.
- Depending on worksite circumstances, higher level of reflective clothing, supplemented by on-person lighting may be warranted.

Where work is conducted under conditions of limited illumination, such as within an abandoned facility, or during nighttime work, appropriate lighting shall be utilized that is appropriate for the work tasks, project scope, and Site conditions. In some circumstances, portable lighting (flashlight) may be appropriate, whereas in other circumstances, lighting equipment (portable generator, light stand) may be necessary to provide illumination of work areas and/or access routes.

4.1.3 Weather/Climate-Related Hazards, Environmental Conditions

Field personnel should be aware of local weather conditions and monitor any advisories issued by the National Weather Service and other local reporting services. Depending on location and season, storms are capable of producing heavy rain, floods, extreme temperatures, high wind conditions, lighting, and/or snowfall. The SHSO must be aware of local weather conditions and forecasts. This section provides the central guidelines and procedures for working in poor weather conditions. For more specific information pertaining to on-canal activities, refer to Section 4.2.2, “Boating and Work On Marine Vessels.”

Heavy Rain - If working or driving in a storm use extreme caution. Headlights should be turned on in vehicles during rainfall events. Marine vessels should be equipped with navigation lights. Workers should be aware of decreased visibility caused by heavy rain especially when driving. Surfaces and tools become slippery and clothes become wet. A risk of hypothermia is present when exposed to winds, even in warm temperatures. If the storms are going to produce thunder and/or lightning, leave the work area immediately and move to a safe area. Use your best judgment to determine if the rainfall becomes too heavy to continue working safely.

CSO discharges within the Gowanus Canal typically occur when rainfall amounts surpass approximately 0.2 inches. Be cautious when working near outfalls and avoid working adjacent to outfalls during heavy rain events unless prior authorization is granted.

Lightning - Lightning can strike as far as 10 miles from the area where it is raining. If you can hear thunder, you are within striking distance. Seek safe shelter immediately. This can be within a building or vehicle. If the duration of time between a flash of lightning and a clap of

thunder is less than 30 seconds, workers should reach safe shelter. Workers should wait until at least 30 minutes after the last qualifying clap of thunder or flash of lightning before going outside again. Together these protocols are referred to as the "30/30 rule." Refer to Appendix 3, "Emergency Response Procedures, Incident Reporting," for evacuation procedures.

Flooding - Flooding may occur because of heavy rain in a short period of time. Flooding is probable on roadways adjacent to the Canal. Avoid driving through flooded roadways. In case of downed power lines, do not walk through flooded roadways. Be particularly cautious at night when flooded areas are difficult to see. Urban flooding can stop traffic and increase the potential for traffic accidents.

Extreme Temperatures - Work activities may take place in extreme heat or cold. Temperatures on the Canal may vary from overland temperatures as a result of reflective heat from the surface water and increased wind. Be prepared if these conditions are anticipated. Have the correct PPE available, exercise proper fluid intake, and take breaks to complete work and prevent heat and cold stress. For more information about these conditions, see Section 4.1.5, "Heat Stress," and Section 4.1.6, "Cold Stress."

High Winds, Tropical Storms, and Hurricanes – Anytime workers will be working at heights under windy conditions (including work on ladders, scaffolds, roof tops, aerial lifts, and other locations where fall hazards are present), or where wind conditions may pose a significant hazard such as from blowing or falling debris, or tree limbs, wind conditions shall be considered and activities modified, curtailed or suspended as appropriate for worker protection. When winds approach 40 mph for overland work, 20 mph for on-canal work or when field personnel feel unsafe based on the activities being performed, field crews should discuss with their SHSO whether the work can continue safely. At risk work activities shall be modified or curtailed, and workers should seek shelter as appropriate. When winds approach 40 mph (gale force winds) twigs begin to break off of trees and vehicles will veer off of the road. Note that tall or elevated equipment may have manufacturer's safe operating wind speeds defined that could be less than 40 mph; therefore, the operator's manual should be consulted prior to operation of the equipment under windy conditions. Additional worker safety measures may be necessary due to storm conditions. Tropical storms are described as storms with sustained winds ranging from 39 to 73 mph and hurricanes produce sustained winds that exceed 74 mph. Avoid driving in these conditions; 70% of injuries during hurricanes are a result of vehicle accidents.

Snowfall and Ice Conditions - Working in the winter months will result in activities taking place during periods of snowfall or icy conditions. If you are working during or after snow has fallen, dress appropriately for the conditions. Snow and ice can cause working surfaces to become slippery; clear snow and ice from all work areas to prevent slip hazards. Work will not be permitted on marine vessels with boat decks covered in ice or snow. Captains of marine vessels will determine ability of vessel transport in icy conditions. Use caution when performing any snow or ice removal activities to prevent injuries. Driving in snowy and icy conditions is also

hazardous. Reduce speed and use caution if you must drive in these conditions. If the weather conditions deteriorate and you do not feel safe working in these conditions, stop work, move to a safe indoor location, and contact your SHSO. Where icy conditions are present, evaluate work locations for hazards due to potential falling ice, and control hazards accordingly. Follow cold stress procedures for working under cold weather conditions.

4.1.4 Heat Stress

Heat-related illness is a recognized occupational hazard and occurs when your body is unable regulate its temperature when exposed to heat-related hazards while working. These hazards may be present as the result of hot weather, wearing PPE that restricts the body's ability to cool itself, or working in or near hot industrial environments (such as associated with ovens, kilns, hot work, smelting, and other hot processes).

The body normally cools itself by sweating, but under some conditions, the body's defenses may be overcome, resulting in a rise in temperature and possible heat-related illness. Very high body temperatures may damage the brain or other vital organs. Risk factors include hot temperatures, direct sunlight, high humidity, stagnant air (no breeze), and sustained strenuous activity. Other risk factors include age, physical condition, obesity, fever, dehydration, heart disease, poor circulation, sunburn, and prescription drug and alcohol use. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Prevention:

- Drink plenty of hydrating fluids. In high heat, a minimum of one gallon per day should be consumed. Fluid should be consumed frequently. Do not wait until thirsty.
- Provide cooling devices, when necessary, to aid natural body heat exchange during prolonged work or severe heat exposure. Devices include field showers, hose-down areas, shade umbrellas/tents, wide-brim hats, and cooling jackets, vests, or suits.
- If amenable to work conditions, wear light-colored, loose fitting, "breathable" clothing.
- Avoid prolonged periods of exposure. Take breaks as necessary. Higher heat exposure requires more frequent breaks.
- Be able to recognize the signs, symptoms and how to treat for heat stress. Signs, symptoms and treatment are listed below.

Signs and Symptoms:

- Mild heat stress - Decreased energy, slight loss of appetite, nausea, lightheadedness.

- Moderate heat stress - Heavy sweating, thirst, faintness, headache, confusion.
- Severe heat stress (heat stroke) - Throbbing headache, confusion, irritability, rapid heartbeat, difficulty breathing, dry skin (no sweating), vomiting, diarrhea.

Treatment:

- Mild and Moderate heat stress - Take to cool place, drink cool (not cold) fluids, remove excess clothing, rest.
- Severe heat stress - Call 911 for an ambulance and get to a cool place, remove excess clothing and rest.
- Adjust work and rest schedules as needed. Establish a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- Provide shelter or shaded areas (77°F is best) to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels to ensure that the cardiovascular system functions adequately. Daily fluid intake must equal the approximate amount of water lost in sweat. Workers are encouraged to drink more than the amount required to satisfy thirst (recommend water and sport drinks, not coffee or soda), because thirst is not an adequate indicator of adequate salt and fluid replacement.
- Remove impermeable protective garments during rest periods.
- Do not assign other tasks to personnel during rest periods.

4.1.5 Cold Stress

Various work conditions may present a risk of cold stress, as from cold weather, or a combination of wet/wind/low temperature. Other cold stress risks may arise from the inherent nature of work activities, such as cold stress from water immersion when working over water, working in cold water (wading, diving), entering refrigeration/freezer units at work locations, and other work-specific aspects.

Prevention:

- Work in pairs to keep an eye on each other and watch for signs of cold stress.
- Wear layers of loose fitting clothing, including insulated coveralls, head covering, gloves and boots when overland. When on a marine vessel, it is recommended that field crew wear float coats.
- Minimize wind chill effects by wearing a wind resistant outer shell.

- Minimize lengthy periods of outdoor activity. This may require additional shifts and taking frequent breaks to warm up.
- Provide warm shelter.
- Remain hydrated. There is a tendency not to drink enough fluids to stay hydrated when the temperature is cold.
- Be aware of the symptoms of cold stress and appropriate first aid measures.
- Because of the considerable danger to personnel, outdoor work should be suspended if the ambient temperature drops below 0°F or if the wind chill factor drops below -29°F.

Signs, Symptoms, Treatment:

- *Mild hypothermia* – Symptoms include shivering, lack of coordination, stumbling, fumbling hands, slurred speech, memory loss, pale and cold skin. For treatment, move victim to warm area, stay active, remove wet clothes and replace with dry clothes or blankets, cover the head, drink warm (not hot) sugary drink.
- *Moderate hypothermia* - Symptoms include the discontinuation of shivering, victim is unable to walk or stand, and may exhibit confused and irrational behavior or judgment. For treatment of this severe medical condition, call for an ambulance, cover all extremities completely, place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest and groin and follow treatments for mild hypothermia.
- *Severe hypothermia* – Symptoms include severe muscle stiffness, very sleepy or unconscious, ice cold skin. Severe hypothermia is a severe, life-threatening condition. For treatment, follow all treatment measures specified for mild and moderate hypothermia, and recognize that transportation to a medical facility as soon as is a critical, life saving measure.

4.1.6 Biological Hazards

This section addresses “baseline hazard preparedness” measures for hazardous plants, animals and insects, as well as “baseline hygiene procedures” for protection against unsanitary conditions. Where workers may be exposed to elevated project-specific risks of exposure to specific recognized infectious or allergenic agents, or where the inherent scope of work involves a potentially infectious biohazard (such as mold remediation, medical waste handling), refer to provisions in Section 4.12, “Infectious or Allergenic Biohazards.”

Hazardous Plants - Persons working on the Site should be able to recognize and identify poisonous plants indigenous to the Site location (e.g., poison ivy, poison oak, poison sumac). For example, poison ivy plants have three leaves arranged at the end of each stem. Two

secondary leaves are attached opposite one another and directly to the stem at their base. The primary leaf is attached to the end of the stem. The leaves often, but NOT ALWAYS, have a shiny appearance. Poison ivy has conspicuous red foliage in the fall. Small yellowish-white flowers appear in May through July at the lower leaf axils of the plant. White berries appear from August through November.

- Poison Ivy often appears as ground cover at the edge of wooded areas along the Canal. It may also appear growing from a vine wrapped around trees.
- Avoid or remove poisonous plants where practicable. Wear appropriate protective clothing (e.g., gloves, long-sleeved shirts) as required.
- One can become sensitized (like a latex allergy) though immune for several years at the beginning.
- If you come in contact with the plant, the plant's oil will be transferred onto your skin and clothing. The best way to manage the oil is to wash skin with cool water and soap (preferably 5% tincture of green soap available at local drug stores). If soap and water is unavailable, thorough (2-3 minutes) rinsing with cold water may help. Do not use warm water. Warm water causes pores to open which can exacerbate the issue.
- The lag time between exposure and symptoms can be quite long – up to several days.
- If you are in the field, blot the area with an alcohol patch and follow by washing as soon as possible. Calamine lotion, Tecnu®, yellow laundry soap, or Colloidal oatmeal (Aveeno®) baths provide relief from itching and rashes. More information about Tecnu can be found at http://teclabsinc.com/.
- If you have to pass through heavy ivy growth, be sure to carefully handle your field clothes when you return. The oil can last on clothing for a few weeks, so wash frequently.
- For additional information, please see http://poisonivy.aesire.com/.

Animal Hazards – Wild or hazardous animals such as stray dogs or cats, raccoons, and rats may be encountered. Workers shall use discretion and avoid all contact with wild or loose animals. If wild animals present a problem, efforts will be made to remove these animals from the Site by contacting a licensed animal control technician, or use special protective measures (such as use of robust leggings or high boots where poisonous snakes may be present).

Stinging Insects - Wasps (hornets and yellow-jackets) and bees (honeybees and bumblebees) are common insects that may pose a potential hazard to the field team during work performed in the spring, summer, or fall. Bees normally build their nests in the soil. However, they use other natural holes such as abandoned rodent nests or tree hollows. Wasps make a football-shaped,

paper-like nest either below or above the ground. Yellow-jackets tend to build their nests in the ground but hornets tend to build their nests in trees and shrubbery. Bees are generally more mild-mannered than wasps and are less likely to sting. Bees can only sting once while wasps sting multiple times because their stinger is barbless.

Wasps sting when they feel threatened. By remaining calm and not annoying wasps by swatting, you lessen the chance of being stung. Wasps and bees inject a venomous fluid under the skin when they sting. The venom causes a painful swelling that may last for several days. If the stinger is still present, carefully remove it with tweezers. Some people may develop an allergic reaction (i.e., anaphylactic shock) to a wasp or bee sting. If such a reaction develops, seek medical attention at once. If a Site worker is allergic to bees or wasps notify your SHSO and, if necessary, notify the rest of the field team to the location of your EpiPen®.

Ticks - Tick-borne pathogens can be passed to humans by the bite of infected ticks. Ticks can be infected with bacteria, viruses, or parasites. Some of the most common tick-borne diseases in the United States include Lyme disease, babesiosis, ehrlichiosis, Rocky Mountain Spotted Fever, anaplasmosis, Southern Tick-Associated Rash Illness, Tick-Borne Relapsing Fever, and tularemia. Other tick-borne diseases in the United States include Colorado tick fever, Powassan encephalitis, and Q fever. Lyme disease is the most commonly reported tick-borne disease in the United States.

Outdoor workers are at risk of exposure to tick-borne diseases if they work at sites with ticks. Worksites with woods, bushes, high grass, or leaf litter are likely to have more ticks. Outdoor workers in most regions of the United States should be extra careful to protect themselves in the spring, summer, and fall when ticks are most active. Ticks may be active all year in some regions with warmer weather.

Where the risk of ticks is present, workers should do the following:

- Wear a hat and light-colored clothing, including long sleeved shirts and long pants tucked into boots of socks, or secured at the ankles with gaiters or similar device.
- Use insect repellents, such as DEET (on skin) and/or Permethrin (on clothing), for protection during the time you will be outdoors, following label instructions for use.
- Check your skin and clothes for ticks every day. The immature forms of these ticks are very small and may be hard to see.
    - Shower or bathe as soon as possible after working outdoors to wash off and check for ticks.
    - Remember to check your hair, underarms, and groin for ticks.
    - Immediately remove ticks from your body using fine-tipped tweezers.

  - Grasp the tick firmly and as close to your skin as possible.
  - Pull the tick's body away from your skin with a steady motion.
  - Clean the area with soap and water.
  - Removing infected ticks within 24 hours reduces your risk of being infected with the Lyme disease bacterium.

- Wash and dry work clothes in a hot dryer to kill any ticks present.
- Learn the symptoms of tick-borne diseases (including fever/chills, aches/pains, rash, especially the circular "target form" red rash around the bite commonly, but not always, seen).
- If you develop symptoms of a tick-borne disease seek medical attention promptly. Be sure to tell your health care provider that you work outdoors in an area where ticks may be present.

Mosquitos - West Nile Virus (WNV) is a mosquito-borne infection transmitted through the bite of an infected mosquito. The symptoms of WNV can be asymptomatic (no symptoms) or in more serious cases can lead to West Nile Fever. West Nile Fever can include fever, headache, tiredness, body ache, an occasional rash on the trunk of the body, and swollen lymph glands. In severe cases, people have developed West Nile Encephalitis or Meningitis which symptoms include fever, headache, neck stiffness, tremors, coma and in some cases death. Most mosquitoes are not infected and the chance of infection from a mosquito bite of an on-Site worker is low. The following precautions will be used to help reduce the risk of mosquito bites:

- Reduce mosquito-breeding areas by making sure wheelbarrows, buckets, and other containers are turned upside down when not used so that they do not collect standing water.
- Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many mosquitoes are most active (between dawn and dusk).
- Use mosquito repellant according to the manufacturer's directions when outdoors for long periods of time and when mosquitoes are most active.

Insect Repellants - Centers for Disease Control and Prevention (CDC) evaluation of information contained in peer-reviewed scientific literature and data available from the EPA has identified several EPA registered products that provide repellent activity sufficient to help people avoid the bites of disease carrying mosquitoes. Products containing these active ingredients typically provide reasonably long-lasting protection:

- *DEET* (Chemical Name: N,N-diethyl-m-toluamide or N,N-diethly-3-methylbenzamide).
- *Permethrin*, used for greater protection from ticks; kills ticks on contact; used on clothing, should not be used on skin; one application to clothing typically stays effective through several washings.
- *Picaridin* (KBR 3023, Chemical Name: 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester).
- *Oil of Lemon Eucalyptus or PMD* (Chemical Name: para-Menthane-3,8-diol) the synthesized version of oil of lemon eucalyptus *IR3535* (Chemical Name: 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester).

EPA characterizes the active ingredients DEET and Picaridin as "conventional repellents" and Oil of Lemon Eucalyptus, PMD, and IR3535 as "biopesticide repellents", which are derived from natural materials. In general, higher concentrations of active ingredient provide longer duration of protection, regardless of the active ingredient, although concentrations above ~50% do not offer a marked increase in protection time. Products with <10% active ingredient may offer only limited protection, often from 1-2 hours. Products that offer sustained release or controlled release (micro-encapsulated) formulations, even with lower active ingredient concentrations, may provide longer protection times. Regardless of what product you use, if you start to get mosquito bites reapply the repellent according to the label instructions or remove yourself from the area with biting insects if possible.

4.1.7 Lifting, Manual Material Handling - General Practices

The need to manually lift equipment, material, samples, and devices and transport them manually from one location to another is common to many work tasks. Safe lifting procedures shall be used to reduce the risk of back injury and other musculo-skeletal injuries, and include the following:

- *Feet* - Feet should be parted, with one foot alongside the object being lifted and one behind. Feet should be comfortably spread to give greater stability. The rear foot should be in position for the upward thrust of the lift.
- *Back* - Use the sit-down position and keep the back straight, but remember that "straight" does not mean "vertical". A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the abdomen that can cause a hernia.
- *Arms and Elbows* - The load should be drawn close to the body, and the arms and elbows should be tucked in. When the arms are held away from the body, they lose much of their strength and power. Keeping the arms tucked in also helps keep body weight centered.

- *Palm* - The palm grip is one of the most important elements of lifting. The fingers and the hand are extended around the object to be lifted. Use the full palm; fingers alone have very little power.

- *Chin* - Tuck in the chin so the neck and head continue the straight back line. Keep the spine straight and firm.

- *Center of Gravity* - Position the body so its weight is centered over the feet. This provides a more powerful line of thrust and assures better balance. Start the lift with a thrust of the rear foot. Shift hand positions so the object can be boosted after knees are bent. Straighten knees as object is lifted or shifted to the shoulders.

- *Twisting Motion* - To change direction, lift the object to a carrying position, and turn the entire body, including the feet. Do not twist your body. In repetitive work, both the person and the material should be positioned so that the worker may avoid twisting his/her body when moving the material.

- *Seek Help* - If the object is too heavy or awkward to be handled safely by one person, seek help from a coworker.

Limit continuous lifting of weights to 50 pounds. Lifts of heavier weights are permitted on an interim basis. Help shall be obtained for lifting of loads greater than 50 pounds or the maximum allowed by the client, whichever is less. Where available, mechanical lift-assistance devices shall be used to lift heavy weights, for example, use of a dolly, hand truck, or wheeled cart. Inspect objects for grease or slippery substances before they are lifted to ensure that the object will not slip. Do not carry long, bulky or heavy objects without first verifying that the way is clear and that vision is unobstructed. This ensures that other persons or objects will not be struck by the load.

Do not carry loads that cannot be seen over or around. Exercise caution when lifting above the chest level. Make sure workers are physically suited for the job before assigning jobs requiring heavy and/or frequent lifting. A person's lifting ability is not necessarily indicated by his height or weight.

Before lifting an object, consideration should be given to how the object will be set down without pinching or crushing hands or fingers. For example, to place an object on a bench or table, the object should be set on the edge and pushed far enough onto the support so it will not fall. The object can then be released gradually as it is set down, and pushed in place with the hands and body from in front of the object.

When two or more people are handling the same object, one should "call the signals." All the persons on the lift should know who this person is and should warn him/her if anyone in the crew is about to relax their grip.

4.1.8 Security, Working Alone

Where work is conducted in a potentially high crime environment, urban setting, or other location with elevated personal security risks, workers shall use appropriate measures for personal security (such as buddy system, security service, work scheduling, and other measures). Potential measures to be considered, as appropriate for a given work situation, include:

1. Lock your vehicle when you step away from it, even if only temporarily.
2. Ensure that the Site is properly and sufficiently illuminated before performing work.
3. Do not perform work at the Site after dusk alone.
4. If security is a concern at an abandoned or uninhabited Site, do not work alone, and consider additional measures suitable for the work environment (security guard, police detail).
5. Evaluate, identify and inform employees about specific high-risk situations, or locations associated with their work.
6. Inform employees working in high-risk areas about actions they may take when dealing with strangers or intruders. These actions may include communicating about the reasons for worker presence in a non-confrontational manner, recommended actions and responses, when/how to call for help or go to a safe area. Be courteous when interacting with people encountered during activities at the Site, including Site personnel, passers-by, homeless people, trespassers, etc.
7. Discuss procedures for employees to follow when dealing with aggressive strangers. Procedures may include equipping field staff with cellular phones and alarm/noise devices, and requiring preparation of a daily work plan and informing a contact person of their location throughout the day.
8. Establish procedures for workers to promptly report unauthorized people (for example, to the Site point of contact, project representative, Site security representative, or other designated contact).
9. Ensure employees have safe transportation available for project needs and verify that vehicles provided are reliable and properly maintained. Consider enrolling in an auto club that can provide emergency roadside assistance.
10. Train employees in safety routines for parking, and for leaving and returning to their vehicles, or on safe procedures for public transportation, including, as applicable:
    - Being observant – look and listen.

- Not slinging purses or bags over the shoulder or around the neck.
- Carrying keys in hand.
- Walking around the vehicle and checking the back seat before unlocking the vehicle.
- Locking doors and keeping windows up.
- How to carry and store valuables.
- The dangers of reading or writing in parked vehicles.
- Maintaining a full gas tank or filling up at well-lit and busy gas stations.
- How to choose a safe parking spot.
- Looking for adequate light from street lamps.

Working alone may include performing work-related duties while not in the presence of or easily accessible to coworkers or other project related individuals (client personnel, other on-Site workers). Working alone may also apply to a small group of employees working in remote locations or isolated sections of a large site, or when traveling between work locations, and when performing work activities that may pose potential exposure(s) to chemical, physical or biological risks.

Section (q) (3) (v) of 29 CFR 1926.65 (HAZWOPER) requires that operations in hazardous areas shall be performed using the buddy system in groups of two or more.

When non-HAZWOPER or non-hazardous waste site work is conducted, precautions should take account of known situations and potential risks when staff are working alone and/or may be in situations noted above in this section. A lone worker should be able to function without risk and with confidence and to facilitate this he/she will need to understand:

- The hazards and risks associated with the intended activity.
- The steps that have been taken to reduce risks to the lowest extent reasonably practicable.
- Any written instructions for the task, including contingency measures for foreseeable problems and the employee's duty to follow procedures.
- The steps to be taken when a problem is encountered with timely communication protocol.

- Where appropriate, steps to minimize the risk of violence, such as when working in unsafe neighborhoods.
- Emergency arrangements for illness or injury.
- The location of the immediate supervisor, manager or responsible person who will understand the situation and can offer assistance.

Managers and Supervisors must understand:

- The importance of ensuring that hazards and risks are correctly evaluated and documented in the Site-specific HASP and PHAs.
- How to obtain professional advice and assistance when problems arise.
- Company's Procedures/Policy/Guidelines and how they should be implemented.

Employees who are required to work alone should:

- Ensure that they do not take unnecessary risks.
- Make their manager aware of any medical conditions that may have developed which could increase the risks of lone working.
- Follow all health and safety procedures including good practice in personal safety and awareness and timely notification of supervisor during routine work activities and when schedule changes.
- Ensure that a colleague is aware of their location in any potentially high dangerous situations.
- Report promptly any threats or potentially dangerous situations.
- Have the knowledge and competencies to undertake their duties safely.
- Have a comprehensive knowledge and awareness of the hazards and risks to which they may be exposed and fully understand what to do if something does not go as planned.
- Ensure someone else knows their whereabouts, what he or she is doing and when they should be expected back to their office or project Site location. This will be accomplished by communicating with off-Site personnel, at a minimum, of three times daily: (1) upon arriving at the Site, (2) midway through the workday, and (3) upon departing from Site.

4.1.9 Routine Driving Hazards – General Practices

This section discusses general hazards and safety measures for routine driving hazards, as described above. More specialized driving and/or traffic-related hazards, such as operation of "non-typical" vehicles (e.g., trucks) or the use of vehicles to tow or transport loads, is addressed in Section 4.3, "Special Driving, Traffic and Transportation Hazards."

General safe driving practices shall be used at all times, including the following:

- Seat belts shall be used at all times.
- Always drive at safe speeds appropriate for weather conditions, day or night driving, traffic conditions, speed limits, and other factors that may be relevant.
- Minimize distractions when driving.
- Minimize tailgating.
- Maintain your vehicle in a safe condition –clean windows, lights, etc.
- When traveling in an unfamiliar location plan your travel route, assemble maps, enter destination in GPS, make note of one-way routes, etc., before departing.
- When using an unfamiliar vehicle (such as a rental car), take the time to familiarize yourself with vehicle controls and other characteristics before driving.
- For long-distance travel, or for travel during sleep hours, minimize fatigue by taking frequent rest breaks, eat light snacks and try to avoid heavy meals, stay hydrated, provide fresh water.
- Do not text while driving – this includes texting, emailing, entering destinations into a GPS device, and similar activities.

Work on the Gowanus Canal Project may involve the driving of vehicles to and from Parcel III as well as the driving of vehicles around the Canal. In addition to general safe driving parameters outlined above, the following procedures and warnings must be followed when operating a vehicle in carrying out work on the Gowanus Canal Project:

- When driving on properties, be aware that there may be uneven ground and tire hazards, swinging gates, bollards, and large vehicles entering and exiting. Choose routes carefully. If possible, new routes should be walked out first.
- Due to the instability of the bulkheads, drivers are prohibited from driving or parking vehicles near the edge of the Canal unless authorized by the SHSO.

- Unless specifically approved by an applicable PHA, the vehicle ignition key shall not be left in an unattended vehicle.
- Workers are prohibited from riding in pickup truck cargo beds.
- Drivers and passengers shall be in the seated position, with the seat belts fastened, before the vehicle is set in motion.
- Tailgates will be closed before the vehicle is set in motion unless carrying an extended load that is properly secured and flagged.
- When driving on Parcel III or any other private property or project Site, drivers shall not exceed 15 mph.
- Drivers operating a vehicle with a gross vehicular weight rating (GVWR) of more than 20,000 pounds will use chocks when parking on steep slopes or grades. Any idling vehicle without a driver present in the vehicle must be chocked.
- A fire extinguisher, first aid kit, and chocks must be kept in vehicles used for fieldwork at the Site.
- Workers shall not use wireless communication devices when operating a vehicle unless the device is in a hands-free mode.

An overview of local traffic regulations and guidelines for driving in Brooklyn, New York are as follows:

- NO RIGHT TURN ON RED is permitted in New York City unless otherwise noted by a traffic sign.
- Be mindful of pedestrians crossing the road, at bus stops near construction entrances, and the general presence of pedestrians on foot and riding bicycles in the vicinity of the work area. Avoid driving through yellow lights as pedestrians may already be beginning to cross the road. Be alert for pedestrians crossing roadways outside of designated cross walks. Be mindful of pedestrians when making turns at intersections. Be especially careful of this at night or in other instances when visibility is limited.
- Be mindful of bicyclists. Avoid driving in the bike lanes and always check your mirrors for bicyclists when making a turn.
- Unless otherwise specified, the speed limit in New York City is 25 mph.
- Be mindful of one-ways. Review Figure 2 for one-way street notations.

- Be mindful of truck traffic on 3rd Avenue. 3rd Avenue is used heavily by tractor trailers and other large trucks as there are no trucks allowed on 4th or 5th Avenue except for local deliveries.

- Do not trust any other drivers to do the right thing. As always, be a defensive driver. Expect other drivers on the road, including taxi cab drivers (whether green, yellow, or a local car service) and buses, to drive aggressively.

- Drive slowly through construction zones and be alert of workers alongside the road.

For security purposes, vehicles must be secured in a safe place and locked with the keys removed whenever unattended unless specifically approved by the SHSO. Sensitive materials or anything of value should not be left in the vehicle. When circumstances make it impractical to remove items, they should be placed in the trunk, kept out of sight, or covered.

In the event of a vehicle-related accident, the driver shall follow procedures found in Appendix 3, "Emergency Response Procedures, Incident Reporting."

4.2 Water and/or Boating Hazards

This section discusses hazards associated with any work conducted on or near water where potential drowning and other water-related hazards are present. This may include working on a watercraft or working near water along the shoreline or bulkheads. For the Gowanus Canal project, working on or near water is an integral component of many of the work tasks to be conducted. In carrying out specific tasks associated with the remedial construction, personnel will be required to work on watercraft and transport equipment and materials on and off watercraft.

4.2.1 Land-Based Work Near Canal

Many work tasks for this project will involve working on land adjacent to the Canal and along the Canal bulkheads. The following hazards and required safe practices apply to land-based work conducted along the Canal:

- Workers are not permitted to walk on gravel slopes formed from bulkhead failures on Parcel III.

- Personnel working within approximately 10 feet of the Canal, where the danger of drowning exists, shall wear a U.S. Coast Guard (USCG)-approved life jacket or buoyant work vest sized and adjusted to the wearer. To be immediately effective in an overboard situation, the straps must be buckled. Vests shall be reflectorized with a rescue light during night/low light or heavy weather conditions. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects, which would alter their strength or buoyancy. Defective units shall not be used.

- If the water temperature is less than 38°F it is recommended that personnel wear float jackets and float pants instead of a life jacket. Proper maintenance of float suits is required just as required for life jackets.

- Additional safety measures must be implemented for personnel working within approximately 5 feet of the Canal, to address the potential fall hazard. When feasible, work near the canal may be limited to locations where existing barriers (guardrail, parapet, or similar) are located, or a temporary barrier may be installed. Where the use of a physical barrier is not feasible, a "tie-off, restraint" system may be utilized to restrict the ability of a worker to reach the edge of the bulkhead. Where neither a tie-off system nor a physical barrier are feasible, a support boat may be deployed to support land-based operations near the Canal. Other potential safety strategies to be considered will include repositioning of the work, and addressing seasonal- and weather-related factors. The approach taken to protect personnel performing land-based work along the Canal will be evaluated on a case-by-case basis and indicated in the task specific PHA.

- Ring buoys with at least 90 feet of line shall be readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.

- Personnel will be required to make notifications to their SHSO each day that work nearby the Canal will occur and the scheduled duration. When work nearby the Canal ceases, personnel must notify their SHSO.

- Employees shall not work alone within 10 feet of the Canal.

- Working near water is not permitted when ice is located in the immediate vicinity of the task site unless authorized by the SHSO.

- Special care will be taken regarding foot placement when working nearby water. Always look ahead at the ground when walking around the water's edge. Avoid slips, trips, and fall hazards by choosing clear paths when moving near the edge of the Canal. Keep walkways clear of slips, trips, and fall hazards. Mark slips, trips, and fall hazards that cannot be removed or avoided completely. Be aware that areas close to the Canal edge may be wet or slippery, especially those areas that are submerged at high tide.

- Emergency preparedness procedures in the event of personnel falling into the Canal are provided in Section 9, "Emergency Preparedness and Response," and task-specific PHAs.

4.2.2 Boating and Work On Marine Vessels

In carrying out specific tasks associated with remedial construction, personnel will be required to conduct work on marine vessels in the Canal. The following hazards and requirements apply to work conducted on the water:

Training:

- Boat operators are required to complete a boating safety course and have experience operating a motorized vessel within the past two years. Records of proof of course completion must be kept on file at the project Site.
- Each passenger not holding certification must be briefed by the certified operator or captain as to the safety equipment and procedures on board the vessel.

Personal Protective Equipment:

- Personnel working on a marine vessel shall wear a USCG-approved life jacket or buoyant work vest sized and adjusted to the wearer. To be immediately effective in an overboard situation, the straps must be buckled. Vests shall be reflectorized with a rescue light during night/low light or heavy weather conditions. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects, which would alter their strength or buoyancy. Defective units shall not be used.
- Rain gear must be available for use during wet conditions as necessary.
- If the water temperature is less than 38°F it is recommended that personnel wear float jackets and float pants instead of a life jacket. Proper maintenance of float suits is required just as required for life jackets.

Transfer Between Boats:

Transferring between boats and barges can be dangerous, particularly in rough weather. Be extremely cautious each and every time you make a transfer. NEVER become complacent about this. Getting caught between vessels, even in calm waters, can be deadly.

Deck Hazards:

Deck hazards are everywhere on vessels/barges. Rigging, wire, fittings, welding, lead, and stored materials are just some of the many trip and snagging hazards. Also watch for slippery decks particularly when muddy, wet, layered with ice or near fuel and lubricant spills. Specific deck hazards must be identified by the vessel operator.

Overhead Hazards:

- Overhead hazards are always a threat.
- NEVER stand under a hanging load, empty bucket hook, or crane boom.
- Stand clear of tag lines and other rigging suspended from above.

- Specific overhead hazards and PPE requirements will be identified by the vessel operator and including in task specific PHAs.
- See Section 4.7.3, "Mechanical Lifting, Rigging," for additional information.

Weather:

- Full consideration will be given to existing weather conditions and forecast during planning for specific project operations.
- Launching, recovering, or otherwise handling a boat is unsafe and will cease during a thunderstorm.
- On-water operations may cease due to wind speeds based on field personnel judgment and consultation with their SHSO. Wind speeds of 20 knots or more may be unsafe to perform on-water work based on the specific task.
- Each SHSO and their field team must use best judgment to consider suspension of work during heavy precipitation events.
- See Sections 4.1.4, "Weather/Climate-Related Hazards, Environmental Conditions," for additional information on weather-related safety precautions, and Section 12.2, "Inclement Weather," on evacuation procedures in the event of inclement weather. The task-specific THA also contains emergency response procedures in the event of inclement weather resulting in a work stoppage.
- Follow the "30/30 rule" when a thunderstorm is imminent (see Section 4.1.4, "Weather/Climate-Related Hazards, Environmental Conditions").
- When ice is present on the Canal, boat captains must use their own judgment and knowledge of the vessel to determine safe navigation through the ice. Particular caution is advised when ice forms solid sheets over the Canal.
- Rather than pushing through patches of ice with a vessel, breaking apart thin sheets of ice, or skim, with a boat hook or, for thicker sheets of ice, gently resting the bow of the vessel on the ice to use the weight of the vessel to break apart ice before proceeding through ice patches are preferred methods of safe navigation.
- Boat captains may stop work if navigation through ice is determined to be unsafe based on ice conditions such as ice thickness.
- On-Canal crews must be aware of impacts to emergency procedures such as man-overboard procedures when ice is present in the Canal. Crews must be aware that although larger tugboats and barges may be able to get through ice, smaller boats used as support vessels may not be able to navigate through ice. The ability of the smaller

support vessel to safely navigate through icy conditions may ultimately determine if work can be performed safely.

Boat Safety Features and Onboard Equipment:

- With the exception of a jon boat or skiff, marine vessels must have approved safety railings.
- A minimum of one ring buoy with 90 feet of line.
- A sound device for alerting such as an alarm, whistle, or horn.
- An alternate means of propulsion (e.g., paddles, oars).
- A minimum of one approved fire extinguisher.
- Cell phones (or equivalent) capable of contacting emergency services.
- An adequately stocked first aid kit.
- A copy of any project-specific navigation rules.
- Mooring lines.
- A boat tool kit.
- Navigation lights if work is to be conducted at night or during low visibility conditions.

General Safe Working Practices for Work Performed on a Marine Vessel:

- Use a pole to probe ahead to assess water depths and/or stability of shoreline.
- Work performed on a marine vessel shall not be performed alone.
- Good housekeeping must be followed onboard to reduce slip, trip, fall hazards.
- To the maximum extent possible, stay seated while the vessel is in motion. At a minimum, passengers should hold on to hand rails when the vessel is in motion.
- All boat staff must be completely inside the boat and are not allowed to be seated on the gunwales or transom or to straddle the bow while the boat is in motion.
- The boat captain must communicate impending changes in direction or speed.
- Avoid tripping hazards associated with boat anchor lines.
- When tasks are being performed on boats that require stretching or reaching over the water, personnel shall be equipped with a harness and lifeline secured to the boat.

Boarding and Disembarking:

- When possible, use three points of contact when boarding and disembarking.
- Avoid carrying items that block your vision.
- Avoid pinch points between vessels and bulkheads or docks.
- A personal floatation device (PFD) must be worn when boarding and disembarking.
- A ring buoy must be present on any dock installed to support the project.

Float Plans:

A float plan will be developed prior to each departure. A template of the float plan is found in Appendix 5, "Non-Emergency Health and Safety Forms." The float plan will include the following:

- Boat operator identification.
- Available communication equipment.
- USCG-required equipment checklist.
- List of passengers.
- Description/registration identification of boat.
- Trip itinerary and anticipated timeline.
- Shore support identification.

Copies of the float plan will be provided to the boat operator, shore support staff and the SHSO.

4.3 Special Driving, Traffic and Transportation Hazards

4.3.1 Transporting Materials, Towing/Hauling Loads

Hazards: Vehicle accident, occupant injury from shifting load, unsafe equipment.

- Ensure load is firmly secured (rope, straps, load configuration) to prevent shifting during travel.
- Slings, chains, strap, rope and related equipment used for towing, hauling, load securing shall be appropriate for use, and used in a manner as to prevent an unsafe condition.

- For trailer use, verify signal/braking lights operational, rear-view mirrors effective, hitch/safety chains secure.

4.3.2 Worksite Located In or Near Vehicle Thoroughfare

Hazards: Worker injury from being struck by vehicle traveling in thoroughfare.

- Wear reflective vests where exposed to traffic hazards.
- Where possible, park vehicles as protective shield from oncoming traffic.
- Configure work area and support vehicles to minimize worker exposure to traffic hazards.
- Use DOT signal devices to re-route vehicles around work area, Site entrances/exits.
- Use DOT-trained flaggers or police detail where appropriate or required.

4.3.3 Water Transportation Hazards

Tidal restrictions and low clearances under bridges spanning the canal must be considered in planning daily field activities. The operability of the bridges must be verified in planning daily field activities. Procedures for bridge openings must be set forth prior to any planned field activities that require bridge openings during routine activities as well as emergency evacuations from the canal. For additional hazards associated with the use of work boats and other watercraft, or water-related hazards associated with work conducted in close proximity to water (such as on bridges, docks, on shorelines, etc.), see Section 4.2, "Water and/or Boating Hazards."

4.3.4 Heavy Equipment Traffic, Construction Site Hazards

For traffic-related hazards associated with construction vehicles, see Section 4.7, "Construction, Heavy Equipment, Lift Equipment."

4.4 Fall Hazards, Fall Protection

4.4.1 General Fall Protection

Where workers may be exposed to fall hazards as the result of working at heights (on scaffolds, building roofs, etc.) or where elevation differences exist between work surfaces, or where a work area is located in a position/location where a fall into a hazardous location exists (such as near/above water, chemical process equipment, operating machinery), fall protection procedures specific to the task, work location and work parameters shall be developed. At a minimum, general fall protection requirements apply when workers are positioned at height above a lower

surface at specific height thresholds above which fall protection is required. These general thresholds are:

- At or above four feet (4') in a general industry work place.
- At or above six feet (6') in a construction work place.
- At or above ten feet (10') when performing work from a scaffold.

The requirement for fall protection at the above general thresholds shall be considered minimum-required practices. Additional circumstances where fall protection may be necessary shall be based on a Site-specific assessment of hazards present. A fall protection strategy shall be developed for applicable tasks, employing, as appropriate, the following fall protection measures:

- Ensure guardrails present.
- Use personal fall apparatus (PFA).
- Use tether or positioning device.
- Restrict access to hazard (barriers, tape, sign).
- Ensure covers in place over holes.
- Use designated "watch person."
- Use fall protection net.

Other general safe work practices shall be employed as applicable when workers are working at heights, and may include:

- Restrict access beneath work to protect other Site personnel from overhead hazards (falling tools, materials, equipment).
- Ensure safe access to elevated work location (ladder, stairs, etc.).
- Remove or implement protective measures related to hazardous conditions onto which a worker may fall, such as install caps on protruding rebar, removing scrap and debris, placing covers over open vessels, and similar measures, as appropriate.

Additional fall protection measures associated with specific equipment designed for workers to gain access and work at heights (ladders, stairs, scaffolds and aerial lifts) are presented in the following sections.

4.4.2 Ladders and Stairs

Field personnel are anticipated to use ladders and stairs throughout various components of the pre-design work. Ladders and stairs exist at several overland points along the Canal and will be utilized to access boats and other marine vessels. Additionally, ladders and stairs may be used to perform work on Canal bulkheads. This hazard analysis covers all types of ladders and stairs that may be encountered (extension/straight ladders, step ladders, fixed ladders, and any form of set stairs). The major hazards associated with these objects include falls and overhead hazards. The sections below present the various guidelines and hazard mitigation steps that must be taken when utilizing such equipment.

In locations where regular access by ladder is necessary, fixed ladders are preferred. This includes locations along bulkheads where access to the Canal is necessary. Therefore, established entry or exit points must be equipped with fixed ladders. In the case where ladders may extend above 20 feet in height (unbroken length), ladder safety climbing devices or cage protection is required. All ladder safety devices will be compatible with ladders with which they are used.

In the case where extension and/or straight ladders are used on the project, the following safety measures must be in place:

- Straight ladders must be secure, placed on a stable base, and be equipped with safety shoes in order to prevent displacement during use. Additional measures shall be used when necessary to secure a ladder (tying off, blocking, re-grading the base, placing plywood beneath the ladder, and other measures appropriate for the work area).
- Straight ladders must be positioned at an angle of approximately 75 degrees from the horizontal, which can safely be established, by positioning the base of the ladder at ¼ of its working length from the vertical plane of the top support.
- Ladders may not be placed in front of doors or openings, and may not be spliced together to form longer sections.
- The ladder shall extend at least 3 feet above the upper work surface.
- Remove hazards and debris from around the base of the ladder, and on the upper work surface near the ladder. Ensure the upper work surface provides stable footing and is free of trip hazards.

Stepladders used during the project must be as follows:

- Ladders shall be set on level ground or properly shimmed, and must be designed for industrial applications (Class 1-A).

- Light-duty household ladders are not acceptable and may not be used.
- Personnel may not stand on the top step or top platform of the step ladder at any point and spreaders of the ladder must be locked at all times.

Ladders of all types must be maintained in good condition. Ladders shall be handled with care and not subjected to unnecessary abuse or misuse. Ladders must be inspected before each use and if found defective, removed from use. Ladder rungs should be cleaned of any precipitation before use. In the instance where any ladders is exposed to fire, chemicals, involved in a fall or collision, or which has been coated with oil or grease immediate inspection and appropriate maintenance will be performed. When not in use, unfixed ladders will be stored where they are protected from potential damage caused by collision, temperature, moisture, and other harmful factors. Ladders will not be permitted to be painted.

When working with any type of ladder, workers will be required to maintain three points of contact at all times when on the ladder. No objects that restrict the use of both hands from climbing will be carried in the climber's hands. In the case where tools are required for the job, a tool line will be established. Additionally, no type of work requiring the use of both hands will be performed on a ladder over six feet from the ground or floor unless a safety harness is worn and the safety lanyard is secured to a substantial overhead anchorage point. When a worker is using a ladder, the ladder must be secured from top and bottom at all times, and at no time will a worker be permitted to stand or sit on the top two rungs of any ladder.

Ladders having metal parts (other than hardware) will not be permitted for used where potential electrical hazards exist unless they bear a manufacturer's label that indicates that it complies with ANSI 14.5 and is approved for electrical use.

Stairways used throughout the project must conform to the following health and safety standards:

- Handrails must be equipped where more than 4 steps are present or the stairway height exceeds 4 feet.
- All handrails will be 30 to 34 inches above stairway treads and free from protruding nails and splinters.
- Uprights will not be less than 2 inches by 4 inches, spaced not more than 8 feet apart and properly anchored
- Rail cross sections will not be less than 2 inches by 4 inches or equivalent.
- At least 5-foot candles of light will be maintained on all stairways.

- Stairways and landings will be kept clear of debris, loose material, and hazardous protrusions.

4.4.3 Scaffolds

Where the need for scaffold use may arise, the following hazard mitigation steps will be followed, and task-specific procedures for safe use of scaffolds will be included in the PHA for that task.

The main risk exposures associated with scaffolds are falls and overhead hazards. These hazards can be encountered with any type of scaffolding: supported, suspended, free-standing and/or mobile scaffold.

All subcontractor personnel involved in the use of scaffolding on the project shall be qualified and knowledgeable in the safety requirements associated with the work as the result of training and/or experience. Only individuals demonstrating the proper level of competency will be allowed to work on scaffolding.

All supported scaffolding will be properly anchored and set on level and stable ground or surface. The proper attachments, tiebacks and planking will be in place. Access to scaffold will be made through proper ladders and stair towers (see Section 4.4.2, “Ladders and Stairs”).

The following scaffold health and safety specifications will be followed at all times:

- Scaffolds must be inspected by the Competent Person prior to each use and after each significant weather event. The inspections must be documented.
- The total height of free-standing scaffold will not exceed 4 times the minimum base dimensions.
- Guardrails or personal fall apparatus will be required for scaffold above 10 feet in height.
- Scaffold load limits will not be exceeded at any point.

4.4.4 Aerial Lifts

The following hazard mitigation steps will be followed should the need for aerial lifts arise. The main risk exposures associated with aerial lifts are falls, overhead hazards, pinch points, fluid leaks, equipment strikes or run-over.

All lift operators will be instructed in the health and safety requirements associated with the work. Overhead and surface obstructions will be reviewed with operators prior to use. Only

individuals who are sufficiently trained, experienced, and qualified will be permitted to operate aerial lifts.

Lifts must be maintained in good condition at all times and inspected before and after each use and if found defective, removed from use. When not in use, lifts will be stored where they are protected from potential damage caused by collision, temperature, moisture, and other harmful factors.

Lift operators must wear the proper harness and lanyard protection when operating lifts. All protective harnesses and lanyards will be inspection before and after each use and if found defective, removed from use.

4.5 Tools, Equipment, Machinery

4.5.1 Hand Tools

General requirements for hand tools include:

- All tools, regardless of ownership, shall be of an approved type and maintained in good condition. Tools are subject to inspection at any time.
- Protect tools from corrosion damage, and keep tools free of accumulated dirt and unnecessary oil or grease.
- Defective tools shall be tagged to prevent their use or they shall be removed from the jobsite.
- Employees shall always use the proper tool for the job performed.
- Hammers with metal handles, screwdrivers, knives with metal continuing through the handle, and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.
- Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Tools shall never be placed unsecured on elevated places.
- All impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked shall be dressed, repaired, or replaced before further use.
- Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs, not with the hands, while being struck by another employee.

- Shims shall not be used to make a wrench fit.
- Wrenches with sprung or damaged jaws shall not be used.
- Pipe shall not be used to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Tools shall be used only for the purposes for which they have been approved.
- Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets.
- Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire.
- All cutting tools such as saws, wood chisels, knives, or axes shall be kept in suitable guards or in special compartments.
- Tools shall not be left lying around where they may cause a person to trip or stumble.
- When using such tools such as screwdrivers and wrenches, employees should avoid using their wrists in a bent, flexed, extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral or straight position.
- When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present or the danger area shall be barricaded or guarded.

When working with knives or bladed tools:

- Always wear proper protective gloves or other protective PPE as appropriate.
- Check the work area and make sure that the ground is free of obstacles such as rocks, stumps, holes, and wet or otherwise slippery conditions, and ensure that you can get a firm footing on the ground.
- Route cords, hoses, and cables supplying power to portable power tools to prevent tripping hazards and to remove them from potential damage from knife.
- Worn, damaged or dull blades should be sharpened or replaced as necessary.

4.5.2 Powered Hand Tools

Powered hand tools may be used for fieldwork or construction activities. Hand tools may be electric-powered, fuel-powered, pneumatic, or powder-actuated. Hazards associated with the use of powered hand tools include eye, hand, or body injury, fuel-related hazards, inhalation

hazards, noise, sparks, heat and fire hazards, and electrical hazards. See fuel-safety practices in Section 4.13, "Commercial Chemical Products, Hazard Communication." See safety practices associated with electrical hazards in Section 4.8, "Electrical Hazards."

Operators of power tools must be provided proper training for safe use and proper inspection of the power tool. Tools must be inspected to ensure safe operating conditions before each use. Excessive scraping, kicking, stretching, and exposure to grease and oils will damage lines or cause them to fail prematurely and possibly injure the operator or fellow workers. Cords, hoses, and cables should be inspected for such wear or deterioration. In addition, cords and cables, including extension cords, shall be checked to confirm a third grounding wire and prong remains in-tact. At no time will electrical power equipment be operated without proper grounding. Ground-check portable electric power tools with metal cases initially and quarterly. Mushroomed punch, drift, and chisel heads should not be used as mushroomed heads represent crystallized metal that will break and fly off when struck. Upon inspection, ensure guards are in place and no hazardous equipment modifications have been added to the tool. Damaged or worn tools must be either replaced or repaired immediately. Temporary or makeshift repairs are prohibited. At the discretion of the supervisor, discard all tools that cannot be repaired safely. Supervisors shall decide when to discard a tool.

All powered hand tools shall be used in accordance with the manufacturer's specifications and properly maintained. Personnel should read the instruction manual for the safe operation of any portable power tool. Tools should be kept free of accumulated dirt and unnecessary oil or grease. Moving and adjustable parts shall be lubricated frequently to prevent wear and misalignment. Cords must be sized adequately for their length and the electrical demand of the tool. Otherwise, they may cause a fire hazard.

The following precaution should be followed when a power tool is in use:

- Stay clear of the hazard zone, or "line of fire."
- Route cords, hoses, and cables to prevent tripping hazards or contact with equipment.
- Prohibit operations of electric tools in wet or damp areas.
- Do not use electrically powered tools near flammable materials or explosive atmospheres, unless they are of the explosion-proof type meeting the National Electrical Code for potentially explosive work areas. Employees operating the equipment should be aware of sparks and or metal fragments when using this equipment.
- For spark/heat generating tools, control fire hazards and segregate combustible/flammable materials.
- Do not use conducting (i.e., metal) tools around electrical facilities. Insulated tools, approved for electrical work, shall be tested frequently for proper insulation.

- Use PPE or other safety practices, as appropriate, for eye, hearing, hand, head, and body protection (such as use of Kevlar chaps and a jacket for chainsaw use).
- Wear eye protection at all times.
- Use respirators, ventilation, wet methods, and other appropriate means to control inhalation hazards.

When finished with a power tool, store the tool in a suitable box or container. Loose tools shall not be stored on ledges or where they might fall. Tools shall be picked up when a job is completed and not be allowed to accumulate in the work area. Store all tools in a safe place.

4.5.3 Operation of Equipment and/or Machinery

Operation of various types of large equipment and/or machinery (in addition to power tools and smaller equipment discussed in other sections) is anticipated for field activities associated with this construction phase of work. Hazards of operating equipment and/or machinery are discussed in sections throughout this HASP and include point-of-operation hazards, pinch points from moving parts, hot surfaces and heat, extension cords and flexible wire, fuel-related hazards, hydraulic pressure, kinetic and stored energy, noise, emissions and discharge gases, working at heights, lifting and repetitive motion, and electrical hazards.

General safety requirements for operation of equipment and/or machinery are discussed in detail throughout Section 4 of the HASP and include:

- Arrange worksite for safe access to equipment/machinery.
- Use equipment/machinery in accordance with manufacturer's use and safety instructions.
- Ensure point-of-operation, mechanical power transmission, other moving parts are guarded with protective devices; do not override interlocks, guards, protective devices.
- Secure long hair/loose clothing/hanging jewelry near moving/rotating parts.
- Heed warning signs/labels, keep safe distance; avoid locations of "struck by" and "caught between" hazards.
- Implement lock-out/tag-out for repairs/adjustments/tooling changes.
- Use safe lifting practices for movement of heavy portable equipment.
- Incorporate safety provisions/safe work practices for compressed air, pressurized systems (pneumatic/hydraulic), stored energy.

- For climbing/fall hazards associated with large equipment, see Section 4.4, "Fall Hazards, Fall Protection."
- For electrical hazards, see Section 4.8, "Electrical Hazards."
- Operate fuel-powered equipment in well ventilated location.
- Use safe practices for fuels; see Section 4.13, "Commercial Chemical Products, Hazard Communication."

4.5.4 Lock-Out/Tag-Out of Hazardous Energy

Should lock-out/tag-out procedures be necessary, lock-out/tag-out locks and devices must be provided and training of workers must be conducted to designate workers as "authorized" personnel or "affected" personnel.

4.5.5 Welding, Cutting, Hot Work

In the event that welding is conducted during Site work activities, several hazards must be addressed including ultraviolet (UV)/infrared (IR) light eye and skin burns, general hot-work hazards, toxic welding fumes, compressed gases, and electrical shock. See Section 4.13, "Commercial Chemical Products, Hazard Communication," for safety procedures related to gases and compressed gas cylinders, and Section 4.8, "Electrical Hazards," for electrical hazards associated with arc welding.

All persons who weld or cut must be properly trained. A hot work permit system must be implemented. Prior to starting work, persons performing welding must read the SDSs for all hazardous substances with which the welder may come into contact. In addition to safe practices and procedures learned through formal welding training, the following general safety guidelines must be followed when performing welding or cutting:

- Never cut off the tops of drums that have contained flammable liquids or gases. Vapors left inside the drum may explode. If a drum that has held toxic or flammable substances must be cut, it should be filled with water, or thoroughly cleaned of such substances by a specialist cleaning company, then ventilated and tested.
- Do not apply heat to drums that have held chemicals because it may cause them to produce poisonous gas.
- Never weld or grind near an empty drum. A single spark inside an empty drum can trigger an explosion. Keep torches, flames and sparks away from grinding and welding equipment.

- Under no circumstances should fittings of oxyacetylene equipment be allowed to become contaminated with grease or oil, which can ignite in the presence of pure oxygen.
- All oxyacetylene equipment must be fitted with flashback arrestors to overcome the danger of flashback.

The use of proper PPE when welding or performing a hot cut is critical. Proper PPE includes:

- Shield or helmet with filtered lens
- Boots
- Fire-resistant gloves
- Leather spats
- Leather apron
- Felt skullcap or beret
- Overalls
- Hand shields

Setting up a safe work zone for welding is paramount to reducing fire hazards and welding-related injuries. To protect against fire hazards, employ a watcher to oversee welding activities. A fire extinguisher must be present when welding is performed. Combustibles must be isolated and cylinders must be chained in the upright position to prevent explosion. Nearby personnel must be protected from hazardous UV and IR light. A shielding curtain may be necessary to adequately protect nearby personnel.

4.5.6 Compressed Air, Compressor Hazards

This section addresses safety procedures associated with compressors, use of compressed air from a facility compressed air system or where compressed air is generated by mechanical/electrical equipment, and held in "air receivers." For a discussion of hazards associated with compressed gases in compressed gas cylinders, see Section 4.13.1, "Compressed Gases." The following general safe practices must be followed when using compressed air:

- Never direct the nozzle toward the body; do not use compressed air for cleaning clothes.
- If compressed air is used for cleaning, restrict pressure to 30 pounds per square inch (psi), equip nozzle with a chip guard.

- Use eye protection.
- Ensure air tank, hoses, fittings are in good repair using factory fittings.

4.5.7 Portable Generators

Portable generators are anticipated to be used on marine vessels and in upland locations along the Canal when access to electricity is not available. Hazards associated with the use of a portable generator include electrical shock, carbon monoxide in exhaust, fuel-related fire, injury from mechanical hazards, and heavy lifting. For safety procedures and guidelines to follow when using electrical equipment, see Section 4.8, "Electrical Hazards." For safe practices for flammable/combustible liquids (associated with refueling portable generators), see Section 4.13, "Commercial Chemical Products, Hazard Communication."

General safety practices for operation of a portable generator include:

- Keep generator dry.
- Never use indoors, or near windows, vents, doors due to carbon monoxide hazard.
- Use power cords/extension cords specified by instructions.
- Use ground-fault circuit interrupters (GFCIs) in accordance with manufacturer's instructions.
- Shut down generator before refueling.

4.5.8 Portable Heaters

Work during winter months may require portable heaters to keep personnel warm. Portable heaters may be used for warming electronic equipment staged along the Canal in cold weather conditions. Hazards associated with the use of a portable heater include electrical shock, carbon monoxide in exhaust, fuel-related fire, injury from mechanical hazards, heavy lifting, and fire from hot surfaces. For detailed safety procedures and guidelines to follow when using electrical equipment, see Section 4.8, "Electrical Hazards." For safe practices for flammable/combustible liquids, see Section 4.13, "Commercial Chemical Products, Hazard Communication."

General safety practices for operation of a portable heater include:

- Keep heater dry, and locate heater on level surface where it will not be knocked over.
- Never use fuel-powered heaters indoors, or near windows, vents, doors due to carbon monoxide hazard.
- Keep combustible materials at least 3 feet from hot surfaces.

- Do not use an extension cord or power strip to power an electric heater.
- Shut down fuel-powered heaters before refueling.

4.6 Drilling

The use of various rig sizes and drilling methods may be required for this project. Regardless of the type or size of drill rig used, typical hazards associated with drilling include the potential for an operator, helper, or observer to be struck-by, run-over, or caught between pinch points associated with the rig. Hazards associated with overhead and buried utility lines, fluid leaks, drill rig fuel, and suspended equipment also exist.

Prior to bringing drilling equipment to the jobsite, a survey must be conducted to identify overhead electrical hazards, potential subsurface hazards, and terrain hazards. Once on-Site, before drilling equipment is moved, the travel route of the rig shall again be visually surveyed for overhead and terrain hazards. Possible hazards shall be documented and communicated to the drilling crew. Detailed safety procedures related to overhead and underground utility lines are provided in Section 4.8, "Electrical Hazards."

Non-essential personnel are to stay clear of the drilling work zone when the drill rig is in operation. Operators must verbally alert personnel and visually ensure personnel are clear from dangerous parts of equipment prior to starting or engaging equipment. At a minimum, hard hats, steel toed boots, hearing protection, and safety glasses are to be worn at all times when performing drilling operations. Operators/helpers must maintain safe distance from moving parts. Loose hair and equipment must be secured. Wearing of loose clothing (e.g., open shirts, hooded sweatshirts, etc.) is not permitted.

All members of the drilling crews shall be trained in the standard operating, safety features and procedures to be utilized during operation, inspection, and maintenance of the equipment. Contractors must inspect drill rigs daily before use. A brief list of required safe operating practices for reference include but is not limited to the following:

- Extend outriggers per the manufacturer's specifications.
- When appropriate use auger guides on hard surfaces.
- Do not run or rotate drill rods through rod slipping devices.
- No more than 5 feet of drill rod column shall be hoisted above the top of the drill mast.
- Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod slipping device.
- Use hoists only for their designed intent. Hoists shall not be loaded beyond their rated capacity. Steps shall be taken to prevent two-blocking of hoists (the condition when the

lower load block or hook assembly comes in contact with the upper load block, or when the load block comes in contact with the boom tip).

- Follow the equipment manufacturer's procedures if ropes become caught in, or objects are pulled into a cathead.
- Clean augers, drill casing, or drill rod only when the rotating mechanism is in neutral and the pipe is stationary is stopped.
- Check cables for frays and hydraulic hoses for leaks daily.
- In situations where ambient water level may be above top of well screen, during well construction, ensure that well casing is vented to prevent air pressure build-up in blank casing above screen.

Drill rigs must be equipped with two easily-accessible emergency shutdown devices, one for the operator and one for the helper, in good repair. Shutdown devices should be tested at the beginning of each day. In addition to emergency shutdown devices, all drill rigs must be equipped with an up-to-date and functioning fire extinguisher. All personnel must be notified of the whereabouts of the shutdown devices and fire extinguisher. Whip checks are required on all high pressure lines. Any machine guards associated with the drill rig must be in place. Drill rigs will only be moved with masts lowered. Maximum safe slope for rigs will be followed. The drill rig will be leveled and appropriate blocking/cribbing will be employed as needed.

Safe practices for refueling, fuel handling, storage, and transport found in Section 4.13.2, “Flammable and Combustible Liquids,” must be followed. Spill equipment must be available for fuel and hydraulic fluid leaks. The discharge of drilling fluids must be channeled away from the work area to prevent ponding of water. Dust control suppression techniques must be followed when production of airborne dust is anticipated. Open boreholes must be capped and flagged. Open excavations shall be barricaded. Monitor weather conditions. Operations shall cease during electrical storms or when electrical storms are imminent. Refer to Section 4.1.4, “Weather/Climate-Related Hazards, Environmental Conditions,” for additional weather related health and safety procedures.

4.7 Construction, Heavy Equipment, Lift Equipment

4.7.1 Heavy Equipment

Operation of materials-handling equipment such as, but not limited to, forklifts, winch trucks, front-end loaders, tractors, etc. by Site personnel is not permitted without prior training, licensure,.

It is anticipated that heavy equipment will be used by on-Site contractors for field activities associated with work on the Gowanus Canal Project. Typical hazards associated with the use of

heavy equipment include the potential for an operator nearby personnel to be struck-by, run-over, or caught between pinch points associated with the heavy equipment. Hazards associated with overhead and buried utility lines, fluid leaks, and fueling also exist. Safety procedures related to overhead and underground utility lines are provided in Section 4.9, "Utility Hazards."

When working near heavy equipment, personnel must follow safe working procedures such that personnel are not getting into a potential crush situation below or between equipment. Personnel must always yield to heavy equipment and are to stay clear of, or restrict access to, swing radius and travel path of equipment. Personnel should use hand signals to communicate with the heavy equipment operator. Eye contact should be made with the operator before approaching equipment. High visibility vests must be worn by all personnel in construction vehicle work areas, on-Site roadways and travel lanes. Park personal and support vehicles in a location as to not obstruct travel lanes or other Site operations.

Only trained and qualified persons are permitted to operate heavy equipment. These qualified personnel are to perform a visual inspection and walk around parked heavy equipment before moving to assure that equipment is in good condition and that there are no personnel on the ground that could be injured or objects that could be damaged by vehicle movement. No passengers on moving and/or operating equipment is permitted except where passenger seatbelts or other means of restraint is present. Passengers are not permitted to ride in or on any portion of the backhoe, bulldozer, forklift or back of a pickup truck. Operators must use hand rails and footholds when mounting and dismounting equipment and maintain three points of contact at all times. Operators are required to use seatbelts. If applicable, roll over protection must be used. Equipment must be inspected daily upon mobilization and maintained in good repair. Brakes, steering, clutches and controls shall be tested. Backup alarms are required for all heavy equipment including smaller vehicles such as fork lifts and skid steers. Leaks or defective safety equipment must be repaired before use. When not in use, equipment is to be locked and secured with brakes set and buckets/forks lowered. Temporary roadways must be marked clearly where needed. Operators must watch for workers in the path of their equipment and must provide warning prior to moving their equipment.

Maximum safe slope for each vehicle will be followed. Do not use heavy equipment on slopes with steepness exceeding 3H:1V unless operations are consistent with manufacturer's recommendations (if the Owner's Manual is not with the equipment or does not specify slope operating procedures, see the SHSO). While on slopes, operate equipment with booms, blades, buckets, beds, etc., lowered or in a stable position. Safety cables tethered to appropriate anchors shall be used for equipment working on steep slopes, where appropriate.

When refueling gasoline-operated equipment, motors must be shut off. Smoking is not permitted when refueling. Proper dispensing equipment must be used. Spill equipment will be available for fuel and hydraulic fluid leaks.

If a malfunction occurs, the operator shall lower hydraulic systems (e.g., blades, etc.) to the ground, set brakes, and shut down equipment. When heavy equipment is in need of repair, slings or support hoists or jacks must be used. Heavy equipment must be blocked or cribbed before working underneath.

4.7.2 Cranes

Barge mounted cranes may be used for moving materials from barge to land or for driving in piling. Hazards associated with cranes include electrocution by overhead utility lines, injury within the crane swing radius, injury from falling overhead loads, and injury from tipping over due to overbalancing, high winds, unstable ground, unsafe slope, or bad placement of outriggers. Detailed safety procedures related to overhead and underground utility lines are provided in Section 4.8, "Electrical Hazards." The following health and safety procedures must be followed in addition to the general safety practices for heavy equipment:

- Only qualified persons are permitted to operate cranes. Qualified persons must be documented with a certificate.
- A Critical Lift Plan & Checklist must be prepared and executed prior to mobilization.
- Equipment must be inspected prior to mobilization and daily by the crane operator.
- The crane operator must remain at the controls at all times during operation.
- Crane operation must be performed under the direction of an appointed signal person at all times.
- Communication between the crane operator and signal person will be maintained through standard hand signals or voice communication equipment.
- The area beneath suspended loads must be kept clear of personnel.
- Rigging procedures must be followed (see Section 4.7.3, "Mechanical Lifting, Rigging").

4.7.3 Mechanical Lifting, Rigging

It is anticipated that mechanical lifting will be performed for several work activities including the use of davits on marine vessels, truck-mounted boom rigs, and drill rig derricks. Hazards associated with the execution of a mechanical lift include falling loads, personnel inappropriately positioned under suspended loads, and pinch points. In addition to the general safety practices for heavy equipment, personnel must follow the safe work practices found in this section specific to performing mechanical lift.

Lifting operations must be coordinated with a competent person. When lowering or raising the cable, make sure hands and clothing are away from the pulleys and winch mechanism. Do not put any part of the body under the crane boom or lifted loads at any time. When working near lifting equipment, maintain eye contact with the crane operator. Hand signals may be needed to communicate with the crane operator in areas with loud noise. Be aware of changes in sound of equipment, which may indicate a change in direction or fatigue with equipment.

The loading limit of the lifting equipment must never be exceeded. In order to determine that the loading limit is not exceeded, personnel should know the weight of the load being lifted and the lifting equipment load chart. For truck-mounted cranes, the capacity is 500 pounds for trucks with GVWR of 8800 pounds or less and 750 pounds for trucks with GVWR of 8800 pounds or greater. The GVWR specifications of trucks can be found on the sticker located on the driver side door jam.

Competent persons must make sure that the following practices are followed when performing a mechanical lift:

- The load is secured correctly to the crane cable. The load that will be lifted is not secured, bolted down, or attached in any way to the ground surface before lifting.
- Slings, chains, rope, wire rope and related equipment used for lifting shall be maintained in good condition, and used in a manner as to protect from damage.
- Rigging, wire rope and hoisting equipment will be inspected and maintained on a weekly basis.
- Hooks will be equipped with safety latches.
- Control unit connectors are plugged into their proper plug locations.
- The crane is secured properly with proper support pin placements.
- Load lifting is as close to vertical as possible and personnel are aware of potential swinging loads once lifted.
- Loads are lifted and dropped at a safe rate of speed.
- When rotating the load, the pathway is clear of equipment and personnel.
- Vehicles are in park with the parking brake on and are parked on as level of a surface as possible.

4.7.4 Fork Lifts

Forklifts may be used to transport materials in staging areas. Common hazards associated with forklift operation include the risk of personnel being struck-by or run-over by the forklift, overhead hazards, pinch points, roll over of the forklift, and fluid leaks. Detailed safety procedures related to overhead utility lines are provided in Section 4.8, "Electrical Hazards."

In addition to general safety practices for heavy equipment found in Section 4.7.1, "Heavy Equipment," the following safe work practices apply to operation of a forklift:

- Only qualified forklift operators are permitted to operate a forklift per established forklift training. A certificate certifying the qualified forklift operators is required.
- Forklift must be inspected daily and documented on a Forklift Preoperational Inspection Checklist.
- Lifting load limits must not be exceeded.
- Forklifts shall not be moved or driven with empty forks in the raised position.
- When not in use, forks must be lowered, the brake set, the controls in neutral, and the key removed.

4.7.5 Aerial Lifts

See Section 4.4, "Fall Hazards, Fall Protection," and Section 4.4.4, "Aerial Lifts."

4.7.6 Trenching and Excavation

This section provides an outline of general safe work practices associated with trenching and excavation.

Prior to Excavation

- Confirm that an OSHA competent person is available. An OSHA competent person is someone with enough training to identify soil types and other excavation hazards and authority to take prompt corrective actions.
- Check for the presence of underground and aboveground utilities before conducting any intrusive work. Support, protect or remove utility lines as appropriate.
- Implement your Company's Confined Space Entry Program if employees are to enter excavations or trenches of 4 feet deep or deeper (regardless of width).

- Remove or brace trees, boulders, etc., adjacent to the work area that could fall into the work area before intrusive begins.
    - Underpin all nearby existing structures to ensure their stability before excavating below the level of the base of the footing of any foundation or retaining wall.

During Excavation

- Wear hard hats, safety boots and reflective vests.
- Use flagmen or warning devices for all mobile equipment using reverse and forward motion
- Adequately slope or shore all sides of excavations/trenches 5 feet or more in depth (depending on local regulations) before allowing anyone to enter them (see below).
- Store and retain all equipment/material and excavated soil/rock/waste (spoil(s)) at least 2 feet or more from the edge of the excavation/trench.
- Use diversion ditches or dikes to prevent water from entering an excavation, and to provide adequate drainage of the area adjacent to the excavation. Prevent water from accumulating in an excavation.
- Install substantial stop logs or barricades when mobile equipment is used or allowed adjacent to excavations.
- Provide a walkway or bridge with standard guardrails where employees or equipment are required or permitted to cross over excavations.
- Ladders used for ingress/egress should extend a minimum of 3’ above ground surface, be secured, and be located so as to require no more than 25 feet of lateral travel for workers in the trench or excavation.
- Avoid standing on top of trench/excavation while personnel are below, in the trench.
- Examine all excavation work areas and faces for unsafe conditions at least at the beginning of each shift and especially after blasting, a rain, a freeze or a thaw. If unsafe conditions are found, all work in that immediate area shall cease until the necessary
    - If it is necessary to place or operate trucks, materials or other heavy objects on a level above and near an excavation, pile, shore, and/or brace sides of excavations to resist the extra pressure due to such superimposed loads.

Shoring an Excavation

- Place cross braces or trench jacks in a true horizontal position, space vertically and secure to prevent sliding, falling or kick-outs.
- Use portable trench boxes or sliding trench shields, if needed, in place of a shoring system or sloping.
- Support systems shall be planned and designed by a qualified professional engineer when the excavation is in excess of 20 feet in depth, adjacent to structures or improvement, or subject to vibration or ground water.
- Removal and backfilling of trench supports must slowly progress together from the bottom of the trench. Jacks or braces shall be released slowly and in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.
- Stability of an excavation left open for a long period of time (i.e. more than a few days) should be evaluated by a professional engineer to assess if slopes, bracing measures, etc. need to be modified.
- Start backfilling trench before removing braces in case of Type C soils.
- Put up barricades – flagging tape, fencing to prevent falls into the excavation.
- Cover or secure trench/excavation if left open overnight.

Sloping an excavation

- Excavate to at least the OSHA minimum required angle ratio according to soil classification identified except for areas where solid rock allows for line drilling or pre-splitting.
- Flatten the angle of repose when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action and slide planes appear.

Soil Classification	Soil Classification Description	OSHA Minimum Requirements For Side Slopes
Soil Type A	Most stable: clay, silty clay and hardpan (resists penetration)	0.75:1 (for one foot vertical rise, the trench wall must be cut back ¾')
Soil Type B	Medium stability: silt, sandy loam, medium clay and unstable dry rock	1:1 (each step has an equal horizontal and vertical rise; only cohesive Type B soils may be benched)
Soil Type C	Least stable: gravel, loamy sand, soft clay, submerged soil or dense, heavy unstable rock	1.5:1 (trench wall must be cut back 1-1/2' for 1' vertical rise; type C soil is not benched)

4.7.7 Unexploded Ordnance

The possible presence of ordnance, explosives and unexploded ordnance (OE/UXO) at an environmental site presents hazards to personnel performing site assessment operations both because of the potential to encounter such items on the ground surface, and because of the potential for such items to be encountered in subsurface areas during invasive site work such as excavating, trenching, or drilling. The general policy to be observed regarding OE/UXO when encountered is: **DO NOT TOUCH, HANDLE OR OTHERWISE DISTURB ANY UXO ITEM**.

Where the potential for OE/UXO is anticipated at a worksite, based on information about historical operations at a site, previous encounters, or other factors indicating the reasonable chance for such encounters, on-site personnel should be briefed about the potential for OE/UXO in surface, subsurface or submerged areas and any known identifying characteristics of UXO items. When moving about the site, personnel should remain alert for any OE/UXO items which might be present. Each work site should be thoroughly checked for the presence of OE/UXO before any other activities commence. In the event that any OE/UXO item is observed or expected, the following will requirements will be observed:

1. Personnel should note the location of the OE/UXO item, and alert all other personnel in the area to its presence.

2. Any work operations occurring within 20 feet of the item will cease. All workers will evacuate this area.

3. Under no circumstances will any Site worker attempt to move or otherwise handle any OE/UXO/suspected OE/UXO item. **COLLECTION OF "SOUVENIRS" IS PROHIBITED**.

4. The owner/site representative will be alerted as to the location of the suspected item.

5. Project management personnel will determine the appropriate course of action and through discussion/coordination with other parties (owner, HS personnel, site workers, public agencies, etc.), as appropriate.

4.7.8 Demolition

Demolition of intact or abandoned buildings is not anticipated for this project. Demolition of various structures associated with construction activities, such as bulkheads, Site features, or subsurface features, will be in accordance with other safety measures specified herein. Where more substantial structures will be demolished, or where such demolition work may pose unique demolition-related hazards to on-Site workers or the public, the work shall be in accordance with a "Demolition Work Plan" to be developed as deemed appropriate by the parties involved in the work.

4.7.9 Blasting

No blasting is anticipated for this project.

4.7.10 Public at Risk, Site Security

During construction operations and other work operations where the public may be at risk from work-related hazards, warning signs, barriers and other means appropriate should be used to protect the public. The Parcel III gates will be secured at all times to protect the public from accessing the staging area. Work along the Canal should be performed in a manner that prevents the public from entering the work zone.

More detailed information on Site control and security measures is provided in Section 5, "Site Control."

4.8 Electrical Hazards

Section 4.8.1, "General Electrical Hazards," addresses common electrical hazards encountered on worksites associated with the use of electrically powered equipment such as power tools, lighting, use of extension cords, and similar equipment. Because electrical tools, appliances, equipment, and related electrical devices are commonly encountered and used in common everyday activities, in the work place and on jobsites, the hazards and safety measures in this section are the most broadly applicable electrical safety considerations associated with the

broadest range of work activities and jobsites. These practices and procedures therefore represent the foundation of workplace electrical safety.

Section 4.8.2, "Electrical Hazards – Electrical Technicians, Electrical Skilled Workers," addresses electrical hazards and safety measures associated with hands-on work on electrical circuits such as rewiring a datalogger, troubleshooting electrical systems, and the repair, adjustment, and maintenance of electrical equipment.

Electrical hazards associated with underground and overhead utilities are addressed in Section 4.9, "Utility Hazards."

4.8.1 General Electrical Hazards

Electrically powered equipment may be used during fieldwork or construction activities. Hazards associated with the use of electrically powered equipment primarily stem from the risk of electrical shock, but also include secondary hazards such as the risk of falling at the result of an electrical shock, as well as tripping over extension cords and other wiring associated with the use of electrically powered equipment.

When using electrically powered equipment near or on the Canal or in any other wet area, water-related hazards must be controlled in a manner appropriate for the job and equipment being used. Electrical equipment used over water shall be marine grade with water tight connections unless otherwise authorized by the SHSO. A GFCI-protected outlet or portable GFCI should be used in wet locations. Portable extension cords must not be run through puddled water. Workers should be especially cautious when running extension cords during foul weather or following rain storms. Workers must never touch electrical equipment when workers are wet or standing in water or on wet surfaces.

Electrically powered tools and equipment, extension cords, and power cords must be inspected before each use for signs of damage such as frayed electrical wires or bent plugs. Damaged electrical equipment must not be used. Instead, damaged electrical equipment should be identified and repaired or discarded.

GFCI-protected outlets or a portable GFCI must be used in wet locations, outdoors, and in basements. GFCIs provide protection against electrocution by measuring the current balance between two conductors. The GFCI will open its contacts when it measures a difference in current between the line conductor and the neutral conductor, stopping the flow of electricity to the device in operation. If a GFCI trips, the problem causing the trip should be identified and resolved before resuming operation of the equipment.

Workers must ensure that all live parts are guarded and enclosures are secure. Electrical enclosures and circuits must be properly labeled. In addition, adequate warning signs and barriers must be set up in all areas where hazardous electrical facilities exist. The location of

extension cords and power cords should be well-marked. All portable extension cords must be equipped with a non-conducting plug and/or another socket shell. All electrical cords shall be equipped with three-blade grounding type plugs. Overloading of electrical circuits is not permitted at any time. The replacement of fuses or circuit breakers with makeshift materials or over-capacity fuses is strictly prohibited. Electrical wiring and equipment used on this project shall be listed by a nationally recognized testing laboratory for the application it is being used.

4.8.2 Electrical Hazards – Electrical Technicians, Electrical Skilled Workers

Prior to conducting any work on electrical systems, the general parameters of the system (outlined above) shall be fully investigated and understood before the work begins. Installation, troubleshooting, maintenance, and replacement of electrical facilities or equipment must only be performed by qualified and properly authorized personnel or electrical subcontractors. Apprentice personnel permitted to work on electrical equipment shall be under the supervision of a fully qualified electrician. Skilled electrical workers must be properly trained and qualified to work on applicable voltages, power supply, and for the task at hand.

General electrical safe work practices, including grounding, use of GFCIs, and other general safe work practices addressed in Section 4.8.1, "General Electrical Hazards," shall be followed, as applicable to the work, at all times. The following safe work practices must be followed to safely work on electrical equipment and protect against arc flash and other means of electrical shock:

- Follow the company Lock-out/Tag-out procedures when applicable. Electrical equipment and lines shall always be considered "energized" until proven "de-energized".
- Before beginning work, each electrical circuit shall be inspected, tested, and where possible, isolated from the power source. Extreme care shall be exercised as wires designed to operate at ground potential may become energized by faulty or inadequate connections.
- Do not wear rings, watches or metallic objects that could act as conductors when working with electrical circuits.
- Do not use metal ladders and un-insulated tools while working with electrical circuits and equipment.
- Protect electrical wires with suitable protective conduits or devices where they are exposed to possible damage.
- Connect grounding devices to a ground before contacting any conductor of a circuit. When grounding devices are removed, they shall be disconnected from the circuit before being disconnected from the ground.

- The type of circuit shall determine the type of protective equipment required. Rubber gloves, sleeves, blankets, mats, and insulated platforms shall be used as required. Questions regarding PPE should be directed to the SHSO.
- Inspect all insulated protective equipment continuously for defects or damage. Any defective equipment shall be replaced before using.
- Establish and enforce testing schedules for insulation qualities for protective equipment. All users shall verify that equipment has been satisfactorily tested prior to use.
- Electricians shall be familiar with the National Electrical Code (NEC); state and local electric codes; OSHA standards, including 29 CFR 1926, Subpart K; and applicable sections of the National Fire Protection Association Codes.
- When working on energized circuits of 440 V or higher, at least one qualified electrician and one other employee shall be actively engaged in work activities, and present at all times when such work is being conducted.
- Use only NEC-approved grounding equipment as a ground for electrical equipment. Metal frames on electricity-powered equipment, electrical facilities, and transmission equipment shall be connected to the grounding system. Alternative grounding systems complying with applicable electrical codes may be used for temporary portable equipment.
- Do not permit overloading of electrical circuits at any time. The replacement of fuses or circuit breakers with makeshift materials or over-capacity fuses is strictly prohibited.

4.8.3 Lock-Out/Tag-Out of Electrical Energy

Performing equipment repair, maintenance or related investigation work, where the worker will be exposed to the hazards of uncontrolled energy or unanticipated start up or operation of equipment, the equipment shall be locked out prior to the work, in accordance with the Company's Lock-Out/Tag-Out procedure. The work shall be performed only by workers properly trained and qualified for lock-out (as "authorized" or "affected" personnel, as applicable), appropriate locks, tags and associated devices shall be used, and specific hazards and safety measures associated with the work task shall be delineated in the corresponding PHA. Hazardous energy to which lock-out requirement apply include not only electrical hazards, but also pneumatic, hydraulic, kinetic energy of all types.

4.9 Utility Hazards

Working in an urban environment requires extreme caution due to the likely existence of several underground and overhead utility lines. Utility lines include electrical, gas, fuel, sewer, water, and telephone lines. Damaging a utility line can be fatal or result in serious injury, can result in

severe damage to equipment, and may result in major work interruptions. Precautions and procedures delineated in this section to identify utility lines, preventing damage to these lines, and protect workers are critical and must be adhered to.

4.9.1 Overhead, Above-Ground Utilities

Overhead utility lines may be encountered when working overland along the Canal with heavy machinery including drill rigs. All above-ground utilities in the vicinity of a work zone should be visually identified. Warning signs may be placed in work areas to remind workers of the above-ground utilities. Other techniques such as shielding or utility relocation may be necessary to make work safe. Proper set back and approach distances must be maintained at all times. A minimum clearance of 20 feet (radius) will be maintained between heavy equipment (i.e., drill rig) and any overhead power lines, regardless of voltage.

Where workers may work at heights on ladders, scaffolds, aerial lifts, or similar work activity that may bring workers in close proximity to overhead utilities, the utility related hazards shall be identified and appropriate safety precautions and procedures shall be delineated. Other factors related to these hazards, such as wind, wet locations, shall be taken into account when considering safe work practices and procedures.

On the Gowanus Canal project, in addition to typical overhead utility hazards associated with overhead electrical power lines, the potential presence of exposed utility lines (electrical, gas, steam, water) associated with bridges over the Canal and along bulkheads shall be considered when developing safe work practices for tasks involving work on boats near or under bridges, and any work to be conducted on or near bulkheads.

4.9.2 Underground Utilities

This section describes the process necessary to investigate, and to the extent practical, identify utilities in work areas for the purpose of avoiding the utilities, protecting utilities and Site personnel, and mitigating impacts to Site operations.

For the Gowanus Canal Project, the occurrence of underground utilities should be anticipated along the Canal and must be addressed when performing any intrusive work along the Canal. In addition, there is a known underground gas line transecting the Canal between the Citizens Gas Works Parcel II at 68 5th Street (Block 471, Lot 100) and the National Grid Substation located at 65 6th Street (Block 990, Lot 138). Signs mark the approximate location of the gas line on both sides of the Canal. Intrusive work will not be selected within a 20 foot radius of the marked area.

The traditional method of using existing “as built” plans and maps (if available) and probing in the field (i.e., “hunt and hope”) is not sufficient to provide adequate assurance that utilities are not impacted during Site activities. Site personnel must implement guidance found in this

section prior to conducting intrusive Site activities (i.e., drilling, well installation, trenching, excavation, hand auguring, etc.).

For the purposes of this section, the following terminology is defined:

- *Approximate location of subsurface installation* - A strip of land not more than 24-inches on either side of the exterior surface of the subsurface installation.
- *Excavation* - Any operation in which earth, rock, or other material in the ground is moved, removed, or otherwise displaced by means of tools, equipment, or explosives in any of the following ways: grading, trenching, digging, ditching, drilling, auguring, tunneling, scraping, cable or pipe plowing and driving, or any other way.
- *High priority subsurface installation* - High-pressure natural gas pipelines with normal operating pressures greater than 415 kilopascal (kPa) gauge (60 psig) or greater than six inches nominal pipe diameter, petroleum pipelines, pressurized sewage pipelines, high-voltage electric supply lines, conductors, or cables that have a potential to ground of greater than or equal to 60 kilovolt (kV), or hazardous materials pipelines that are potentially hazardous to workers or the public if damaged.

Typical underground utility clearance practices are as follows:

- Identify the location of the planned intrusive activities.
- Mark the planned work area with white water based marking paint. If work area is not visible from the street either because of obstruction or distance, provide distance from street to work area (i.e., 150 feet north).
- Contact DigAlert or dial 811 (nationwide) to identify utilities in your work area. http://www.digalert.org/ (811) provides a link to the local state operated "Call-Before-You-Dig" service. New York City is covered by the New York City One-Call service (www.newyork-811.com).
- It is important to note that the DEP does not participate in the New York 811 program and must be contacted directly. DEP utility maps may be required through formal requested online at:

  http://www.nyc.gov/html/dep/html/forms_and_permits/locations.shtml

- Review existing utility maps with facility personnel and determine the approximate numbers and types of utilities within the project area. This is inclusive of below-ground utilities that may be encountered during intrusive operations as well as overhead utilities that may be encountered during operations (i.e., drilling mast and overhead power lines).

- Most "Call-Before-You-Dig" services will only mark below-ground utilities leading to a utility meter. With the exception of high priority utilities (as defined above), utilities present after passing through a meter may be left without adequate inspection. In such cases, the use of a private utility location firm may be prudent to ensure thorough identification of utilities.

- Retain the services of a private utility locating company that can identify metallic utilities and anomalies in the vicinity of the work area. Private utility location firms use a variety of location techniques. The suspected types of utilities should be discussed with the private utility location firm to ensure that proper techniques are used. Improper techniques may result in missed or improperly identified utilities.

- DigAlert must be called at least 48 hours prior to the start of work to complete a utility inspection. (For example, if you notify DigAlert on Tuesday at 9:43 a.m. no work can begin until Thursday at 9:43 a.m.). Intrusive work must begin within 10 working days of the mark out. If intrusive work does not start within 10 working days, DigAlert must be notified for a request to re-mark the utilities.

- Record the inspection confirmation number. Confirm that the inspection was conducted prior to the start of work. The inspection confirmation number is critical in the event that an unmarked utility is encountered, or if a utility identified during the inspection request did not mark the Site for the presence or absence of the utility (no-show). If a no-show occurs with it may be possible that the utility operator sent a facsimile care of the project manager (identified during utility inspection request) indicating that there are no conflicts in the planned work area. However, if there is any question, contact DigAlert immediately and request that the missing utility please call to confirm presence or absence of utility in work area or schedule a meeting time at the Site.

- After below-ground utilities are identified, the utilities should be marked. The most common marking method is paint or pin flags. The following marking colors are generally widely accepted to demarcate specific types of utilities, but should be confirmed.

- Be observant of above-ground features at a site that may be indicative of an underground utility line. An example of this would be noticing two fire hydrants and noting that there is likely a buried water line between them, signs of trenching activities, asphalt or concrete patches, or linear depressions in the ground surface.

- Following the completion of the utility marking, the work area should be inspected by all members of the project team (client, engineer, and contractor) to inspect and discuss the finding. Adjustments to Site operations, if necessary, should be discussed and agreed upon by the project team prior to initiation of Site work. If possible, work areas should be re-located away from utilities.

- If conditions allow, consider using vacuum excavation.

- Due to the prevalence of unknown or unmarked utilities in the NYC area, low impact soil removal techniques (potholing) must be implemented to either confirm the presence of utilities or to provide protection of utilities before invasive activities. In such cases, hand excavation, hand auguring, vacuum excavation, water jet removal, or other low impact removal techniques may be necessary to a depth of 8 feet. Hand excavations for utility clearance purposes must be restricted to non-conductive hand tools such as fiber glass or wooden tools. The use of a jack hammer is permitted only for the breakup of surface pavement. In cases where a high priority utility is located within 10 feet of the work area, documentation from the utility owner must be obtained allowing potholing before any work can be conducted. If the utility is not found after potholing is conducted, contact DigAlert and the utility owner immediately to request additional information as to the location of the utility. It is necessary to conduct potholing activities before any work can be conducted in the vicinity (within 10 feet) of the high priority utility.

- If utility location markings are lost, damaged, or faded, a new utility location survey should be conducted to replace the missing or damaged markings. Please note that

some municipalities require that all utility markings be removed after work is completed. Black spray paint may be used to cover up utility markings in the street but must be removed from sidewalks.

- In all cases, State, local, utility-specific requirements, facility-specific controls, permits, and operations should be considered and incorporated into the THA.
- Utility protection should be addressed during each tailgate or job briefing in order to reinforce below-ground utility location and the avoidance of above-ground utilities.

4.10 Confined Space Entry, Hazardous Enclosed Spaces

4.10.1 Confined Space Entry

Work in confined spaces is not anticipated for field activities associated with fieldwork or construction activities that are part of the Gowanus Canal Project. In the event work in a confined space is required, work will be performed in accordance with the "Company's" Confined Space Entry Procedure.

4.10.2 Hazardous Enclosed or Indoor Spaces

Hazardous enclosed or indoor spaces may include various enclosed spaces that do not qualify as "confined space" but in which hazards may be enhanced, particularly regarding the potential for accumulation of atmospheric hazards. Pertaining to anticipated field activities associated with remedial work on the Gowanus Canal project, an enclosed space may include a storage container used for sample processing.

In order to address the accumulation of atmospheric hazards in an enclosed space such as a storage container used for sample processing the following safety procedures must be followed:

- Use air monitoring equipment as discussed in Section 6, "Air Monitoring," as well as in THA developed for the work.
- Use respiratory protection if necessary and when appropriate (see Section 6, "Air Monitoring").
- Use fans, blowers or other effective means of ventilation to introduce fresh air and dissipate atmospheric hazards.

4.11 Storage of Bulk Materials, Material Handling

For the Gowanus Canal Project, it is anticipated that materials used for fieldwork activities will be stored at Parcel III and various smaller staging areas along the Canal. Materials will be stored in a manner to prevent tipping, sliding, rolling, falling or collapsing. When possible materials will be secured when stacked, racked, blocked, interlocked, tied, or wrapped. Load

limits of racks, platforms, and scaffolding will not be exceeded. Stored materials will not block aisles or passageways. For storage of chemicals, refer to Section 4.13.7, "Chemical Storage."

4.12 Infectious or Allergenic Biohazards

This section addresses worksite conditions where workers may be exposed to elevated project-specific risks of exposure to infectious or allergenic agents that are specifically associated with work activities or work locations. These hazards may include working in the presence of sewage, bird guano, mold, or where human bloodborne pathogens and other elevated disease risks are present.

Where low hazards are present, and/or where hazardous agents are peripheral to the work activity, or where the risk of exposure is low, general worksite hygiene and housekeeping practices should be employed, protective (surgical/nitrile) gloves may be used, and most important, ensure that hand washing equipment or facilities are readily available to workers.

Where more severe hazards are present, for example elevated amounts of bird guano, mold or other biological agents, protective clothing, respiratory protection (respirator/dust mask), decontamination procedures beyond hand washing, may be appropriate.

Where workers may be potentially exposed to human pathogens, "Universal Precautions," worker vaccinations, and other precautions appropriate for the hazard shall be considered. Where workers may be exposed to "bloodborne" pathogens, a project-specific Bloodborne Pathogen Program shall be developed and implemented. In addition, as may be appropriate for a project-specific hazard, safety measures shall be developed in consultation with a qualified medical professional.

On the Gowanus Canal project, biological hazards are present at the Gowanus Canal due to potentially high levels of infectious agents (viruses, bacteria) in sediment and surface water of the Canal. The Gowanus Canal has served as a combined sewer overflow and consequently has received untreated sanitary sewage from numerous outfalls throughout the Canal. Decomposed sewage will potentially be encountered within canal sediments. The USACE site investigation report for Gowanus Bay and Gowanus Canal, dated October 2003, identified elevated concentrations of bacteria in Canal sediments. Bacteria species identified in the Gowanus Canal sediments were associated with sewage and can cause illness if ingested or direct contact. PPE specified in task specific THAs, in conjunction with ordinary hygiene practices, will effectively minimize potential exposures.

The 1 February 2014 New York State Department of Health Public Health Assessment for Gowanus Canal (provided in Appendix 7, "Hepatitis A Information Package") concluded that full-body immersion recreation (e.g., swimming, scuba diving) in the Gowanus Canal could harm people's health due to a combination of potential exposures to chemicals, biologicals, and

other physical hazards. Other activities on the Canal are NOT expected to harm people's health.

Due to the presence of Hepatitis A virus in sewerage and its presence in Gowanus Canal water, and due to its persistent nature in the environment and a potential source of human infection, additional information is provided in the following paragraphs about this hazard, and the potential protection of worker health on this project from receiving a vaccination for Hepatitis A. A fact sheet entitled "Hepatitis A Vaccine, What You Need to Know," published by the Centers for Disease Control (CDC) of the U.S. Department of Health and Human Services, is provided in Appendix 7. Additional information from the CDC's website offers the following recommendations for Hepatitis A vaccination:

> *Hepatitis A vaccination is recommended for all children at age 1 year, for persons who are at increased risk for infection, for persons who are at increased risk for complications from Hepatitis A virus (HAV), and for any person wishing to obtain immunity. CDC recommendation for* ***persons who have occupational risk for infection****: persons who work with HAV-infected primates or with HAV in a research laboratory setting should be vaccinated. No other groups have been shown to be at increased risk for HAV infection because of occupational exposure. CDC also indicates that in the United States, no work-related outbreaks of Hepatitis A have been reported among workers exposed to sewage.*

While recognizing the very low hazard of Hepatitis A infection posed to workers on the Canal, and based on information in the New York State Department of Health document, Consultants and Contractors may offer the vaccination to their personnel.

Gowanus Canal Superfund Site personnel will be provided with a briefing regarding the potential Hepatitis A hazard as part of project safety orientation, as well as part of regular health and safety communication during the project (daily tailgate safety briefings).

Subcontractors/vendors that are contracted to perform activities that may cause employee exposure to water, sediment, or any other contaminated materials that may be taken from the Canal, will receive information regarding any potential health hazards, so that their own management and/or medical personnel can determine their own policy regarding the Hepatitis A vaccination.

4.13 Commercial Chemical Products, Hazard Communication

For commercial chemical products used at all work locations, the following requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) shall be implemented:

- *Safety Data Sheets* - SDSs for each hazardous substance shall be available, either on-Site or readily available within same work shift. Safety data sheets of all chemicals used for the project shall be compiled and kept in the field office trailer.
- *Containers and Labelling* - Chemical substances shall be stored in appropriate containers, and labelled properly with the required hazard information. Labelling applies to primary containers in which the substance was originally received, as well as secondary containers into which the substance was dispensed for subsequent work. Labels shall not be defaced.
- *Training* - Workers shall be trained/oriented on the hazards of the hazardous substances which they will work with, or to which they may be exposed (from nearby work).

Prior to the use of chemical products, coordinate/discuss during safety meetings to ensure information about hazardous substances used on the project is available. Typical products used Site personnel will include decontamination solutions, sampling preservatives, fuel for equipment operation.

For work activities that involve a uniquely hazardous commercial chemical product, or which is used in large quantities, or is otherwise notable or unique pertaining to its hazards, toxicity, protective measures, or other parameters, the SDS for that substance shall be incorporated (attached) to the PHA prepared for that task, and the associated hazards and safety measures specific covered during initial safety orientation s conducted for that task, as well as subsequent tailgate meetings when appropriate.

The following sections provide guidelines for safe work practices for various general categories of commercial chemical products used in the workplace.

4.13.1 Compressed Gases

This section applies to compressed gases in compressed gas cylinders (not to air compressors and similar equipment). Chemical hazards may include flammability, toxicity, or asphyxiation hazards, and physical hazards may include fire/explosion, and projectile hazards. The following safety practices shall be implemented, as applicable:

- Secure cylinders upright, caps on when not in use, handle with care, prevent damage.
- Propane cylinders not in use must be stored outdoors in cage or similar secure enclosure.

- Ensure acetylene cylinders NOT secured to steel arc welding bench.
- Store/use in a manner to prevent asphyxiation hazard.
- Segregate oxygen and fuel gases by distance (20') or barrier.
- Control ignition sources.
- "No smoking" signage at cylinder storage area for flammable gases.
- Use/store in a manner to control inhalation exposure hazards, PPE, air monitoring.

4.13.2 Flammable and Combustible Liquids

For flammable and combustible liquids, such as decontamination reagents (methanol, solvents), sampling reagents (hexane), fuels (gasoline, diesel fuel), the following procedures shall be used:

- Use proper storage measures to restrict access, protect containers, contain/segregated potential fire hazards. Storage measures may include use of flammable storage cabinets, designated on-Site storage location, and associated precautions.
- For fuels, use proper fuel safety can (metal fuel cans are preferred).
- Measures to control ignition sources and prevent flammable/combustible liquid fires, shall be implemented, such as:
    - No-smoking requirements, or designated smoking areas
    - Segregation of hot work or related spark-producing work through use of special separation, barriers, work modifications, designated locations.
    - Ventilation to dissipate vapors
    - Product elimination or substitution (such as replace flammable liquid with less hazardous combustible liquid)
- Grounding and bonding shall be used where appropriate, such as:
    - Electrical bonding between receptacle and dispensing container
    - Grounding of containers trough use of grounding wire or placing container on ground
    - Placing fuel cans on the ground (and not in a vehicle or trailer insulated from grounding by rubber tires) during filling.

Probably the most commonly used flammable liquid is gasoline, because in addition to its use as a vehicle fuel, it is commonly used as a fuel for other equipment such as boat motors, portable generators, landscape equipment, and power tools. The following guidelines shall be observed, as applicable, when working with gasoline:

- Avoid generating and breathing mist and vapors, and avoid direct skin contact.
- Use in a well-ventilated area and be especially careful when working in a small enclosed (indoor) room since concentrations can build up quickly.
- When working with gasoline, depending on the activity, amount of gasoline, duration of work activity, and potential for splash hazards, hands should be covered with polyethylene or PVC gloves, eyes should be protected with safety glasses or goggles, and arms should be covered with long sleeves. Users should not be wearing contact lenses since irritants can be absorbed by the lenses. Slip-resistant, safety footwear should also be worn when working with gasoline.
- No smoking, eating, and drinking when using gasoline, and do not expose gasoline to bare light bulbs or sources of heat/ignition.
- Extra care should be taken when working with gasoline due to extremely high ignitability. Vapor can ignite when pumping or pouring due to static electricity so always make sure to ground metal containers when pumping, dispensing, or pouring product. Only use spark-free tools when handling gasoline and do not use funnels or plastic buckets.
- Store gasoline in clearly labeled, leak free, gasoline safety cans (grounded) or drums and observe all manufacturers recommendations when storing or packing.

4.13.3 Acids, Caustics, Corrosives

The primary hazard of working with acids, caustics and other corrosive substances is damage to eyes, face, and skin. The following safe work practices shall be observed as appropriate for the task/activity and material being used:

- Proper PPE shall be worn, and work practices implemented, to minimize/avoid contact with eyes and skin.
- Eye protection is of paramount concern. Under minimum hazard conditions, regular safety glasses may be appropriate, but for higher hazards chemical goggles or face shield shall be used. This determination shall be made based on the nature of the material, quantities, potential for splash hazards, availability of eye wash, and other Site specific factors.

- Wear protective clothing when working with acid including protective gloves, goggles, long sleeved shirt or lab coat, and safety footwear. Users should not wear contact lenses because acid can be absorbed onto the lens. Work clothes should be laundered separately from other clothes and washed before reusing them.

- Equipment for eyewash, deluge shower, drench hose, hand washing (with water), as appropriate for the hazard and activity should be available. For substances that represent severe eye hazards due to the inherent hazard of the material, in conjunction with other factors (quantities used, work practices, potential for splashing), an eyewash providing a minimum of 15 minutes of flow should be used.

- Avoid generating and breathing in mist and vapors as acid can be an extreme irritant to lungs. Work with acid in a well-ventilated area to minimize the chance of inhalation. When appropriate, airborne levels should be monitored using appropriate testing equipment to ensure that occupational exposure limits are not exceeded.

- When working with acid or handling acid containers, never smoke, eat, or drink, or expose acid to bare lights or ignition sources. Always thoroughly wash hands with soap and water after working with acids.

- When mixing acid with water, always add acid to water and never water to acid to avoid a potentially dangerous reaction. When possible, premixed solutions (prior to entry in the field) will be utilized.

- Recommended storage containers are poly lined drums or containers made of glass carboy or glass (suitable for typically laboratory amounts). Mild steel or galvanized containers should not be used. Containers should be clearly labeled, placed in secondary containment, and securely sealed when not being used.

4.13.4 Toxic Substances

For work involving direct use and handling of toxic substances, the following safety practices shall be observed:

- Review the label, SDS or other information source to become aware of toxicity, signs and symptoms of exposure, physical characteristics, primary routes of exposure, and applicable occupational exposure limits.

- Use/store in a manner to control/minimize exposure (inhalation, ingestion, skin contact, skin absorption).

- Where feasible, use engineering controls (ventilation, containment, etc.) to control hazards.

- Use PPE (respirators, gloves, clothing, aprons, etc.) as appropriate.
- Conduct air monitoring as appropriate for the workplace situation.

4.13.5 Emissions from Fuel Combustion

Inhalation exposure hazards may result from use of fuel-powered vehicles in close proximity to a work area, or near an air intake to a building. Other fuel-powered equipment may include propane heaters, fuel-powered portable generators, heavy equipment, drill rig, etc. Typical fuels in such equipment may include gasoline, diesel fuel, and propane or natural gas. Inhalation hazards from fuel-powered equipment included carbon monoxide, asphyxiation (in enclosed spaces), and generation of combustion-related airborne hazards (soot, carbon, organic compounds, etc.). The following practices shall be observed when inhalation hazards are present as the result of emissions from fuel combustion:

- Position outdoor personnel upwind of exhaust source.
- Use blowers, fans to provide fresh air to work area and dissipate atmospheric hazards.
- Where possible, use ducts and/or fans to capture and exhaust emission to the outdoors.
- Use respiratory protection for high levels of smoke, exhaust particulates, soot.
- Conduct air monitoring for carbon monoxide, as appropriate (see Section 6, “Air Monitoring”).

4.13.6 Dry Ice

Dry ice may be used during processing and shipment of environmental media samples. Although dry ice is not classified as a dangerous substance or mixture according to the Globally Harmonized System, if handled and stored unsafely, dry ice can present a significant hazard to Site workers. As is the case for all commercial chemical products, Site workers must review the Safety Data Sheet for dry ice before handling.

Sublimation of dry ice produces carbon dioxide, which at high concentrations can cause asphyxiation. Dry ice must be stored and handled in a well ventilated area. Site workers are not permitted to store dry ice in enclosed spaces including shipping containers, trailers, or field vehicles.

Prolonged exposure of dry ice to bare skin can potentially cause frostbite and may damage skin tissue. Safety glasses and adequately protective gloves must be worn when handling dry ice. Personnel should use a scoop or cup to transport dry ice from containers to avoid direct contact with skin.

4.13.7 Chemical Storage

Where large quantities of chemical products, highly toxic and hazardous materials, or a large number of containers of toxic/hazardous will be necessary on a jobsite, the need for special chemical storage provisions on the jobsite shall be assessed and appropriate measures implemented, in accordance with the following guideline:

- Use a chemical storage cabinet, storage room, storage cage, designated storage location, as appropriate for the worksite.
- Provide appropriate security, such as locks, lights, surveillance, etc.
- Ensure incompatible chemicals are segregated.
- Provide secondary containment for large quantity containers.
- Locate special safety equipment near chemical storage (such as respirators, eye protection, fire extinguishers, etc.).

4.14 Site Contaminants, Chemical Wastes, Hazardous Materials, HAZWOPER

Environmental contaminants encountered during work for the Gowanus Canal Pre-Design Project will include substances originating from historical releases and currently present in water and sediments in the Canal, and in soil and groundwater adjacent to the Canal and in nearby upland locations. The primary constituents will include:

- VOCs from fuel releases (gasoline, diesel) and other historical sources, including benzene, toluene, xylene, ethyl benzene, and related petroleum-derived compounds.
- SVOCs (poly-aromatic hydrocarbons, or PAHs), also known as “coal tar pitch volatiles,” and polychlorinated biphenyl (PCBs).
- Metals, including mercury, selenium, silver.

Hazardous substances likely encountered during the work in sediments and soils, originating from natural processes of the decay of organic materials, will likely include methane and hydrogen sulfide.

A summary of these primary contaminants of concern (COCs) in samples of soil, groundwater, and sediments is provided in Appendix 2. This table includes information on occupational exposure limits, routes of exposure, health symptoms, and toxicological target organs.

4.14.1 HAZWOPER (OSHA 29 CFR 1926.65) Sites

Gowanus Canal is a Superfund Site and corresponding work conducted on this project is considered to be regulated by the OSHA HAZWOPER Standard (to the extent workers will be potentially exposed to chemical contaminants in a regulated work zone (exclusion zone [EZ], contamination reduction zone [CRZ]). This HASP was prepared to address the following required elements:

- Assign appropriate roles and responsibilities, in particular assign a Site Health and Safety Officer, and assign roles and responsibilities to project staff (see Section 1.6, "Project Organization, Key Personnel, Health and Safety Responsibilities")
- Include Site map/figure depicting work locations and other relevant Site-specific information (see Figure 2, "Site Map").
- Provide a Site description, description of work tasks and delineate hazards and safe work practices for the work (see Section 2, "Site Description," Section 3, "Description of Work," and Section 4, "Hazards and Controls, Task Hazard Analyses").
- Implement Site control plan via Exclusion Zone(s), Contaminant Reduction Zone(s) and Support Zone (EZ, CRZ, SZ) (see Section 5, "Site Control").
- Training (see Section 10, "Health and Safety Training and Information").
    - Site workers in EZ or CRZ to have OSHA 40-hour training, current 8-hour refresher, 3 days supervised field experience.
    - Site supervisor(s) required to have 8-hr. Supervisor training.
    - "Peripheral" Site workers, engaged on-Site, with no hazardous exposure may be required to have 24 hr. training.
- Site workers in EZ or CRZ to participate in Medical Monitoring program, as applicable (see Section 11, "Medical Surveillance and Related Services").
- Implement Site-specific procedures for worker protection as follows:
    - Implement safe work practices appropriate for the hazard (see Section 4, "Hazards and Controls, Task Hazard Analyses").
    - Use appropriate PPE (see Section 7, "Personal Protective Equipment").
    - Conduct air monitoring as appropriate for the task and corresponding hazards (see Section 6, "Air Monitoring").

  - Utilize proper decontamination procedures (see Section 8, “Decontamination”).
  - Implement a spill containment plan (see Section 4.14.4, “Spill Containment, Waste Management”).

- Implement an emergency preparedness and response plan (see Section 9, “Emergency Preparedness and Response”).

4.14.2 Chemical Contaminants but Not Regulated by HAZWOPER

In work situations where project personnel may encounter hazardous substances and contaminants but the work environment may not be regulated by the OSHA HAZWOPER regulation, practices for worker protection shall be implemented, including:

- Workers to be knowledgeable/aware of chemical hazards thru safety training/orientation and availability of hazard information.
- Implement controls to minimize worker exposure through engineering controls, work practices, PPE, as appropriate.
- If workers must wear respiratory protection, they shall also participate in a periodic medical monitoring program and be fit tested.
- Conduct air monitoring/sampling to monitor/evaluate worker exposure, as applicable.

4.14.3 Off-Site Migration of Contaminants

Where a jobsite activity may result in excessive or hazardous levels of emissions off Site to the surrounding community, control measures including dust suppression (water spray), covers, foam, and other appropriate means shall be employed. As appropriate for the work and work place environment, community/perimeter/fence line air monitoring should be conducted in accordance with a perimeter air monitoring plan developed for the work.

4.14.4 Spill Containment, Waste Management

Where work practices may generate quantities of chemical waste, or where a significant risk of a chemical spill may be present, a waste management or spill containment and response plan shall be developed for the project.

Similarly, handling of drums or large containers, or uncovering buried drums, is not anticipated.

Should the need for handling drums or other containers of hazardous substances arise during the project, general guidelines are as follows:

- Only trained personnel should open drums containing unknown materials.

- Bulging drums or containers are an indication of pressure build-up. Open all drums or bungs extremely slowly to determine the presence of vapors or pressure inside the drum. If the possibility of fire or explosion exists, a protective shield should be used and/or remote opening devices. Employees not directly involved with opening a container shall be kept a safe distance away.

- Use only drums and containers that meet the appropriate DOT, OSHA, and EPA regulations.

- Utilize drum/container handling equipment whenever possible. The equipment should have a sufficiently rated load capacity and should be able to operate smoothly on the available surface.

- Label and identify drums and containers when moved to the staging areas to safely identify and classify their contents. Segregate incompatible drums.

- Inspect the integrity of the drum container before moving. Any drum or container lacking integrity shall be placed within an over pack container.

- Staging areas require adequate escape routes. Staging area should provide secondary containment for all moved drums.

- Employees must be warned of the potential hazards associated with the contents of containers or drums prior to moving said containers or drums.

- Organize Site operation to minimize the amount of drum or container movement. Have a clear view of the available pathway when moving drums. If needed, an additional person should be available to provide guidance.

- Never stand on drums or containers.

- Use non-sparking tools and appropriate grounding and bonding equipment.

- Appropriate fire extinguishing equipment must be on-Site at all times during drum handling.

- Spill control equipment shall be on-Site in areas where spills ruptures or leaks may occur.

4.15 Radiation Hazards

On the Gowanus Canal Project, occupational hazards of either ionizing or non-ionizing radiation are not anticipated. General information about radiation hazards are provided in this section, should such hazards arise during the project.

4.15.1 Ionizing Radiation

Occupational hazards of ionizing radiation may result from:

- The presence of radioactive contaminants in subsurface locations or on surfaces in facility where radioactive isotopes were previously, or are currently, used.
- The use of testing equipment that constitutes a potential source of exposure to radioactivity (such as nuclear density gauge, or x-ray fluorescence testing equipment).
- The presence of radiation-generation equipment as part of on-Site industrial processes (such as nuclear power plant operations, or use in industry of x-ray-generating equipment).

Where the hazards of ionizing radiation are anticipated or may arise on a project, the nature of the hazard(s) shall be fully characterized, and project-specific safety measures for worker protection developed, potentially including specific safe work procedures, PPE, breathing zone air monitoring, personal radiation dosimetry, adherence to occupational exposure limits, and other measures deemed appropriate.

4.15.2 Non-Ionizing Radiation

Occupational hazards of non-ionizing may be caused by a variety of circumstances, sources, and work procedures. Non-ionizing radiation consists of electromagnetic rays/fields (excluding the portion of the electromagnetic spectrum consisting of ionizing radiation such as x-rays and gamma rays). Non-ionization radiation and related hazards may include:

- Infrared and ultraviolet (IR/UV) light from welding, cutting and other hot work (as well as from the sun's rays).
- Microwave hazards from microwave ovens, industrial equipment.
- Radio frequency (RF) radiation from cell phone transmitting towers, industrial equipment, radio transmitters, etc.

Where the hazards of ionizing radiation are anticipated or may arise on a project, the nature of the hazard(s) shall be fully characterized, and project-specific safety measures for worker protection developed, potentially including specific safe work procedures, ambient radiation monitoring, adherence to occupational exposure limits, and other measures deemed appropriate.

5. SITE CONTROL

5.1 Buddy System

The buddy system is required for all tasks. The buddy system includes maintaining regular contact via sight or radio communication with on-Site personnel, clients, and/or contractors. In situations where only one employee is performing fieldwork, on-Site personnel must have appropriate communication devices on his/her persons at all times and shall maintain contact with off-Site personnel and the on-Site security team. The fieldworker must communicate with off-Site personnel, at a minimum, of three times daily: (1) upon arriving at the Site; (2) midway through the work day; and (3) upon departing from Site.

5.2 Controlled Work Zones

Given the inherent nature of certain aspects of the work, for example minimally-invasive procedures where low levels of COCs are anticipated, and where disposable PPE will be used for personal protection, formally-delineated exclusion zone (EZ) and contamination reduction zones (CRZ) may not be necessary for the work. However, such work should nevertheless be organized and conducted in a manner that addresses the functional intent of controlled work zones, that is, to prevent the spread of contaminants to locations outside of the immediate work zones. Depending on the specific nature of each task, Site location, and other Site factors, each work effort will be conducted from a temporary staging area or "base of operations" (e.g. a "support zone" or SZ) to be established on an ongoing "as needed" basis by supervisory field staff. Typically, Parcel III will serve as the "base of operations" for most field activities. Depending on specific Site conditions encountered during the progress of work, and where invasive disturbance of potentially contaminated Site materials will occur, formal delineation of work areas will be necessary. Further, if it is necessary to delineate work areas in order to effectively restrict access by other personnel or the public, the boundaries of the EZ, CRZ, and SZ or of the general Work Zone, will be marked using appropriate methods such as traffic cones, warning tape, temporary fencing or other means appropriate for the work.

5.3 Site Access

Access to the Canal varies depending on the location and nature of the work to be performed. Marine vessel access to the Canal will be predominantly from the Gowanus Bay. The primary point of access from overland will be via the dock at Parcel III. Emergency access points to the Canal are indicated on Figure 2 and are described in the task-specific PHAs. Primary access to Parcel III will be via ordinary means through entry gates both on Smith Street and Huntington Street. Security guard booths are located at the main construction gates on Smith Street and Huntington Street. Guard booth personnel should be notified of site security issues as necessary. Site access will be controlled by guard booth personnel when present and by on-site personnel when security officers are not present. When security officers are not present, gates on Parcel III shall be kept closed. When workers are present at Parcel III, the gates will remain unlocked to

allow for access by emergency responders. Gates shall be locked at the end of the work day. A secondary mangate entrance is located on Smith Street. This mangate leads directly into the visitor trailer. The mangate will be locked unless the visitor trailer is staffed.

5.4 Visitors

Visitors to Parcel III and the Site along or within the Canal will require an escort for safety purposes. Personnel will be prohibited from entering the CRZ or EZ or the Work Zone until they have received the proper PPE, they have read, understand, and meet the requirements outlined in their HASP and they participate in a "tailgate" meeting outlining specific concerns and current conditions. Visitors must sign-in at the visitor trailer.

6. AIR MONITORING

The sections below describe the air monitoring requirements for workers during completion of the current phase of work.

6.1 Dust

Based on analysis of the maximum concentrations of COCs (see Appendix 2), and because much of the work will involve handling of wet materials, dust exposure is anticipated to be very minimal. Furthermore, should visible dust be generated during Site activities, water spray will be used to control dust. Each Consultant and Contractor is responsible for determining the need to perform monitoring for dust.

Should conditions change, and if it be determined that dust monitoring is needed, dust monitoring will be conducted using a hand-held total dust monitor. The target compounds for dust monitoring will include metals, PAHs, PCBs and other non-volatile substances anticipated. A sustained breathing zone action level of 2.5 milligrams per cubic meter (mg/m^3) will be implemented, unless a different action level is deemed appropriate based on other information related to conditions anticipated for each task (as addressed in each PHA). When breathing zone concentrations reach this level on a sustained basis, work will be temporarily discontinued to allow for water spray to control dust levels. If water spray is ineffective at controlling breathing zone dust levels to this action level, respiratory protection will be worn (see Section 7 "Personal Protective Equipment").

6.2 Volatile Organic Compounds (VOCs)

During invasive Site activities, air monitoring will be performed to evaluate airborne exposure levels associated with the volatile and non-volatile COCs on-Site within the breathing zone of Site workers. Air monitoring will be conducted using a direct-reading photoionization detector (PID) with a 10.6 electron volt (eV) lamp. An action level of 1 part per million (ppm) will be implemented: when breathing zone concentrations reach this level on a sustained basis, work will be temporarily discontinued to allow vapors to dissipate and to assess wind direction; work will be repositioned upwind, if possible, as a means of controlling worker exposures to VOCs in excess of 1 ppm; if breathing zone VOC concentrations cannot be controlled to a level less than 1 ppm, respiratory protection will be worn (see Section 7, "Personal Protective Equipment"). If sustained airborne VOC levels in workers breathing zone exceed 10 ppm, work will be temporarily discontinued, hazards reassessed, and air monitoring and personal protection procedures will be modified accordingly, in accordance with revisions to be made in this HASP.

The potential need for air monitoring for VOCs on other tasks will be evaluated as the THA for each task is developed.

6.3 Other Atmospheric Hazards

Conditions that may give rise to naturally generated atmospheric hazards, including hydrogen sulfide, and oxygen deficiency or explosive atmosphere (due to methane), are not anticipated. Hazardous conditions associated with these parameters because the work will be conducted outdoors in an "open environment" where physical conditions will not facilitate hazardous accumulation of gases, and the work on this project will involve very limited disturbance of environmental media (sediments, soils) from which these gases may originate. Thus, air monitoring for those parameters is not anticipated. Should conditions change, and unanticipated atmospheric hazards are encountered, work will be temporarily discontinued, the hazard evaluated, and appropriate air monitoring will be conducted in accordance with revisions to be made in this HASP. Standard action levels for these parameters will be used, as follows:

- Hydrogen Sulfide: greater than 10 ppm
- Flammable Vapors: greater than 10% of lower explosive limit (LEL)
- Oxygen Deficiency: less than 19.5%

The potential anticipated need for air monitoring of the above parameters will be based on an evaluation of anticipated hazards, work procedures and other factors associated with each task, and air monitoring requirements will be addressed for that task in the corresponding THA.

6.4 Equipment Calibration

Monitoring equipment will be calibrated in accordance with the manufacturer's requirements. Calibration results and air monitoring measurements will be documented.

6.5 Perimeter Air Monitoring

Should community/perimeter/fence line air monitoring be conducted during the course of work addressed in this HASP, it will be conducted by the responsible party in accordance with a perimeter air monitoring plan.

7. PERSONAL PROTECTIVE EQUIPMENT

The levels of PPE required for each task are presented in the PHAs. Each Consultant and Contractor is responsible for performing a hazard assessment to determine the appropriate PPE requirements for each task. As needed based on-Site conditions, additional protective clothing, such as a Tyvek suit or face shields, eye protection, and respiratory protection, will be used.

At a minimum, on canal work will require workers to wear safety glasses, chemical resistant gloves, and a PFD. Additional protective equipment to protect against splashing and exposure to sediments such as face shields and Tyvek suits are indicated in task-specific THAs. Sampling and processing of sediment cores including decontamination of sampling and processing equipment may require the use of additional PPE such as chemical resistant bib aprons, cut resistant glove liners, splash guards, and vented safety goggles. When outside of the office trailer at Parcel III, at a minimum, workers are required to wear standard Level D attire (standard work clothes) with the addition of a hard hat, safety glasses, steel toe boots, and a high visibility safety vest. PPE must be kept well-maintained. Safety glasses, hard hats, ear protection, and respiratory protection must be kept clean of contaminants including canal sediment. Grossly soiled Tyvek and gloves must be replaced to prevent spreading of contaminated sediment.

In accordance with air monitoring action levels established in Section 6, “Air Monitoring,” the potential exists for using Level C protection for certain invasive activities. Minimum respiratory protection levels will consist of the following:

- Dust: Half- or full-face air purifying respirator, with N99 cartridges.
    - VOCs: Half- or full-face air purifying respirator, with organic vapor cartridges.

Should respiratory protection be required for both dust and VOCs at the same time, a half-or full-face air purifying respirator with combination N-99/VOC cartridges will be used.

The level of protection may be upgraded or downgraded by the SHSO according to air monitoring action levels provided in Section 6, “Air Monitoring.” The PPE levels that are implemented must be documented in a daily field log.

If respirators are worn, workers must abide by the company’s Respiratory Protection Program in accordance with 29 CFR §1910.134. A record of the last fit test for each Site worker that may be required to wear a respirator must be provided prior to wearing a respirator. Fit tests are valid for a period of one year. Persons with facial hair that may interfere with the respirator seal may not wear respirators.

8. DECONTAMINATION

Each SHSO and PM will determine the type and level of decontamination procedures for their personnel and equipment based on evaluation of specific work activities in the work zones. In an emergency, the primary concern is to prevent the loss of life or serious injury to personnel. Medical treatment will take precedence over decontamination in the event of a life threatening and/or serious injury/illness. Personnel will perform decontamination in designated and identified areas upon leaving "hot zones" where the potential exists for exposure to hazardous chemical, biological, or environmental conditions.

Decontamination of personnel in modified Level D will consist of closure and disposal of coveralls, disposable boots, and gloves, (if applicable).

Decontamination of personnel in Level C, if applicable, will consist, at a minimum, of:

- Removal and disposal of boot covers, coveralls, and washing of gloves (as applicable).
- Removal, cleaning, and storage of respiratory protection.
- Washing of boots or other non-disposable PPE (e.g., hard hat, safety glasses/goggles, etc.) if suspected of being contaminated using a soap solution followed by a water rinse.
- Removal and disposal of gloves.

Wash solutions and PPE may require disposal at a licensed waste facility. Hand tools and sampling equipment shall be decontaminated as needed by washing in decontamination basins with appropriate solutions, or, if possible, by dry decontamination.

9. EMERGENCY PREPAREDNESS AND RESPONSE

The purpose of this section is to present an at length discussion of the measures set forth to prepare for an emergency and the procedures to follow in the event of an emergency, including post-emergency follow-up activities. Task-specific emergency procedures will be presented in individual PHAs. Personnel must be knowledgeable of the procedures described in the THAs and applicable procedures described in this section. IN THE EVENT OF AN EMERGENCY, EMERGENCY RESPONSE PROCEDURES SPECIFIC TO EACH TASK WILL BE INCLUDED IN EACH THA AND THAT INFORMATION WILL BE USED BY SITE PERSONNEL FOR EMERGENCY RESPONSE.

9.1 Emergency Response Procedures and the Safety Dash Card

In the event of any emergency, the SHSO or designated alternate shall be immediately notified via the on-Site communication system (i.e., cell phones and two-way radios). The procedures delineated in this section shall be followed immediately, or as appropriate. The task specific PHAs provide emergency response procedures as well as general safety requirements, external emergency contacts and project-related contacts, and routes to medical care facilities for reference in the event of an emergency. In addition to the PHA, field crews will have in possession for quick reference in the field, the Safety Dash Card provided in Appendix 3. This dash card includes an overview of general emergency procedures, contact information for key project personnel and external emergency response, directions to the nearest hospital, a map of emergency egress points along the canal, and a map of Parcel III. The dash card must be accessible to field crew personnel at all times for reference in case of an emergency.

9.2 Emergency Contacts, Summoning Emergency Services

Table 2, "External Emergency Contacts," presents a list of contacts and telephone numbers for the applicable local off-Site emergency responders. Applicable contacts specific to each task are also provided in the task-specific PHAs.

In the event of a **serious emergency requiring emergency response from external emergency providers**, whether serious injury, fire, security incident, utility-related event, or other serious emergency, the following procedures shall be implemented unless unique task-specific procedures are identified in the PHA:

1. Call 911 to summon police/fire department/ambulance.
2. Notify SHSO immediately.
3. Conduct evacuation procedures as appropriate for the situation.
4. On 911 call, stay calm, listen carefully, answer all questions accurately and clearly.

5. Provide accurate rendezvous location. This location will be dependent on the location along the Canal. Refer to Figure 2, "Site Map," for the appropriate location. If at Parcel III, direct responders to the nearest gate, either on Huntington Street or Smith Street and assign a Site worker to open the gate and wait at the gate to further direct emergency responders.

6. If you reach a recording, do not hang up, wait for call-taker to respond.

7. Provide accurate description of event, follow all instructions.

8. After incident is stabilized and emergency response procedures are complete, notify appropriate project personnel.

In the event of a **non-serious or non-life-threatening injury or event/incident**:

1. Notify the SHSO immediately.

2. Respond as appropriate for the incident (use fire extinguisher, administer first aid, seek non-emergency medical attention, stabilize the situation, as appropriate).

9.3 Site Evacuation

If applicable, the SHSO or Project Safety Manager shall call for evacuation of Parcel III or the Canal. If evacuation from Parcel III is required, Site workers should move to the meeting location ("Rally Point") located near the entry gate at Huntington Street Gate, and indicated on the Site Map (Figure 2) unless unique evacuation procedures are presented in the task-specific THA. An evacuation of Parcel III may be required as a result of the ongoing remediation of Parcel III. Three loud blasts on the emergency air horn will indicate evacuation of Parcel III is required. If evacuation is required from the Canal, workers should refer to the PHA for task-specific evacuation procedures. Emergency egress points along the Canal are indicated in Figure 2 and on the Safety Dash Card for reference in the field. Additional egress points may be available when tidal conditions allow for safe evacuation directly over bulkheads and when use of a built-in ladder is not required.

9.4 Medical Emergencies, First Aid

A first aid kit and portable eyewash equipment will be available anywhere where work is being performed so that personnel can easily and quickly administer first aid. The location of the first aid kit and portable eyewash equipment will be indicated during the preliminary health and safety orientation conducted at the start of a given task and reviewed when appropriate. All first aid kits will be replenished of supplies after use as soon as possible and no later than 24 hours after use. The following measures shall be followed if material gets into the eyes of workers:

- Flush eyes with water for at least 15 minutes if chemicals do get into the eyes. If condition persists, seek medical attention.
- If dust or foreign objects are in your eyes, do not rub your eyes.
- If an object becomes embedded in the eye, do not attempt to remove. Lightly bandage your eyes, or both eyes, if possible and immediately seek medical attention.

A hospital and an urgent care facility near the Site have been identified. Unless a different hospital or urgent care facility is indicated in a task-specific PHA, the New York Methodist Hospital will be used as both the hospital and urgent care facility. Figure 3 presents the route to the hospital for emergency-room care and non-emergency care. Figure 3 also includes the facility name, phone number, and written directions from Parcel III. Names and contact information for medical facilities are also provided on Table 2, "External Emergency Contacts." Figure 3, "Route to Hospital for Emergency Care and Non-Emergency Urgent Care," and task-specific emergency contact information are included in the task-specific PHA. For ease of reference in the field, emergency contact information and directions to the New York Methodist Hospital are indicated in the Safety Dash Card provided in Appendix 3.

In the event of a medical emergency requiring urgent emergency medical care, an ambulance service shall be utilized to transport to the injured victim to the hospital.

In the event of non-critical, non-emergency injury, requiring medical evaluation or treatment, the urgent care facility should be used.

9.5 Man Overboard (From Work Boat)

In the event of a man overboard situation, the following procedures will be followed:

- All boat personnel will be immediately made aware of the situation.
- One lookout will be assigned to constantly monitor and report the location of the overboard personnel.
- A ring buoy will be deployed to the overboard personnel. Movement of the boat at this time should be limited to as little as necessary. Ring buoy should be deployed to both conscious and unconscious personnel as the device will serve to mark the location of the person overboard.
- If the person is able to swim or be pulled to the boat without moving the boat then the boat should remain as stationary as possible.
- Moving the boat to the overboard personnel should be done cautiously. The operator of the boat and the lookout should be in constant communication.

- A ladder should be deployed for re-boarding the boat. Personnel should be allowed to enter the boat unassisted, if possible.
- Unconscious personnel should be pulled on board using the shoulders of the life jacket or the man overboard should be held or secured to the side of the boat while the boat moves slowly to shallow water.
- Precautions should immediately be taken to avoid hypothermia. Dry clothes and blankets should be supplied to the person.
- The boat should move immediately to the nearest docking location and support personnel should be notified of the incident.
- All man overboard situations should be reported to the SHSO.

9.6 Fire/Explosion

For small fires, flames should be extinguished using a fire extinguisher by trained personnel. In the event of large fires and/or explosions, the local fire department should be contacted and they will handle mitigation and control. Fire extinguishers will be available anywhere where work is being performed that a risk of fire exists. A fire extinguisher must be available at all times on motor-driven marine vessels and at Parcel III. The type of fire extinguisher provided must be adequate for the category of fire that is at risk to occur. The location of the fire extinguisher will be indicated during the preliminary health and safety orientation conducted at the start of a given task and reviewed when appropriate.

9.6.1 Monthly Fire Extinguisher Inspection

Fire extinguishers must be inspected monthly. An inspection record must be kept in the field office trailer. The inspection must verify the following:

- Hose, horn, and/or nozzle are unobstructed
- Gauge pressure must be in the operable range
- Lock pin and tamper seal must be in place

9.7 Chemical Spill, Spill Containment

Tasks for this project may involve handling of drums and/or containers that contain stored chemicals and/or wastes associated with sampling, invasive work on the Canal, transportation, etc. If trained to do so, workers must implement the hazard mitigating procedures for drum/container handling presented in Section 4. Review the SDS for any hazardous chemicals that will be used at the Site to ensure that no additional spill mitigation measures are required. Any additional spill mitigation measurements will be provided in task-specific PHAs.

9.8 Weather-Related Emergencies

The occurrence or coming of inclement weather will result in the temporary suspension of work activities. Work will not resume until the inclement weather has passed and the conditions are deemed safe. The "30/30 rule" must be followed regardless of location along the Canal (see Section 4.2.2, "Boating and Work On Marine Vessels"). In the event that Site workers are caught on the water during unforeseen inclement weather, workers must immediately stop work and evacuate the Canal via the egress points indicated in the task-specific PHA and marked out in Figure 2, "Site Map." Workers will seek shelter in field vehicles until notified by their SHSO that work may continue.

9.9 Security Emergencies

Tasks for this project involve working in an urban environment that requires additional security. Workers must implement the hazard mitigating procedures for urban environments presented in Section 4, "Hazards and Controls, Task Hazard Analyses." Site workers should avoid confrontation with bystanders or other unauthorized people. Should a Site worker feel endangered by a bystander, the Site worker must stop work and move to a safe location and call the local police or, if a life-threatening situation exists, call 911.

9.10 Incident Reporting

Immediately following an incident, or as soon as possible after an emergency incident has been stabilized, all incidents occurring on-Site are to be reported to the SHSO. The SHSO will then coordinate proper reporting of the incident.

9.10.1 Incident Reporting Procedures

For all incidents, the SHSO shall ensure that the following incident-reporting obligations are satisfied:

- Promptly notify the CM and PSM of the nature, extent, and outcome of the on-Site emergency.
- Implement any further actions necessary, per directions/recommendations of project management/supervisory personnel and/or health and safety personnel.
- Within **8 hours** after any incident a draft of the National Grid "Incident Report Form" (provided in Appendix 3) shall be completed by the Project Manager, SHSO, or other project personnel, and submitted to the project-specific National Grid representative. **Note that this National Grid "Incident Report Form" must be completed for all incidents including "near miss" events.**

10. HEALTH AND SAFETY TRAINING AND INFORMATION

10.1 HAZWOPER Baseline Pre-Assignment and Annual Refresher Training

Prior to arrival on-Site, each Consultant and Contractor will be responsible for monitoring that their staff meets the requirements of pre-assignment training (40/24 hours HAZWOPER). In addition, personnel must be able to document dates of attendance at an annual 8-hour refresher. Failure to provide this documentation will prohibit entry to the active work area(s) (i.e., Exclusion Zone).

Personnel involved in field activities subject to OSHA HAZWOPER 29 CFR 1926.65 will be required to participate in both a health and safety training program that complies with criteria primarily set forth by the OSHA HAZWOPER in 29 CFR 1926.65(e) and a medical surveillance program covered under 29 CFR 1926.65(f), or equivalent regulations based on the jurisdiction in which the project is performed.

10.2 Site Supervisor Training

Consistent with OSHA 29 CFR 1926.65 (e)(4), prior to arrival on-Site, individuals designated as Site supervisors require an additional eight hours of specialized training.

10.3 Boat Safety Training

- All boat operators are required to complete a boating safety course and have experience operating a motorized vessel within the past two years. Proof of course completion must be kept on record.
- Each passenger not holding certification must be briefed by the certified operator or captain as to the safety equipment and procedures on board the vessel.

10.4 Pre-Entry Health and Safety Orientation, Tailgate Meetings

The primary framework of planned safety-related orientation and discussions are described in the following paragraphs, and include:

- Pre-Entry Health and Safety Orientation
- Daily Safety Meetings

Records of these planned safety discussions are provided in Appendix 4 and Appendix 5 of this HASP.

Pre-Entry Health and Safety Orientation - Site personnel will attend an initial safety orientation during which the HASP and applicable PHAs will be reviewed prior to initiating field activities. This review will include the following:

- Understanding the line of authority regarding health and safety and Site personnel roles and responsibilities.
- Information of specific hazard agents related to the Site and Site operations will be discussed, such as health hazards of Site chemicals and specific safety hazards of processes, tools, and equipment.
- Training in the proper use, maintenance, and decontamination protocol of PPE and Level(s) of Protection.
- Appropriate work practices and engineering controls to reduce/eliminate exposures to Site hazards will be reviewed.
- Personnel will be informed of means for normal Site and emergency communication(s).
- Air monitoring strategies will be discussed to include the frequency/types, action levels, sampling techniques, pre/post calibration techniques.
- Unique/Site specific medical surveillance requirements that need to be considered based on-Site contaminants.
- Understanding Site control measures, work zones, and proper decontamination procedures for personnel/tools/vehicles, etc. to reduce the potential for both on/off Site contamination.
- Personnel will be trained to respond quickly and properly in the event of an emergency.
- Personnel involved in specific hazardous activities, such as confined space entry, drum handling, sampling unknowns, etc. will receive specialized training in the appropriate techniques to employ prior to commencing these operations.

All sections of this HASP that pertain to the scope of work being performed must be reviewed during this briefing. After reading the HASP and attending a pre-entry safety orientation, each Site worker must sign a statement acknowledging that they have read and understand the HASP requirements.

Daily Safety Meetings - Daily meetings must be held at the beginning of each day by the SHSO to discuss important health and safety issues concerning tasks to be performed during that shift. Topics discussed in the daily meetings, and those in attendance, will be documented in the Daily Tailgate Meeting Record or Daily Safety Tailgate and Floatplan if on-Canal work is to be

performed. Site personnel should also communicate health and safety concerns associated with the tasks they will be performing at the daily safety meetings. Documentation for daily safety briefings will be prepared by the SHSO utilizing the documentation form provided in Appendix 5, "Non-Emergency Health and Safety Forms."

11. MEDICAL SURVEILLANCE AND RELATED SERVICES

11.1 Baseline Medical Surveillance Exam

The baseline medical examination is used to identify physical capabilities and certain medical limitations that may have an impact on the candidate's ability to perform in the position and/or job activity for which he/she is being considered, as well as to establish certain baseline medical parameters. The initial test results can then be compared against future periodic or project-specific monitoring results.

11.2 Periodic/Annual/Biennial Medical Exam

The periodic medical examination is used to evaluate an employee's continued fitness for duty and to assess possible impact(s) occupational exposures may have had on their health status. The periodic examination includes an update to the medical and work history, results of previous occupational exposure assessments, and a detailed medical exam tailored to the job description.

The health care provider determines the frequency of the periodic medical exams based on regulatory requirements, the position/work activities of the employee, and the level of exposure to physical, chemical, and biological agents.

11.3 Exposure/Activity/Project-Specific Medical Testing

Exposure-specific medical tests and/or evaluation of biological indices may be conducted to establish a baseline for certain project-specific parameters, to monitor the effectiveness of hazard controls, and/or to assess the impact of occupational exposures associated with a particular work activity or project. The health care provider will require or recommend an exposure-specific exam when deemed appropriate based on knowledge of project hazards, occurrence of employee health symptoms, or an unexpected exposure event. The health care provider will determine the type and frequency of the exposure-specific medical exams for employees designated to participate based on sound medical practice, latest toxicology information, and current regulatory requirements.

11.4 Hepatitis A Vaccination

The Consultant or Contractor may offer two-part Hepatitis A immunization to their personnel working on the Gowanus Canal Site. Typically, personnel who will be offered the vaccine include:

- Employees assigned to provide on-Site support (i.e., will be physically performing work on the Canal) other than just observing the performance of work by others will be offered the vaccine.

- Site workers who may come in direct contact with water, sediment, or any other contaminated materials that may be taken from the Canal.

Receiving the vaccination is not mandatory. Employees who are offered the vaccination will have the right to receive or decline the vaccination and will be asked to indicate their choice on the "Hepatitis A Vaccination Acceptance/Declination Form" (provided in Appendix 7, "Hepatitis A Information Package"). If, at a later date, a person who declined then wishes to receive the vaccination, the vaccination will be available to them. Vaccinations will be provided by the Company's health care provider at no cost to employees.

For information about Hepatitis A hazards, background information on biological hazards associated with the Gowanus Canal, and other aspects of the Project safety procedures for these hazards, see Section 4.12, "Infectious or Allergenic Biohazards."

12. SUSPENSION OF WORK

12.1 Individual Stop Work Authority

All Site personnel are granted the right to discontinue their work if imminent hazards and/or unsafe actions/conditions are encountered during their work. Notify the SHSO and CM of the condition immediately.

12.2 Inclement Weather

The occurrence or coming of inclement weather that threatens the safety of project personnel will result in the temporary discontinuation/delay of their work activities. Their work will not resume until the inclement weather has passed and the conditions are deemed safe.

13. HASP AMENDMENTS

Over the course of this project, it is possible that the project-specific details and working conditions will change. Periodic review of the HASP is required to determine the need for amending as necessary to effectively describe the changing working conditions and to mitigate the potential health and safety issues that may arise during the project.

14. RECORDKEEPING

Exposure and medical monitoring records will be maintained according to OSHA 29 CFR 1910.20 (Access to Records), 29 CFR 1910.120 (HAZWOPER), and 29 CFR 1926. Required records, logs, and forms will be maintained according to the appropriate regulation including monitoring data, calibration logs, medical certifications, 40-hour training, current 8-hour refresher training, current 8-hour supervisor training, and other training required as part of this work.

TABLES

FIGURES

APPENDIX 1

Task Hazard Analyses

APPENDIX 2

Contaminants of Concern

APPENDIX 3

Emergency Response Procedures, Incident Reporting

APPENDIX 4

Pre-Entry Health and Safety Orientation

APPENDIX 5

Non-Emergency Health and Safety Forms

APPENDIX 6

Health and Safety Inspection Checklist

APPENDIX 7

Hepatitis A Information Package

Appendix 8

HASP Amendments