AECOM Environment

Prepared for:
National Grid
Hicksville, New York

Prepared by:
AECOM
New York, New York
February 2015

Community and Environmental Response Plan (CERP)

Former Rockaway Park Manufactured Gas Plant Site, Bulkhead Area Remedial Action

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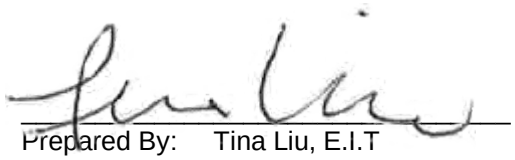
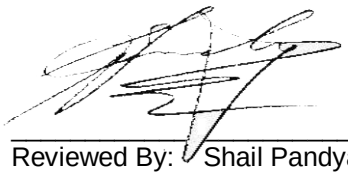


Prepared By: Tina Liu, E.I.T



Reviewed By: Shail Pandya, Sr. Engineer

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List of Acronyms

bgs	below ground surface
CAMP	Community Air Monitoring Plan
CERP	Community and Environmental Response Plan
DBW	DNAPL Barrier Wall
DNAPL	Dense Non-Aqueous Phase Liquid
ft bgs	Feet below ground surface
MGP	Manufactured Gas Plant
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OVD	Odor, Vapor, and Dust
Project Site	Bulkhead Area, north of the Site and Beach Channel Drive, between Beach 108th Street and Rockaway Freeway
ROD	Record of Decision
Site	Rockaway Park Former Manufactured Gas Plant site
SPDES	State Pollutant Discharge Elimination System
VOCs	volatile organic compounds

1.0 Introduction

National Grid has prepared this Community and Environmental Response Plan (CERP) to summarize the controls, monitoring, and work practices that will be implemented during the remediation of the Rockaway Park Former Manufactured Gas Plant (MGP) Site (Site) – Bulkhead Area (project Site) to address the potential for short-term impacts to the surrounding community or environmental resources. The remediation will include installation of a subsurface dense non-aqueous phase liquid (DNAPL) barrier wall (DBW), pre-drilling down to 70 feet below ground surface (ft bgs), pre-trenching to a depth of 10 ft bgs along the alignment of the DBW, placement of 2 feet of clean backfill, and construction of a park. The Bulkhead Area is located north of the Site and Beach Channel Drive, between Beach 108th Street and Rockaway Freeway in Rockaway Park, Queens County, New York.

The CERP is a concise summary of the controls, monitoring, and work practices, and how they combine to provide the necessary protection of the community and ecological resources. Additional details regarding how these controls will be implemented are contained in the project's Design Package. The purpose of the CERP is to provide members of the community with information on the steps and programs that have been put in place in order to protect their health and minimize the disturbance caused by construction activity. This effort will be performed under the approval and oversight of the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH).

This CERP has been prepared in accordance with the Record of Decision (ROD) for the Site [NYSDEC, 2004], Administrative Order on Consent [Index No. D1-0002-98-11, (NYSDEC, 1999)] between KeySpan Corporation (currently known as National Grid) and the NYSDEC, and Section 5.1(f) of the NYSDEC Final DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010.

2.0 Public Communication and Outreach

2.1 National Grid Contact Information

If members of the community have questions or wish to report a concern, they can contact National Grid on the Rockaway Park Project Hotline Telephone at (718) 403-3400 or National Grid public representative Roger Cawley at (718) 403-3400.

2.2 Rockaway Park Remediation Website

A dedicated website has been setup for the environmental remediation work being performed at the project site (http://www.rockawayparkmgpsite.com/). The website includes a description of the Site, a description of the Project and its current status, information about health and safety issues associated with Manufactured Gas Plants, and contacts and links to the NYSDEC website. A Key Document section includes all of the major reports on the Site, Fact Sheets, and Citizen Participation Plan.

The website will be updated with a written summary of the progress on the project every week while remedial construction is occurring. Each update will contain a description of the work completed the previous week and work that is planned for the next two weeks.

2.3 Document Repositories

National Grid has established local document repositories for site-related documents. The Site documents are available to the community to review throughout the remedial program at the following locations:

Queens Borough Public Library
Peninsula Branch
92-25 Rockaway Beach Boulevard
Rockaway Beach, NY 11693
Phone #: (718) 634-1110
Website: http://www.queenslibrary.org/branch/Peninsula
Hours of Operations: Vary by day. Check website for further information.

Community Board 14
1931 Mott Avenue
Far Rockaway, NY 11694
Phone #: (718) 471-7300
Hours of Operation: By appointment

New York State DEC
Region 2 Headquarters
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101-5407
(718)482-4900
Hours of Operation: By appointment

The following documents, as available, will be placed in the Repository:

- Administrative Order on Consent
- Citizen Participation Plan
- Fact Sheet Announcing the Start of the Remedial Investigation
- Remedial Investigation Work Plan
- Remedial Investigation Report
- Reports of any Interim Remedial Measures
- Feasibility Study Report
- Proposed Remedial Action Plan
- Record of Decision (ROD)
- Remedial Design
- Other Materials (e.g., Information Sheets, Notices, etc.).

2.4 Regulatory Agency Contact Information

The remediation work at the project site is being performed under the oversight of the NYSDEC. The contact information for the NYSDEC and other regulatory agencies involved in providing oversight for the remedial work being performed at the project site are presented below:

New York State Department of Environmental Conservation
Douglas MacNeal, P.E.
Environmental Engineer
NYSDEC
Division of Environmental Remediation
11th Floor
625 Broadway
Albany, NY 12233-7014
(518) 402-9662

New York State Department of Health
Stephanie Selmer
NYSDOH Bureau of Environmental Exposure Investigation
Empire State Plaza
Corning Tower, Rm 1787
Albany, NY 12237
(518) 402-7860

3.0 Community Air Monitoring Plan (CAMP)

A draft site-specific CAMP is provided in Appendix A. The final draft will be prepared by Contractor selected to perform the air monitoring prior to the start of work. The CAMP shall be enforced 24 hours a day, 7 days a week during the course of the project. The intent of the CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses, and on-ite workers not directly involved with the work activities) from potential vapors and dust carried in the air as a direct result of remedial work activities on the project site. The CAMP provides air monitoring procedures, contamination concentration limits, and procedures to reduce vapor and dust generation if the limits are approached. Once completed, the CAMP will be made available online at http://rockawayparkmgpsite.com/key_docs.html.

During construction activities which may create dust or vapors (excavation, drilling, etc.), fence line perimeter air monitoring will be conducted using a combination of real-time (continuous and almost instantaneous) air monitoring at fixed locations and walk-around supplemental monitoring using hand-held instruments on an as-needed basis. Contaminants commonly found at former MGP sites will be monitored, including volatile organic compounds (VOCs) and dust. VOCs are chemicals that easily enter the air as gases from some solids or liquids. During construction VOCs could potentially enter the air from the chemicals in the contaminated soils.

The CAMP will include a Contingency Plan that defines the different concentration limits and specific response activities to be implemented during working hours if the limit for a measured compound is exceeded. The response actions, potentially including work stoppage, are intended to prevent or significantly reduce the migration of contaminants carried in the air from the project site.

The real-time perimeter limits consist of alert limits and action limits. An alert limit is a level of contaminant in the air that triggers a response action. An alert limit and an action limit does not suggest the existence of a health hazard, but serves instead as a screening tool to take action, if necessary, to assist in minimizing contaminants from moving off site through the air. An action limit is a level of contaminant or odor in the air that triggers work stoppage.

4.0 Public Protection Measures

National Grid and their Contractor will implement a number of plans to protect the public from physical hazards at the project site. Each of these measures is designed to make the area surrounding the remediation safe for the general public.

4.1 Warning Signs

The Contractor will place signs at the Site entrances on Beach Channel Drive indicating that the project site is being remediated by National Grid under the oversight of the NYSDEC. In addition, signs will be placed on the gate indicating that the project site is an active construction site and only authorized personnel are allowed onto the project site. Site security may also be present during all hours to prevent access as discussed in Section 9.

4.2 Parking Limitations

If needed, a parking ban may be placed for the area adjacent to the project site entrances on Beach Channel Drive for the duration of the remediation. The ban will be in place to allow trucks to turn into and out of the project site safely without damaging private property. New parking signs will be placed along Beach Channel Drive outlining the parking restrictions. The ban will be limited to working hours only and enforced by New York City Traffic Department.

4.3 Street Closure

For a brief period of time, one lane of the westbound Beach Channel Drive may be closed to allow trucks to turn into and out of the Site safely without damaging property or compromising safety. Flaggers will be present to direct traffic through the remaining open lane. The closed lane on Beach Channel Drive will be reopened once these portions of the work are completed and the westbound roadway has been restored to existing conditions.

4.4 Site Fencing

Construction fencing will encompass the entire project area and staging areas for the Contractor. As discussed in Section 9, temporary fencing will also be maintained around the excavation. The perimeter fencing is intended to prevent public access to the project-Site. This fencing will be monitored during non-working hours by site security as described in Section 9.

4.5 Sidewalk Closure

The sidewalk along westbound Beach Channel Drive from Beach 108th Street to Rockaway Freeway will be closed to pedestrian traffic for the duration of the project. Detour signage will be placed on Beach Channel Drive warning of the closed sidewalk.

5.0 Odor, Vapor, and Dust Control

Odor, vapor, and dust (OVD) control will be required for this project due to the proximity of residential and commercial buildings.

If required by permit, plywood will be installed on site perimeter to contain odors and vapors that are generated during the Work. All impacted excavated material will be covered, and trucks transporting impacted materials will be required to use tarp as a physical control. The OVD Control Plan is included as Appendix B of this report. A summary of the plan is presented below.

5.1 Odor and Vapor Control

If the real-time perimeter limits are exceeded or significant nuisance odors are noted, National Grid, the Construction Manager, the Engineer, and the Contractor will consult to determine what type of emission control action is appropriate. Actions that may be taken to reduce contaminant or odor levels include the following:

- Spraying water on exposed soil surfaces and/or roadways to reduce windblown dust.
- Covering working areas consisting of exposed impacted soils, trucks loaded with impacted soils, or stockpiles of impacted soils with tarpaulin covers, vapor reducing foam, or other vapor control agents.
- Temporarily relocating work to an area with potentially lower emission levels.
- Reducing the production rate or change the sequence of work activities.
- Changing the work methods or equipment to alternatives that reduce the potential to create dust or release contaminants into the air.
- Using specialized odor suppressing foams to cover any impacted soils. The foam is a product which reduces the ability of vapors and dust to enter the air.

In practice, these actions will typically be used proactively to prevent alert levels from being reached at the project site perimeter.

5.2 Dust Control

Construction activities will be performed so as to limit the creation of dust. Dust control measures will be used to minimize the potential for creating dust during construction activities. Dust control measures will include water spraying and/or specialized foams. The Contractor will provide materials to help prevent generating dust which may include tarps and/or water, specialized foams, or other National Grid-approved methods. The Contractor will keep sufficient materials on site to help reduce the level of dust from construction activities. The material will be stored within the project site and will be easily mobile in case of need.

Truck routes on site will be inspected continuously during periods of high truck traffic for excessive dirt or dust. Heavily traveled truck routes on the project site will be wet down to minimize dust emissions.

The cleaning of trucks exiting the exclusion zone will help eliminate dusty conditions on the project site. Transport trucks exiting the project site will pass through an inspection area and be inspected to ensure tires and undercarriages are clean and that tarps are secured. Excessive mud and loose dirt observed on the trucks will be manually removed with brooms and brushes as necessary. The proper cleaning of trucks exiting the project site will aid in minimizing/eliminating dust leaving the project site. A decontamination pad large enough to accommodate equipment and truck traffic will be constructed at the exit point to clean tires of transport trucks exiting the project site.

6.0 Construction Noise Mitigation

The remedial activities conducted at the project site will conform to the noise codes for New York City, which is provided in New York City Code Chapter 28 - Citywide Construction Noise Mitigation. More information on the New York City codes can be obtained online at http://www.nyc.gov/html/dep/html/noise/index.shtml.

The Contractor will be required to complete the Construction Noise Contact Sheet and a Construction Noise Mitigation Plan, both of which must be conspicuously posted on the fence outside the construction area.

The Noise Monitoring Plan is included as Appendix C of this report. A summary of the Plan is presented below:

To be in compliance, equipment shall be used only during the hours of 7:00 a.m. and 5:00 p.m. on weekdays or as mandated by any NYC rules and regulations or permits. In the event of special or emergency circumstances that require work to be conducted outside the permitted time, the Contractor will obtain after hours work authorization.

The work that will be completed requires the Contractor to perform tasks which may result in extreme levels of noise. Additionally, some common construction sounds will be heard from the project site, like truck and equipment traffic sounds (including engine noises and backup alarms).

If noise issues do become a concern the Contractor may also locate pieces of machinery on the project site to maximize the distance from potential receptors and utilize sound barriers as needed. This should include levels of measureable noise or vibration which may trigger the need for alternative construction methods or shut down the operation resulting in the noise.

7.0 Vibration Monitoring

It is anticipated that the remedial activities at the project site may generate high levels of vibrations for nearby residents. The work that will be completed requires the Contractor to perform tasks that are commonly associated with high levels of vibration (pile driving).

The Vibration and Settlement Monitoring Plan is included as Appendix D of this report. A summary of the Plan is presented below:

The most common source of vibrations from the project site will be from the pile driving and compaction equipment, which will be used to install the DBW sheet piles and tighten together layers of clean soil as it is used to replace impacted soil that has been excavated, respectively. Pile driving equipment, including a high frequency vibratory hammer, uses vibrations to vertically drive sheet piles into the ground. Compaction equipment tightens soil by creating vibrations over a very small area; however, the compaction equipment that will be used on this site will be small and not nearly powerful enough to cause damage to nearby structures.

The Engineer will complete a thorough review of the means and methods selected by the Contractor to perform the required work. If vibrations are substantial, a vibration reduction plan will be put in place for the project site.

Vibration monitoring would be performed by AECOM, who has specialized training and equipment to measure vibrations which travel through the ground. Typically, when called for, small vibration monitoring devices are placed at the project site boundary and at nearby residences to measure vibrations. One of the most commonly used instruments to measure vibrations on construction sites is manufactured by the Instantel Company. (Visit http://www.instantel.com for more information on these devices). For most types of structures there are guidelines available on acceptable vibration levels that should pose no risk of cosmetic or structural damage, which can be used as a maximum limit on vibrations for the work. These include levels of measureable vibration which may trigger the need for alternative construction methods or shut down the operation resulting in the vibration.

8.0 Pre and Post-Construction Survey Program

Structures such as personal residences and businesses that are adjacent or near the project site and truck routes may be contacted by National Grid to arrange for a pre- and post-construction survey of their property.

A pre-construction survey is conducted by a third-party consultant of the Contractor and/or National Grid. The goal is to document the condition of the property and any structures that are on it prior to the start of work on the project site. A survey of this nature is typically conducted on the interior and exterior portion of the structures on a property and can be completed on the order of a few hours, depending on the size and number of the structures to be inspected. Still photos or video recordings may be taken in some places to document pre-existing damage to structures.

A post-construction survey is similar to a pre-construction survey, but it is conducted after the completion of work at the project site. It is performed to document the condition of structures after the work to serve as a record for damages caused, if any, by the nearby construction.

An individual report will be sent to each property owner containing the findings of any pre-construction or post-construction surveys conducted on their structures. Copies of the pre- and post-construction survey results are kept by National Grid and can be used as evidence in the event of claims of damage to structures caused by construction related activities. Likewise the survey results can also be used to defend the Contractor against false damage claims.

9.0 Site Security

The objectives of the project site security plan are to prevent the vandalism/destruction of construction equipment, prevent unauthorized access, and minimize health and safety concerns for the surrounding residential neighborhood.

9.1 Perimeter Security

A temporary fence will be maintained around the perimeter of the excavation with a height of approximately 8 feet. All gates will have the ability to be locked at the end of each work day. If the area is not otherwise lighted (i.e., building floodlights, municipal streetlights, etc.) the Contractor will provide temporary lighting at the gate.

9.2 Equipment Security

All vehicles and/or equipment left on the project site will be secured at the end of each working day. These criteria must be met by vehicles and equipment remaining inside the perimeter fence or at a secured remote area if left on the project site overnight or during non-work days. No vehicles or equipment will be left overnight in an unsecured location. The Contractor will ensure that all non-essential equipment is de-energized when left on the project site and not in use to prevent any malfunctions from occurring while workers are not present.

9.3 Overnight Security

Overnight and weekend security measures will be provided by the Contractor. Security personnel will be present on the Project Site during those times.

10.0 Erosion and Sediment Control Measures

The erosion and sedimentation control plan is intended to minimize soil erosion and control stormwater on the project site.

10.1 Implementation of Erosion Control Measures

The Contractor shall install and maintain the following erosion control measures for the duration of the excavation work. Additional erosion control measures may be needed due to events beyond the control of National Grid. The Contractor will install any additional measures necessary to prevent erosion as directed by National Grid.

Silt Fence with Hay bales: Silt fence with hay bales will be installed along the perimeter of the project site. The silt fence with hay bales trap soil that may be carried by water running across the Site as a result of heavy rain.

Stabilized Construction Entrance: Each project site entrance and exit will be equipped with a construction entrance; a stabilized pad of aggregate which reduces or eliminates the tracking of sediment onto public streets.

Decontamination Pad: Each project site exit may be equipped with a decontamination pad, where trucks exiting the site may be washed, removing contaminants and dirt from trucks before they exit the project site and travel on public roadways. Truck wash water is collected within the decontamination pad sump and transported for disposal off-site.

10.2 Stormwater Runoff Control

The work will meet the substantive requirements of a State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (GP-02-01). Erosion will be prevented and sediment will be controlled during all on-site earthwork activities in accordance with the applicable New York State guidance. Stormwater run-off will be controlled to prevent contact with impacted soils. Any stormwater that does contact impacted soils will be collected and disposed off-site. Hay bales, silt fence, and rip rap will be used as necessary to prevent erosion of exposed soils.

On-site decontamination pads will be used to remove mud from truck tires and prevent tracking of mud and impacted soil onto the streets. Detailed plans and specifications for erosion and sediment control are provided in the Design Package.

11.0 Waste Management

This section identifies the procedures for managing, treatment, and disposal of waste materials generated as a result of the project site Remediation. All wastes removed from the Site will be transported from the project site by properly permitted and/or licensed waste haulers directly to the National Grid-approved disposal facilities. All trucks will be inspected to ensure the proper placards, decals, and permits are displayed. Trucks will utilize the approved truck route and the most direct hauling route to the disposal facility as indicated in Section 13.

MGP-impacted soils removed from the project site may be directly loaded into trucks for shipment for the approved treatment facility. Trucks will not be allowed to stage on local roadways. The Contractor will schedule trucks in a manner that will minimize the wait time for loading.

Vehicles containing excavated soils will be covered with a solid plastic tarp. If necessary, spray-on odor suppressing materials such as Rusmar Foam may be used to reduce potential VOC emissions or odors during transit.

The impacted materials will be shipped to a thermal desorption treatment facility. At the facility the impacted soils are placed in a rotary kiln that heats the soil which volatilizes the organic contaminants in the soil. The contaminant laden vapors are then collected and treated at the facility. The treated soil is then re-used for beneficial uses such as cover materials at landfills or as aggregate for asphalt or concrete.

Wastewater associated with decontamination activities on the project site will be sent off-site for disposal.

12.0 Transportation Plan

The purpose for the Transportation Plan at the project site is to describe the objectives for traffic control and address any potential concerns. The complete Transportation Plan is included in the Appendix E. The Transportation Plan indicates the traffic routes and traffic management at the project site for:

- Trucking impacted soil and debris off-site;
- Importing clean fill to the project site, as needed;
- Liquid waste hauler picking up dewatered liquids, if necessary;
- Contractor access and parking;
- Equipment access and storage;
- Traffic control at the project site entrance;
- Requirements for truck flagmen/safety spotters on site.

The Contractor will provide traffic control personnel when all trucks are entering or exiting the project site on Beach Channel Drive. Traffic control personnel will also direct traffic as needed upon delivery of equipment, trailers, excavation support materials, etc. To maintain access and lines of sight, the Contractor will arrange for and coordinate with the appropriate local authorities to ensure that on-street parking nearest to the entrance/exit gate is limited throughout the duration of the work. Trucks will not be allowed to queue on local streets; however, the Contractor shall stage trucks at the Site where vehicles can wait to be loaded. All the roadways utilized by the Contractor during the work will be checked daily for spillage and seepage and cleaned to the satisfaction of National Grid, as necessary.

12.1 Truck Controls

All material hauled to and away from the project site will be performed by companies that are appropriately licensed to perform such work in the state of New York. Additionally, all truck drivers must read and sign a truck driver orientation training program.

Upon arrival to the project site, each truck will be visually inspected to ensure appropriate permits are in place. The truck will be initially lined with polypropylene plastic tarp along their beds to prevent water from seeping out of the soil onto local streets. When applicable, odorous truck loads of soil will be foamed to control odors. The trucks will also utilize a heavy tarp which will be extended over the cargo area and overlap the sides and rear of the cargo area to prevent soil from becoming airborne during transport. Before each vehicle leaves the project site it will pass through a decontamination station as described in subsection 10.1.

Appendices

Appendix A of CERP

Community Air Monitoring Plan (CAMP)

AECOM Environment

Prepared for:
National Grid

Prepared by:
AECOM
New York, New York
February 2015

Community Air Monitoring Plan

(Appendix A of the Community and Environmental Response Plan)

Former Rockaway Park MGP Site; Bulkhead Area Remedial Action
Rockaway Park, Queens County, New York
NYSDEC Site No.: 2-41-029

AECOM Environment

Prepared for:
National Grid

Prepared by:
AECOM
New York, New York
February 2015

Community Air Monitoring Plan

(Appendix A of the Community and Environmental Response Plan)

Former Rockaway Park MGP Site; Bulkhead Area Remedial Action
Rockaway Park, Queens County, New York
NYSDEC Site No.: 2-41-029

Prepared By: Melissa Wellman

Reviewed By: Leo J. Gendron

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List of Acronyms

ASTM	American Society for Testing and Materials
CAMP	Community Air Monitoring Plan
COI	Constituents of Interest
DER-10	DER-10 Technical Guidance for Site Investigation and Remediation
EPA	Environmental Protection Agency
HASP	Health and Safety Plan
MGP	Manufactured Gas Plant
PAM	Portable Air Monitoring
PID	Photoionization Detector
PM_{10}	Particulate Matter with a diameter 10 micrometers or less
Project Site	Bulkhead Area, north of the Site and Beach Channel Drive, between Beach 108th Street and Rockaway Freeway
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Heath
Site	Rockaway Park Former Manufactured Gas Plant site
TVOC	Total Volatile Organic Compound
VOC	Volatile Organic Compound

1.0 Introduction

This Site-specific Community Air Monitoring Plan (CAMP) has been developed to provide specific procedures for measuring, documenting, and responding to potential airborne contaminants during the remedial action at the Former Rockaway Park Manufactured Gas Plant (MGP) site (Site) – Bulkhead Area (project site). The procedures in this CAMP are focused on the monitoring of airborne contaminants at the project site perimeter and complement the work zone monitoring conducted to protect project site workers as described in the project site Health and Safety Plan (HASP). This CAMP will be conducted in accordance with and builds on the air monitoring guidelines established by the New York State Department of Health (NYSDOH) in the New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) (May 2010). The air monitoring and sampling described herein will be conducted during ground intrusive activities associated with the installation of a sheet pile wall.

The purpose of the air monitoring program is to provide early detection in the field of potential short-term emissions for the compounds of concern. The early detection of potential emissions and associated contingency measures is intended to expedite any necessary mitigation measures and reduce the potential for the community and public to be exposed to hazardous constituents at levels above accepted regulatory limits and guidelines provided in DER-10. Amendments to the CAMP will be documented using the Amendment Form presented in Appendix A on an as needed basis.

The residuals encountered at former MGP sites are well defined. They are generally related to residual coal tar and principally contain volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). As stated previously, these constituents may contribute to fugitive emissions during the proposed remedial activities. VOCs have the potential to volatilize into the ambient air and be present in the gaseous state, while the heavier constituents, such as PAHs, are typically associated with entrained particulate matter.

The objectives of the CAMP are as follows:

- Provide an early warning system to alert National Grid that concentrations of total organic compounds (TVOC), respirable particulates (PM_{10}), and odor in ambient air are approaching Action Limits due to project site activities;
- Provide details for a project site Contingency Plan that is designed to reduce the off-site migration of contaminants/odors if established Action Limits are approached or exceeded;
- Determine whether engineering controls are effective in reducing ambient air concentrations to below Action Limits and make appropriate and necessary corrective actions; and
- Develop a permanent record that includes a database of perimeter air monitoring results, meteorological conditions, equipment maintenance, calibration records, and other pertinent information.

During remedial activities at the project site, the air monitoring program will include the following:

- Real-time continuous air monitoring for TVOC and PM_{10};

- Supplemental walk-around perimeter TVOC and PM_{10} monitoring using hand-held instruments as appropriate;
- Periodic integrated sampling for compound specific VOC samples; and
- Real-time meteorological monitoring for wind speed, wind direction, wind variability, and temperature.

An aerial overview and a site map showing the preliminary locations of the air monitoring stations are shown in Figure 1-1.

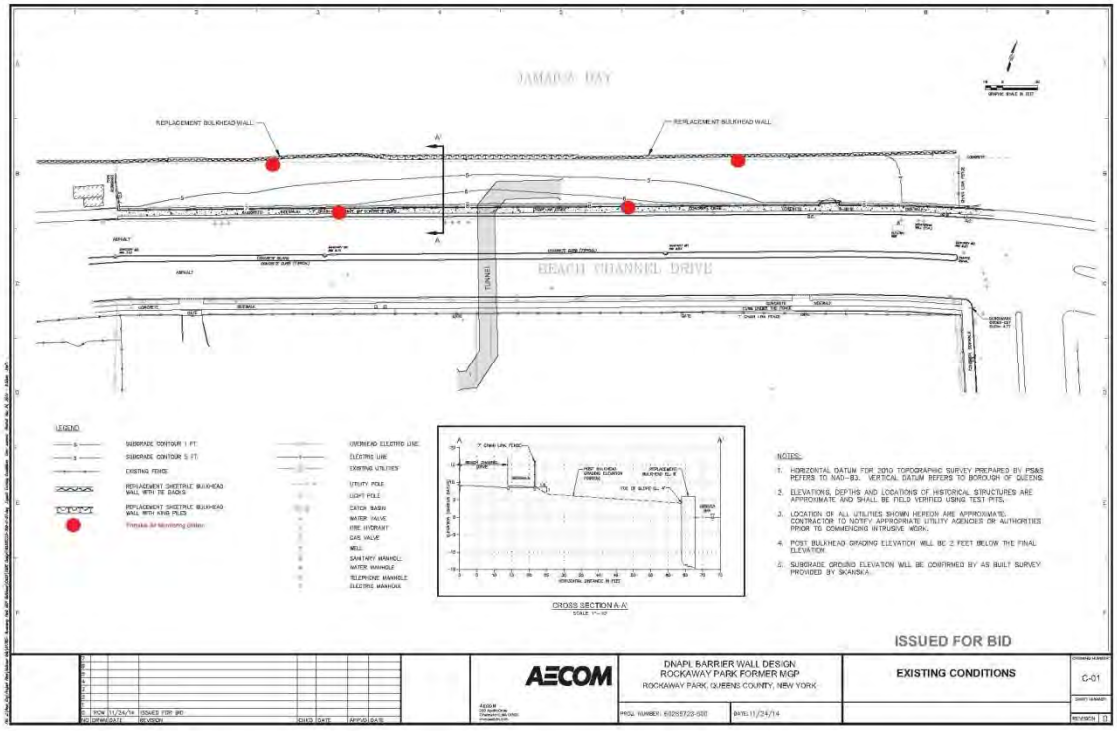
1.1 General Approach

The general approach to meet the objectives of the CAMP is two-fold:

1. Utilize a real-time air monitoring system to measure the constituents of interest (COI). Real-time monitoring data will be used as an early warning system so that the air monitoring contractor can alert National Grid and the project site Construction Manager (CM) if concentrations of COI are approaching the Action Limits. Under this scenario, National Grid, the project site CM, and the air monitoring contractor can then begin to evaluate and implement appropriate project site controls to maintain acceptable ambient air concentrations.

2. Develop comprehensive data management and analysis procedures. Data will be generated from a variety of sources, including real-time portable air monitoring, integrated VOC sampling, supplemental hand-held equipment, and meteorological monitoring. These data will be reduced, evaluated, verified, and presented to National Grid and the project site CM in a timely manner to facilitate effective decision-making.

Figure 1-1: project site Overview



2.0 Alert, Response, and Action Limits

Alert, Response, and Action Limits will be used as a real-time screening tool to manage site activities to minimize the potential for off-site emissions. If concentrations are above the Action Limits during ground intrusive activities, prompt implementation of operational modifications should be effective in preventing adverse impacts to off-site air quality in the vicinity of the project site.

2.1 Alert, Response, and Action Limits

The Response and Action Limits shown in Table 2-1 are consistent with the 15-minute concentrations listed in DER-10. They are intended to be a project site management tool used to maintain existing air quality standards and guidelines at the project site perimeter. The Alert Limit presented in the table was developed by National Grid to provide an additional level of data evaluation to support the management of the project site.

Table 2-1: Target Concentrations (above Background) and Site Conditions

				Site Condition			
Target – units	**Alert Limit**	**Response Limit**	**Action Limit**	**Operational Condition**	**Alert [3] Condition (Above Background[1])**	**Response Condition (Above Background[1])**	**Action Condition (Above Background[1])**
TVOC (PID) – ppm	3.7	5.0	25.0	$[C_{avg}] \leq 3.7$	$3.7 < [C_{avg}] \leq 5.0$	$5.0 < [C_{avg}] \leq 25.0$	$[C_{avg}] > 25.0$
PM_{10} – $\mu g/m^3$	NA	100	150	$[C_{avg}] \leq 100$	NA	$100 < [C_{avg}] \leq 150$	$[C_{avg}] > 150$
Odor[2] - n-butanol scale	NA	NA	3	OI ≤ 3 and No Odor Complaints	NA	NA	OI > 3 or Odor Complaints

Definitions:

TVOC = Total Volatile Organic Compounds
PID = Photoionization Detector
PM_{10} = Particulate Matter
ppm = parts per million volume
$\mu g/m^3$ = micrograms per cubic meter
$[C_{avg}]$ = 15-minute average concentration of target
OI = Odor Intensity based on the n-butanol scale adapted from ASTM E544-99. Odor measurements made over a 15-minute interval.
NA = Not applicable, odor intensity will be either an Operational Level or Action Level; there is no Alert and/or Response Limit and there is no Alert Limit for PM_{10}.

Notes:

[1] Background is defined as the current upwind concentration. Background concentrations will be used to calculate the actual Property contributions to TVOC's and PM_{10} during the final evaluation of the Site conditions as part of the weekly data summaries.
[2] Odor intensity observations are based on the n-butanol scale.
[3] Developed by National Grid to provide an additional level of data review

3.0 Monitoring and Sampling Procedures

This section of the CAMP presents a detailed description of the air monitoring and sampling procedures that will be used during the project site ground intrusive activities.

Air monitoring activities will be conducted throughout the program to evaluate conditions at the property line (fenceline) to ensure that the measures used to control potential fugitive emissions are effective and document ambient air quality/conditions. The monitoring program will consist of the following real-time monitoring and integrated constituent-specific sampling during active periods of remediation:

- Continuous real-time monitoring for TVOCs and PM_{10} will be conducted at four (4) portable air monitoring (PAM) stations (8- to 10-hours per day, 5-days per week (Monday through Friday, 7:00AM through 5:00PM));
- Hand-held and observational monitoring for TVOCs, PM_{10}, odor and visible dust will be periodically conducted, as warranted, during periods of remediation;
- Integrated sampling for VOCs will be periodically conducted using SUMMA canisters; and
- Continuous meteorological monitoring.

3.1 Real-Time Air Monitoring

Continuous real-time air monitoring for TVOCs and PM_{10} will be conducted upwind and downwind of the work area along the project site perimeter at four (4) PAM stations. Information from the PAM stations will be supplemented by routine hand-held and observational air monitoring; one (1) meteorological tower; one (1) central computer system; and one (1) alarm notification system.

3.1.1 Portable Air Monitoring Stations

Continuous real-time TVOC and PM_{10} monitoring will be conducted at four (4) PAM stations around the perimeter of the project site. Locations of the PAM stations are shown in Figure 1-1 and can change with proximity of work relative to wind conditions. The PAM stations will be programmed to measure 15-minute average TVOC and PM_{10} concentrations updated continuously every 1-minute, 8 to 10-hours a day 5-days a week (estimated to be Monday through Friday 7:00AM to 5:00PM). Each PAM station will be positioned to monitor from the breathing zone and can be repositioned each work day to better target the fenceline concentrations in the vicinity of active work areas. The location of each station, the work zone, and the wind direction will be noted daily.

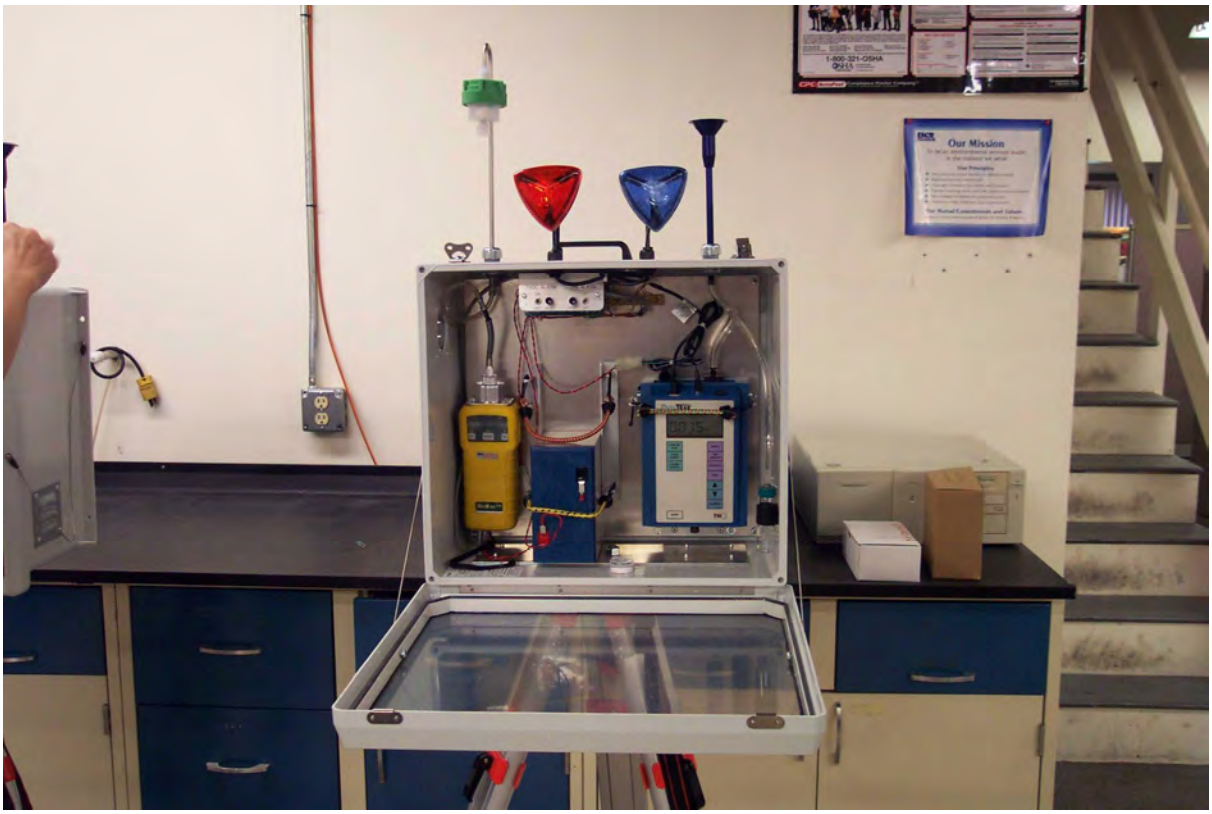
Each PAM station will include the following:

- Station tripod;
- PID (RAE PID or equivalent);
- Particulate monitor equipped with a PM_{10} particle size separator (DustTrak or equivalent);

- Data logger; and
- Wireless communication device.

Each PAM station will continuously measure and record TVOCs and PM_{10}. TVOC and PM_{10} data will be stored in data-loggers located within each PAM station. Data from each piece of equipment will be telemetered in real-time to the central location and stored on a central computer system. At each PAM station, the 15-minute data averages (60 concentrations per hour) of TVOC and PM_{10} will be recorded and updated every 1-minute. In the event of elevated concentrations of TVOC and/or PM_{10}, the 15-minute average value of TVOC or PM_{10} data from the upwind and downwind stations will be compared and the resultant concentration will be calculated and recorded. PAM station setup is shown in Figure 3-1.

Figure 3-1: Portable Air Monitoring Station



3.1.2 Supplemental Walk-Around Monitoring

Supplemental perimeter monitoring for TVOC, PM_{10}, odor, and visible dust will occur along the perimeter of the project site on an as-needed basis.

Specific project site conditions that may trigger walk-around perimeter monitoring include:

- Visible dust;

- Odor complaints;
- Detection of TVOCs and/or PM_{10} at a PAM where concentrations exceed an Alert, Response, and/or Action Limit; and
- Direction by National Grid, the project site CM, or NYSDEC.

When a triggering condition is observed during ground intrusive activity, the supplemental downwind perimeter monitoring will occur continuously until the conditions that triggered the monitoring have subsided.

3.1.2.1 Total Volatile Organic Compounds

TVOC concentrations will be measured and recorded using a portable real-time PID (RAE PID or equivalent).

3.1.2.2 Particulate Matter

PM_{10} will be measured and recorded using a portable real-time particulate monitor (DustTrak or equivalent) equipped with a PM_{10} impactor.

3.1.2.3 Odor Intensity

Odors will be observed based on the n-butanol scale, as adapted from ASTM E544-99. At each monitoring location, the data value, sample time, and sample location will be collected and recorded. Additional temporary monitoring points may be established due to changing project site and/or meteorological conditions.

3.1.3 Meteorological Monitoring

A Climatronics meteorological monitoring system, or equivalent, will be established on-site. The meteorological system will be installed in a location that is as clear as possible from buildings, trees, or other obstructions. The meteorological system will continuously monitor temperature, wind speed, and wind direction. Fifteen-minute average values for each meteorological parameter will be stored in the meteorological system and downloaded continuously into the on-site central database.

A Campbell Scientific data logger (or equivalent) provided with the meteorological system also includes a digital standard deviation (sigma) processor which calculates the wind fluctuation (sigma theta). Sigma theta is an important parameter to observe during remediation activity, so that the potential for fugitive emissions to change direction during slow wind periods can be assessed and documented.

3.1.4 Central Computer System and Interactive Display

TVOC, PM_{10}, and meteorological data will be stored in data-loggers located within each monitoring station. Stored data will be transmitted in real-time, via wireless communication device, to the central computer system located in the central air monitoring trailer. Results are then sent electronically to the data processing office for validation.

3.1.5 Real-Time Alarm Notification System

In the event that concentrations above the Alert, Response, or Action Limits for TVOC or PM_{10} are observed, the air monitoring consultant will be notified via auditory and visual alarm notifications in the

central trailer. If internet connection is available the system can be programmed to provide automated text messaging or email notifications to the on-site technician or another AM staff, as required.

Equipment calibration will be performed according to the manufacturer's instructions. Each PID will be calibrated once daily using a certified standard isobutylene gas for TVOC mode. Particulate monitors for PM_{10} will be zeroed daily, and a once-per-week upscale check will be performed on each instrument. Hand-held portable equipment will be calibrated before each use.

3.2 Integrated Volatile Organic Compound Measurements

Integrated VOC samples (24 hours) will be collected once per week at two (2) of the PAM stations (plus one (1) collocated sample per month). The samples are collected to demonstrate that the real-time monitoring stations are effective in measuring the concentration of the VOC COI.

Integrated VOC samples will be collected using 6-liter Summa® canisters (or equivalent vacuum canisters) and analyzed using United States Environmental Protection Agency (EPA) Method TO-15 (modified to include naphthalene). An accredited laboratory will perform the analytical testing on the canisters and will provide Category B deliverables as required by the New York Analytical Services Protocol. The data will be validated according to EPA and New York State requirements.

3.3 Pre-Construction Baseline Monitoring and Sampling

Since a formal pre-construction monitoring program was conducted prior to the original remedial activities back in 2009, a brief 3-day pre-construction monitoring program will be conducted to establish that baseline ambient air concentrations have not changed since 2009. Sampling methods will follow those described in Section 3.1 and Section 3.2.

Pre-construction real-time monitoring will take place at the same four (4) PAM stations to determine TVOC and PM_{10} baseline conditions. TVOC plus PM_{10} data will be recorded 8-10 hours per day for a minimum of three days. Integrated VOC samples will be collected at two (2) PAMs for two consecutive 24-hour sampling periods. Meteorological monitoring will also be conducted during this period.

4.0 Quality Assurance

The CAMP includes several activities related to Quality Assurance and Quality Control (QA/QC), designed to ensure that the field program is being and has been properly conducted and that the analytical results have been reviewed for accuracy and overall quality. Goals of the QA/QC aspect of the program are, among other things, to assure that the field activities, laboratory results, associated responses to periods of elevated concentrations, and data reporting are appropriate and protective of the environment and public health.

4.1 Field Documentation

A field log book and measurement device calibration field forms along with monthly data listings, will be maintained by the air monitoring contractor throughout the air monitoring program. Information to be recorded by the air monitoring contractor will include:

- Description of remediation activities conducted during elevated data values;
- Daily Site maps showing the locations of each PAM station and hand-held monitoring locations for the day;
- Any corrective actions conducted due to elevated real-time air monitoring concentrations such as foaming/watering, covering stockpiles, reduced work pace, etc.;
- Integrated VOC sample media receipt dates, conditions, and numbers;
- Copies of the COC forms;
- Sampling equipment installation, operation, and removal dates;
- Sampling equipment calibration dates and results;
- General field weather conditions on sampling days;
- Any unusual situations which may affect samples or sampling;
- Sample dates; and
- Start and stop times.

General QA/QC procedures related to the collection and analysis of representative field monitoring data and samples are discussed in the following sections.

4.2 Instrument Calibration

Instrument calibrations will be performed according to the manufactures recommendations. Hard copies of the manufacture's instrument manuals will be kept on-site as part of the project notebook.

The following sections detail the specific calibration frequencies for each type of monitoring. Daily instrument calibration results will be maintained on-site for the duration of the project.

4.2.1 Real-Time Air Monitoring

Instrumentation associated with PAM and hand-held activities will be calibrated on a daily basis in accordance with the manufacturers' instructions using either commercially available standards or internal calibration points. Specific calibration checks may be conducted at the start of daily remediation activities. In certain circumstances similar calibration checks will be conducted at the conclusion of the measurement day. For example: a calibration check will be conducted if a device, such as an analyzer, is suspected to be functioning improperly or a calibration check may be conducted during the operational day if a device is suspected of malfunctioning. There may also be circumstances where a calibration check is conducted in conjunction with a period of elevated concentrations to verify or validate the instrument (device) measurements. This check could be conducted just after the period of elevated concentrations or, in certain circumstances, during the period of elevated concentrations.

Each PID will be calibrated (to zero and an upscale concentration) once daily using a certified standard isobutylene gas for TVOC mode. Particulate monitors for PM_{10} will be zeroed daily plus a once-per-week upscale check will be performed on each instrument with a dust generator (i.e., smoke tube). Hand-held instrumentation will be calibrated before each use.

The meteorological instrumentation will be calibrated during the setup of the project, every six months during the project, and at the time of take down to document the condition of the equipment and assure the quality of the meteorological data recorded. Periodic observations and comparisons to other meteorological stations will be made by a technician to evaluate the overall air flow and weather conditions in the area.

4.3 Integrated VOC Air Monitoring

The 24-hour integrated VOC samples will be collected in a 6 Liter Summa Canister equipped with a flow control regulator during remediation activities. Spare flow control regulators will be supplied by the laboratory for use on the integrated VOC sample. The flow controllers will be calibrated by the laboratory to collect a sample at a flow rate that will allow the canister to fill over a 24-hour period. The flow controllers will be returned to the laboratory for cleaning and recertification every 3 months, or when routine checks indicate a change in flow rate.

4.3.1 Field Quality Control Samples

Field duplicate (or collocated) samples will be collected and used to facilitate the evaluation of the precision and accuracy of the results from the laboratory samples. Collocated samples will be collected at a rate of one (1) collocated sample per month (approximately 1 collocated sample will be collected for every 8 samples). The results will be evaluated, and it will be determined if the results are reasonable.

5.0 Data Management Procedures

This section of the CAMP discusses the data management procedures that will be used during the program. Data will be generated from a variety of sources, including real-time monitoring, hand-held and observational monitoring, and integrated VOC sampling. These data must be reduced, evaluated, verified, and presented to National Grid and the project site CM in a timely manner to facilitate decision-making. The data management process for each source of data is discussed below.

Analytical data generated at each PAM station are sent to the central computer system via wireless radio telemetry. The PAM baseline monitoring data will also be downloaded to the project database for data evaluation.

5.1 Exceedance Notifications

Monitoring results for TVOCs and PM_{10} will be reported to the construction manager and NYSDEC, when Response and/or Action Limits have been exceeded, to allow prompt evaluation and response to potential emissions. The air monitoring technician, together with National Grid and the project site CM, will decide when shut-down and start-up criteria are met.

In addition, if there is a period of confirmed concentrations above the Action Limit during off hours, an email notification will be provided within 24 hours of the incident to the NYSDEC and NYSDOH.

5.2 Weekly Data Summaries

The following weekly data summaries will be prepared and transmitted to National Grid and the project site CM:

- Maximum 15-minute average concentrations of TVOC, PM_{10}, and odor intensity;
- Upwind and downwind comparison and discussion of Alert, Response, and Action Limits reached during the week;
- Average 15-minute wind speed, wind direction, relative humidity, and air temperature data;
- Summary of project site activities; and
- Air monitoring station location maps.

5.3 Monthly Summaries

In addition to the weekly data summaries, a monthly data CD will be provided to National Grid, the NYSDEC, and NYSDOH.

5.4 Final Air Monitoring Report

At the conclusion of the program, the air monitoring contractor will prepare a summary of the real-time and integrated VOC air monitoring results. The report will include summaries of meteorological data, as well as real-time and integrated VOC data from each air monitoring location. The air monitoring contractor will prepare up to two (2) hardcopies and one (1) electronic copy of the final report

documenting the air monitoring results. Additionally, copies of the analytical data and QA/QC documentation will be provided on CD following the completion of the program. The air monitoring report will be submitted to National Grid for review within 90-days of the project completion.

6.0 Contingency Plan

The Contingency Plan is designed to identify potential project site control measures that may be implemented in response to elevated levels of COI or odor measured during ground intrusive activities. In general, a tiered approach to project site conditions with corresponding response actions will be implemented during the air monitoring program.

The four (4) tiers of project site conditions are defined as follows:

- **Operational Condition**: Normal or ambient air-conditions where PM_{10} concentrations are less than the Response Limit and TVOC concentrations are less than the Alert Limit;
- **Alert Condition**: Concentration of TVOC is greater than the Alert Limit, but less than the Response Limit;
- **Response Condition**: Concentration of PM_{10} or TVOC is greater than the Response Limit, but less than the Action Limit; and
- **Action Condition**: Concentration of PM_{10} or TVOC is greater than the Action Limit.

The Contingency Plan will rely on real-time data generated from the PAM, hand-held readings, odor intensity, and meteorological monitoring. These data sources will be evaluated together in order to make appropriate decisions concerning project site conditions and potential control measures. Table 2-1 presents the project site Condition decision table that will be used to determine the appropriate project site Condition based on contaminant concentrations. Possible Alert, Response, and Action Condition corrective actions are listed in Table 6-1 and are presented in detail in the Emissions Control Plan.

Explanations of the notification system, specific conditions, and response actions for TVOCs, PM_{10}, and odor are presented in the following sections.

Table 6-1: Site Conditions and Corrective Actions

Site Condition	Corrective Action
Operational Condition	• Normal Site operations – No Response Action Required.
Alert Condition (TVOC only)	• Establish trend of data and determine if evaluation/wait period is warranted; • Apply VOC emission suppressant foam over open excavation areas; • Slow the pace of construction activities; • Cover all or part of the excavation area; • Slow the pace of construction activities; • Change construction process or equipment that minimizes air emissions; and/or • Evaluate Site activities as they relate to COI concentrations.
Response Condition	• Establish trend of data and determine if evaluation/wait period is warranted; • Temporarily stop work; • Temporarily relocate work to an area with potentially lower emission levels; • Apply water to area of activity or haul roads to minimize dust levels; • Reschedule work activities; • Cover all or part of the excavation area; • Apply VOC emission suppressant foam over open excavation areas; • Slow the pace of construction activities; and/or • Change construction process or equipment that minimizes air emissions.
Action Condition	• Cease construction activities; • Assess work activity modifications; and • Re-evaluate CAMP.
Notes: The bulleted response actions specified under each Site condition can be implemented in any order that is most appropriate under the existing site conditions and are detailed in the Emissions Control Plan.	

6.1 Total Volatile Organic Compounds

TVOC concentrations in air will be measured and recorded by the PAM stations. Table 2-1 presents the TVOC decision table that will be used to determine the appropriate Site Condition based on contaminant concentrations.

6.1.1 Operational Condition

Operational Condition will be in effect when the 15-minute TVOC concentration from each PAM station is less than the Alert Limit of 3.7 ppm.

Under an **Operational Condition**, each PID located at PAM stations will operate in the TVOC mode and will collect and analyze a TVOC sample at a frequency of one 15-minute average each minute.

6.1.2 Alert Condition

An **Alert Condition** will occur if any 15-minute TVOC concentration measured at a PAM station is greater than the Alert Limit (3.7 ppm), but less or equal to the Response Limit (5.0 ppm).

At this time, the upwind and downwind TVOC concentrations will be compared to determine if the preliminary Alert Condition is due to project site activities. If downwind TVOC concentrations are greater than 3.7 ppm above the background concentration, then it will be assumed that the preliminary project site condition is due to project site activities.

6.1.3 Response Condition

A **Response Condition** will occur if any 15-minute TVOC concentration measured at a PAM station is greater than the Response Limit (5.0 ppm), but less than or equal to the Action Limit (25.0 ppm).

If the above condition is true, then a Response Condition will be verified. Under a verified Response Condition, a contingency meeting attended by the air monitoring consultant, National Grid, NYSDEC and/or NYSDOH representatives (when possible), and the project site CM will be held to determine appropriate response actions. This meeting will be held within 60 minutes of the Response Condition verification.

6.1.4 Action Condition

If average TVOC concentrations exceed the Action Limit of 25.0 ppm then the project site will enter into an **Action Condition**. An Action Condition will remain in effect when the 15-minute average TVOC concentration is greater than or equal to 25.0 ppm (Action Limit).

Under an Action Condition, construction activities will be halted. A meeting attended by the air monitoring consultant, NYSDEC and/or NYSDOH representatives (when possible), National Grid, and the project site CM will be held within 60 minutes of the Action Condition notification to determine appropriate corrective actions. Possible Action Condition corrective measures/actions are listed in **Table 6-1**. After appropriate corrective measures/actions are taken, work activities may resume provided that the TVOC concentration at the project site perimeter is no more than 25.0 ppm above background for the 15-minute average.

If average TVOC concentrations fall below the Action Limits, then the project site will be returned to a Response and/or Alert Condition at which time work activities may resume.

6.2 Particulate Matter (PM_{10})

PM_{10} concentrations in air will be measured and recorded by the PAM stations. Table 2-1 presents the PM_{10} decision table that will be used to determine the appropriate project site Condition based on the contaminant concentrations.

6.2.1 Operational Condition

Operational Condition will be in effect when the 15-minute PM_{10} concentration from each PAM station is less than the Response Limit of 100.0µg/m^3 (following an evaluation of background concentrations).

6.2.2 Response Condition

A **Response Condition** will occur if any 15-minute PM_{10} concentration measured at a PAM station is greater than the Response Limit (100 µg/m^3), but less than or equal to the Action Limit (150 µg/m^3). At this time, the project site CM and National Grid will be notified of elevated measurements PM_{10} concentrations and a possible Response Condition. Under a Response Condition, upwind and downwind PM_{10} concentrations will be compared to determine if the Response Condition is due to project site activities. If downwind PM_{10} concentrations are greater than 100 µg/m^3 (Response Limit) above the upwind (background) concentrations (Response Limit), then it will be assumed that the Response Condition is due to project site activities.

The Response Condition will remain in effect as long as the 15-minute average PM_{10} concentration is greater than or equal to 100 µg/m^3 (Response Limit) above background and less than or equal to 150 µg/m^3 (Action Limit). Under a Response Condition, dust suppression techniques must be implemented. At this point, routine monitoring continues and 15-minute averages continue to be evaluated. Work may continue with dust suppression techniques, provided that downwind PM_{10} levels do not exceed 150 µg/m^3 above background and provided that no visible dust is migrating off-site from the Work area

If the above condition is true, then a Response Condition will be verified. Under a verified Response Condition, a contingency meeting attended by the air monitoring consultant, National Grid, NYSDEC and/or NYSDOH representatives (when possible), and the project site CM will be held to determine appropriate corrective actions. This meeting will be held within 60 minutes of the Response Condition if the elevated concentrations are not mitigated by dust suppression techniques.

6.2.3 Action Condition

An **Action Condition** will go into effect if the average 15-minute PM_{10} concentration exceeds 150 µg/m^3 (Action Limit) above background. Under an Action Condition, work must be stopped and a meeting attended by the air monitoring contractor, National Grid, the NYSDEC or NYSDOH representatives, and the project site CM will be held within 60 minutes of the Action Condition notification to determine appropriate corrective actions.

Work may resume provided that dust suppression measures and other controls are successful in reducing the downwind PM_{10} concentrations to below 150 µg/m^3 above background and in preventing visible dust migration.

6.3 Visible Dust

In addition to measured PM_{10} concentrations, the CAMP requires monitoring of visible dust conditions. If visible airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM_{10} levels do not exceed 150 µg/m^3 above background and no visible dust is migrating from the work area.

6.4 Odor

Odors from MGP sites are generally negligible due to surface soil cover of contaminated materials. However, excavation work may expose these materials and odors may become detectable. Odors may cause concern among the nearby community, visitors to the site, and onsite workers regarding potential health risks. Health risks or the potential for health risks do not rely strictly on detectable odors. A detectable odor does not indicate health risks. However, controlling odor emissions from a site can allay public fears about health risks and provide additional means of controlling nuisance emissions during remediation activities.

For MGP sites, the characteristic odor during remediation has been attributed primarily to naphthalene and indene, although additional compounds may contribute to the overall odor. (Pure naphthalene has the characteristic odor of mothballs). Odor intensity levels will be noted and recorded as needed during perimeter walk-around monitoring. Intensity levels will be based on the n-butanol scale as adapted from ASTM E544-99. Table 2-1 summarizes the Site Conditions and Odor Intensity observations.

An Operational Condition will remain in effect if the odor intensity, based on the 8-point n-butanol scale, is less than or equal to 3 (Action Limit). An Action Condition will go into effect when odor intensities are greater than 3, based on the 8-point n-butanol scale, or there are odor complaints from the public.

If an Action Condition, due to odor, is verified, then a meeting attended by the air monitoring contractor, National Grid, NYSDEC or NYSDOH representatives, and the project site CM will be held within 60 minutes of the Action Condition to determine appropriate corrective actions.

Appendix A

Amendment Form

Air Monitoring Plan Amendment

Amendment No.: _____

Client:	**Project Name:**
Location:	**Date:**
Amendment Description:	
Reason for Amendment:	

Appendix B of CERP

Odor, Vapor, and Dust (OVD) Control Plan

AECOM Environment

Prepared for:
National Grid

Prepared by:
AECOM
New York, New York
February 2015

Odor Vapor and Dust Control Plan

(Appendix B of the Community and Environmental Response Plan)

Rockaway Park Former Manufactured Gas Plant; Bulkhead Area Remedial Action
Rockaway Park, Queens County, New York
NYSDEC Site No.: 2-41-029

Contents

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List of Acronyms

CAMP	Community Air Monitoring Plan
COIs	Constituents of Interest
DBW	DNAPL Barrier Wall
DNAPL	dense non-aqueous phase liquid
ft bgs	feet below ground surface
HDPE	High Density Polyethylene
MGP	Manufactured Gas Plant
NYSDEC	New York State Department of Environmental Conservation
NYSDEP	New York State Department of Environmental Protection
OVD	Odor, Vapor, Dust
Project Site	Bulkhead Area, north of the Site and Beach Channel Drive, between Beach 108th Street and Rockaway Freeway
Site	Rockaway Park Former Manufactured Gas Plant site
VOCs	Volatile Organic Compounds

1.0 Introduction

This Odor, Vapor, and Dust (OVD) Control Plan (the Plan) has been prepared to provide a summary of potential impact mitigation options that could be implemented to control, reduce, and minimize the effects of potential fugitive emissions resulting from the remedial activities at the Rockaway Park Former Manufactured Gas Plant (MGP) site (Site) - Bulkhead Area (project site) located in Rockaway Park, Queens County, New York. The project site, where the dense non-aqueous phase liquid (DNAPL) Barrier Wall (DBW) will be installed, is approximately 0.6 acres and is located north of the Site and Beach Channel Drive. The remediation will be performed in 2015 and will involve the pre-drilling and pre-clearing of soil from the alignment, installation of the Waterloo Barrier System along the alignment, off-site disposal of contaminated soil and debris, and importing of clean backfill. The implementation of the Plan will control fugitive emissions ensuring that the community and workers are not exposed to constituents of interest (COIs) at levels greater than federal, state, and local health-based guidelines.

The information presented in the Plan is designed to provide the construction management team with a summary of typical control options and guidance in their implementation. As such, the Plan identifies construction activities that might be potential sources of fugitive emissions, distinctive impacts of odor or dust, and their corresponding control measures.

The potential sources of fugitive emissions are listed in Section 2 while the typical control options are discussed in Section 3. A summary of potential receptors is provided in Section 4. This Plan does not preclude the use of other mitigation technologies or techniques designated in other design documents.

2.0 Potential Sources of Fugitive Emissions

The following section details the potential sources of OVD resulting from the implementation of remedial activities at the project site. Fugitive emissions can be generated from a variety of activities including the remediation processes themselves and/or from the temporary staging of materials for characterization, consolidation, and scheduling for transportation.

Due to the COIs associated with the remedial activities at former MGP sites, fugitive emissions can take the form of volatile organic compounds (VOC's), odor, and/or dust. Dust can be entrained with low levels of high molecular weight constituents, while VOC's can volatilize into ambient air. Odor emissions will result from the atmospheric exposure of impacted media. Experience demonstrates that the potential for odor generation is more significant from Site soils than from groundwater. Therefore, the discussion of odor generation will be generally limited to activities involving the handling of impacted soils. It should be noted that the constituent concentrations associated with MGP odors are typically less than the levels that potentially pose a health risk, as the odor threshold of COI's are typically less than health-based action levels.

2.1 Remediation Processes

Remedial activities can generate fugitive emissions through the disturbance/exposure of impacted media, and/or the transfer/transport of materials. The following sections provide an overview of the proposed project site operations, i.e., sheet pile installation, limited drilling activities, subsurface obstructions removal, and transferring and loading of material and their associated emissions.

2.1.1 Sheet Pile Installation

Waterloo Barrier® brand steel sheeting will be installed along Beach Channel Drive on the south side of the project site as a part of the remedial activities. The sheeting will be used as a DBW to prevent further migration of MGP-related residual impacts. Prior to sheet pile placement, the alignment will be pre-cleared to a depth of 10 feet to remove any subsurface obstructions in the shallow soils that would prevent the sheeting from being installed to depth. Odor is not expected during the DBW installation.

See the following section on subsurface obstructions removal for details on potential fugitive dust or VOC/odor emissions.

2.1.2 Pre-Clearing Excavation

Pre-clearing excavation is expected to be the principal source of potential fugitive emissions during the project site remedial action. A 3-foot wide, 170 foot long, and 10 foot deep trench will be excavated along the barrier wall alignment. The excavated material will be temporarily placed on polyvinyl before backfilled back into the trench. It is expected that only a 20-30 foot section of the trench will be open at any given time. The excavation material is not anticipated to be heavily impacted with MGP- related residuals. Any olfactory or visually impacted soil will be stockpiled and categorized for off-site disposal. All pre-clearing work will be completed only when absolutely necessary, and water and odor submission foam will be on-site to eliminate all potential odor and dust emissions. All concrete subsurface structures will be stockpiled on polyvinyl material until it is trucked off-site for disposal.

Past project experience suggests that fugitive dust from excavation activities will not generally pose a significant problem and that the intensity of VOC/odor emissions will be highly variable, with the greatest impact occurring when impacted areas are disturbed/exposed. In the event air and dust monitoring indicates action levels have been reached or surpassed, an odor suppressant foam (or similar agent) will be utilized as described in the Section 3.2.1.

2.1.3 Pre-clearance Drilling

The DBW alignment will be pre-drilled using a hollow stem auger or similar. The alignment will be pre-drilled at 5 foot intervals to a depth of 70 feet below ground surface (ft bgs). Approximately 35 locations will be pre-drilled. Local short term odor and/or VOC emissions may be generated during the pre-drilling activities.

2.1.4 Transfer, Storage, and Loading of Material

Another source of potential emissions associated with remedial action will be the stockpiling or manual loading of impacted soils for disposal. Additional consolidation or size reduction of material should be avoided to minimize the source of emissions.

To the extent practicable, the majority of the soils will be directly loaded into trucks for off-site disposal. However, contingent upon work activities and rate of production, it may be necessary to stockpile or stage impacted material for consolidation, characterization, or scheduling of transport. This material has the potential to be an emission source, and stockpile/staging areas will be covered, as required, with high-density polyethylene (HDPE) fabric.

2.1.5 Fill Placement

Dust may be generated during fill placement over the entire project. It is anticipated that 2 feet of fill will be placed during the project.

3.0 Site Controls

This section describes site controls that will be implemented during the remedial activities for the minimization and control of fugitive emissions and to ensure that ambient concentrations of COI's remain below federal, state, and local health based guidelines. The mitigation options have been classified into levels to be implemented based on site-specific action levels delineated in the *Community Air Monitoring Plan,* AECOM, January 2015 (Appendix A of the CAMP). The actual mitigation measures will be determined in the field by the on-site Construction Manager, who may also choose to implement mitigation measures to avoid reaching the site-specific action levels.

A three-tiered set of controls are proposed for this Plan:

- Level I – Built into the design of the Plan and includes proactive measures to minimize the effect of fugitive emissions. Level I includes air monitoring to ensure that levels of VOC's and dust are under site-specific action levels.
- Level II – Procedures that are implemented in response to specific increases in fugitive emissions but are not likely to have a significant impact in the schedule of remedial activities. Level II controls will be made available on-site at all times.
- Level III – More aggressive procedures, initiated in response to specific increases in fugitive emissions, which are likely to have a more significant impact on production schedule and remedial activities.

The Construction Manager is required to progressively implement these options until emission sources are controlled and ambient concentrations no longer have the potential to pose a health risk. A summary of the proposed controls for processes and storage activities are provided in Tables 3-1.

3.1 Level I Controls

Level I Controls are built into the design of the remedial activities and involve physical controls, site layout, and scheduling.

3.1.1 Physical Controls

If required by permit, plywood will be installed on the Project Site perimeter fencing to be used as a physical control for odors, vapors, and dust. The fence will be installed over jersey barriers, bringing fence height to ~11 ft. The resistance caused by the visual barrier will elevate the discharge point of emissions, allowing emissions to leave the site via the top of the perimeter fence. This will promote better mixing and dispersion. Another form of simple physical control will be the use of tarps on trucks to move or transport impacted material.

All stockpiles of impacted material will be covered if left inactive for a period of more than 2 hours.

All trucks used for off-site transport will have tarps in place to cover impacted material. On-site haul routes will be routinely wetted using a hose, sprinkler, or dedicated water truck to control dust.

3.1.2 Site Layout

The dispersion of fugitive emissions is controlled by meteorological conditions and their impact generally decreases with distance from the source. If possible, transfer/storage areas will be placed downwind of off-site receptors.

The height of the stockpiles/staging areas, if necessary, will be lower than the top of the perimeter fencing (approximately 8 feet) to utilize the benefit of the barrier cloth. If stockpiles are staged near the fence line (within 100 feet), they will be less than 8-feet in height.

3.1.3 Coordination of Disposal

Characterization by the Engineer may be required for off-site disposal of impacted soils. The engineers will collect and categorize soils with fast track turnaround time to minimize the amount of time the impacted soils are staged on-site. Impacted soils will be placed within roll-off containers that will be covered except during loading and off-loading.

The Contractor will coordinate with all of the selected facilities and schedule transportation to ensure uninterrupted soil removal from the project site. These actions will allow for direct loading where practicable and minimize stockpiling.

3.2 Level II Controls

Air monitoring will routinely be performed at the fence line of the project site as delineated in the Community Air Monitoring Plan (CAMP) during all work activities. The results will be compared to site-specific action levels for VOC's and total particulates. These presumptive action levels are provided in Table 3-1.

If the action levels are exceeded, additional monitoring will be conducted to confirm the result. Level II controls will be enacted if the exceedance is confirmed. The Construction Manager will then work through the applicable list of site controls until the fence line monitoring results for all parameters are determined to be less than their associated action levels. Specific Level II controls are discussed below.

3.2.1 Suppressing Agents

Several agents that can be applied over emissions sources have been determined to be effective in controlling emissions. These include odor suppressant foam for VOC mitigation and water spray for dust suppression.

The following suppressing agents have been identified for use, but additional agents may be used or substituted for other proven agents such as odex, hydromulch, or ecosorb.

3.2.1.1 Odor Suppressant Foam

Odor suppressant foam has been successfully utilized on similar sites. It is presented in this plan as an option.

Odor suppressant foam can provide immediate, localized control of VOC and odor emissions. The foam is created by the injection of air into a foam concentrate/water mixture using a Pneumatic Foam

Unit. The foam is applied via a hose to cover source areas to a depth of 3 to 6 inches. Foam (Rusmar AC-900 or equivalent) is a short term remedy and can be actively used to control VOC and odor emissions from active excavations/stockpiles and during the loading of trucks. It is shipped as a concentrate and diluted with water at the project site. Under normal conditions, this foam can last for several hours. However, it has been observed to degrade quickly in direct sunlight or precipitation, so it must be applied liberally and frequently to all areas that require odor control.

Information regarding the foam and application units is provided in Appendix A.

3.2.1.2 BioSolve

BioSolve can be used as an alternative to or in conjunction with foam. The dilute solution can be sprayed directly onto newly exposed soil surfaces or stockpiles of contaminated material where volatilization is taking place. BioSolve creates an emulsion with the MGP-related residuals thus suppressing vapors, allowing work to continue safely without disruption to workers or neighbors.

3.2.1.3 Water Spray

A spray of water can be used to minimize the amount of dust created. A water hose is effective for controlling dust over a small area, while lawn sprinklers or a dedicated water truck may be more efficient for extended control of large areas or on-site haul routes.

3.2.2 Tarps

Tarps can provide effective control for source areas that are likely to be inactive for extended periods of time. To be effective, the size of the source area should be controlled such that it can be covered using a single tarp. Rolls of 6-mil polyethylene will be used to cover inactive stockpiles and roll-off containers. Tarps will also be used for covering exposed soils loaded into trucks. All trucks will be lined with 10-mil polyethylene sheeting. The liners will be large enough to overlap and fully cover the top of the load. Additional automatic mesh tarps will be used to secure the liners.

3.3 Level III Controls

Level III controls are to be implemented when Level II controls have been exhausted and ambient concentrations of emissions continue to exceed the site-specific action levels. Each of the control options listed in this subsection has the potential to significantly affect the schedule/production rate of remedial action activities. These delays may be required periodically to ensure that acceptable levels of fugitive emissions are maintained and are preferable to a complete work cessation to control an emission event.

3.3.1 Production/Schedule

It may be necessary to reduce the excavation rate to reduce the surface area of disturbed media or to slow the generation rate of stockpiles and roll offs. These activities would result in smaller source areas that could be more effectively controlled using Level II techniques. Efficient scheduling/ coordination of operations can also limit the impact of active emission sources. Close coordination of excavation activities can decrease the surface area of disturbed material, thereby reducing the size of the emission source. A smaller source area can facilitate the implementation of additional controls, if required.

3.3.2 Meteorological Conditions

It may be necessary to limit certain activities to those periods when preferred meteorological conditions exist, such as wind direction or low temperatures. Most of the work for the project will be performed in the spring months.

3.3.3 Relocation of Activities

Another option is to temporarily cease work and move the remedial activities to lesser-impacted areas of the project site until adequate control measures can be implemented or more favorable meteorological conditions return.

4.0 Off-Site Receptors

The use of project site controls will ensure that there is not a significant risk associated with fugitive emissions. The remedial activities will likely generate distinctive odors similar to asphalt sealer, which is detectable within several hundred meters of the project site and may be bothersome to sensitive individuals.

The Site encompasses approximately 9.5 acres. The project site, where the DBW will be installed, is approximately 0.6 acres and is located north of the MGP site and Beach Channel Drive. The primary potential receptors are as follows:

- City of New York Department of Environmental Protection (NYCDEP) sewage treatment plant
- Residences south of Rockaway Freeway
- Businesses west of Rockaway Freeway

The potential receptor locations are residential and commercial in nature (office, storage, retail, manufacturing, individual residential homes) and will have residential owners or managers/supervisors that can serve as useful points of contact.

Theses contacts will also be provided with copies of the fact sheet including:

- Schedule of remediation
- Nature of contaminant
- Potential for odors/evaluation of risk
- Site contact information

Table

Table 3-1
Levels and Response Actions
OVD Control Plan
Former Rockaway Park MGP Site – Bulkhead Area
Rockaway Park, New York

Site Condition	Response Action
Operational Level: Normal or ambient air-conditions where all target concentrations are less than the Alert Limits (75 percent of the Action Limit)	• Normal Site Operations – No Response Action Required
Alert Level: Concentration of at least one target is equal to or greater than Alert Limit (75 percent of the Action Limit), but less than the Action Limit	• Establish trend of data and determine if evaluation/wait period is warranted • Temporarily stop work • Temporarily relocate work to an area with potentially lower emission levels • Apply water to area of activity or haul roads to minimize dust levels • Reschedule work activities • Cover all or part of the excavation area • Apply VOC emission suppressant foam over open excavation areas • Slow the pace of construction activities • Change construction process or equipment that minimize air emissions
Action Level: of at least one target is equal to or greater than the Action Limit	• Cease construction activities • Assess work activity modifications • Re-evaluate air monitoring work plan
Notes: The bulleted response actions specified under each site condition can be implemented in any order that is most appropriate under the existing site conditions.	

Target Compounds	**Alert Limit**
TVOCs (15-minute average concentration)*	3.7 ppm greater than background**
Respirable Particulate Matter (RPM_{10}) (15-min avg)*	100 µg/m^3 greater than background**

Target Compounds	**Action Limit**
TVOCs (15-minute average concentration)	5 ppm greater than background**
TVOCs (15 minute instantaneous concentration)	25 ppm greater than background**
Respirable Particulate Matter (RPM_{10}) (15-min conc)	150 µg/m^3 greater than background**
Odor (n-butanol scale) (15-minute sustained)	3 (Verified related to construction)
Odor (nuisance)	Public complaints that are verified to be related to construction
Hydrogen cyanide	1 ppmv

ppmv - parts per million volume
µg/m^3 - micrograms per meter cubed
* 15-minute average concentrations updated every 1 minute
** Background is defined as the current upwind 15-minute average concentration.

Appendix A

Material Safety Data Sheet, AC-900 Series Equipment (PFUs)

MATERIAL SAFETY DATA SHEET

LONG DURATION FOAM AC-645

SECTION I: GENERAL INFORMATION

- Manufacturer's Name: RUSMAR INCORPORATED
- Manufacturer's Address: 216 Garfield Avenue • West Chester, PA 19380
- Manufacturer's Phone No.: 610-436-4314
- Chemical Family: Aqueous anionic surfactant mixture
- Trade Name: RUSMAR AC-645

SECTION II: HAZARDOUS INGREDIENTS

- Paints, Preservatives, and Solvents - None
- Alloys and Metallic Coatings - None
- Hazardous Mixtures and Other Materials - None

SECTION III: PHYSICAL DATA

- Boiling Point: 100° C
- Vapor Pressure: 25mm Hg at 25° C
- Vapor Density (Air = 1): N/A
- Water Solubility: Complete
- Specific Gravity: 1.01 to 1.06
- % Volatile, By Volume: None
- Evaporation Rate: N/A
- Appearance/Odor: Translucent, white, milk-like, odorless, viscous liquid

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

- Flash Point (Method): Nonflammable
- Flammable Limits: N/A
- Extinguishing Media: N/A
- Special Fire Fighting Procedures: None
- Unusual Fire and/or Explosion Hazards: None

SECTION V: HEALTH HAZARD DATA

- Threshold Limit Value: Not Determined
- Effects of Overexposure: This material is not expected to present an inhalation or ingestion hazard. It may cause an eye or skin irritation upon direct contact.
- Emergency and First Aid Procedures: Wash thoroughly with clean water

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MATERIAL SAFETY DATA SHEET

LONG DURATION FOAM AC-645

SECTION VI: REACTIVITY DATA

- Material is stable
- No material incompatibility
- Hazardous Decomposition Products: Low levels of sulfur oxides on exposure to high temperatures (concentrate). Foam is non-combustible.
- Polymerization will not occur

SECTION VII: SPILL OR LEAK PROCEDURES

- Steps to be taken in case material is released or spilled: If spilled indoors on a hard surface, the spill area may be slippery and should be thoroughly washed with water. Contain spill and absorb material with dirt or other appropriate absorbent.
- Waste Disposal Method: This material is completely biodegradable and can be disposed of in a sanitary landfill according to local regulations.

SECTION VIII: SPECIAL PROTECTION INFORMATION

- Respiratory Protection: None required for normal operations
- Ventilation: No special requirements
- Protective Gloves: Not required, but recommended
- Eye Protection: Not required, but recommended
- Other Protective Equipment: None

SECTION IX: SPECIAL PRECAUTIONS

- Storing/Handling Precautions: Avoid excessive heat. Material will freeze, but thawing will not cause changes in the product.
- Other Precautions: None

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MATERIAL SAFETY DATA SHEET

LONG DURATION FOAM AC-900 SERIES

SECTION I: GENERAL INFORMATION

- Manufacturer's Name: RUSMAR INCORPORATED
- Manufacturer's Address: 216 Garfield Avenue • West Chester, PA 19380
- Manufacturer's Phone No.: 610-436-4314
- Chemical Family: Aqueous anionic surfactant, polymer latex mixture
- Trade Name: RUSMAR AC-900

SECTION II: HAZARDOUS INGREDIENTS

- Paints, Preservatives, and Solvents - None
- Alloys and Metallic Coatings - None
- Hazardous Mixtures and Other Materials - None

SECTION III: PHYSICAL DATA

- Boiling Point: 100° C
- Vapor Pressure: 25mm Hg at 25° C
- Vapor Density (Air = 1): N/A
- Water Solubility: Complete
- Appearance/Odor: Opaque, gray, viscous liquid
- Specific Gravity: 1.01 to 1.06
- % Volatile, By Volume: None
- Evaporation Rate: N/A

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

- Flash Point (Method): Nonflammable
- Flammable Limits: N/A
- Extinguishing Media: N/A
- Special Fire Fighting Procedures: None
- Unusual Fire and/or Explosion Hazards: None

SECTION V: HEALTH HAZARD DATA

- Threshold Limit Value: Not Determined
- Effects of Overexposure: This material is not expected to present an inhalation or ingestion hazard. It may cause an eye or skin irritation upon direct contact.
- Emergency and First Aid Procedures: Wash thoroughly with clean water

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MATERIAL SAFETY DATA SHEET

LONG DURATION FOAM AC-900 SERIES

SECTION VI: REACTIVITY DATA

- Stability: Material is stable. This material will likely coagulate if frozen.
- Incompatibility: Addition of other materials may cause coagulation
- Hazardous Decomposition Products: Low levels of sulfur oxides on combustion and dense, black smoke
- Polymerization will not occur

SECTION VII: SPILL OR LEAK PROCEDURES

- Steps to be taken in case material is released or spilled: If spilled indoors on a hard surface, the spill area may be slippery and should be thoroughly washed with water. Contain spill and absorb material with dirt of other appropriate absorbent.
- Waste Disposal Method: This material has only a modest BOD and can be deposited in sewers. However, it should be flushed with copious amounts of water. The material can be disposed of in approved landfill; dried waste may be incinerated.

SECTION VIII: SPECIAL PROTECTION INFORMATION

- Respiratory Protection: None required for normal operations
- Ventilation: No special requirements
- Protective Gloves: Not required, but recommended
- Eye Protection: Not required, but recommended
- Other Protective Equipment: None

SECTION IX: SPECIAL PRECAUTIONS

- Storing/Handling Precautions: Avoid excessive heat. Material will freeze, thawing will NOT return product to usable form.
- Other Precautions: None

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PRODUCT DATA SHEET

LONG DURATION FOAM AC-645

GENERAL DESCRIPTION

AC-645 Long Duration Foam is a patented product which produces a thick, long-lasting, viscous foam barrier for immediate control of dust, odors and volatile organic compounds (VOCs). AC-645 is designed for use with Rusmar Pneumatic Foam Units.

AC-645 foam is recognized by the Environmental Protection Agency and the U.S. Army Corps of Engineers as providing superior emission control for a period up to 17 hours. AC-645 has been specified for use at Superfund and other hazardous waste sites across the United States and Canada.

FEATURES

- Biodegradable
- Will not add to treatment costs
- No ambient temperature limitations
- Easy to use
- More effective than tarps
- Non-reactive
- Non-hazardous
- Safe for workers and the environment
- Requires only water dilution
- No clean up necessary
- Non-combustible
- Covers any contamination source

APPLICATIONS

The primary application for AC-645 is control of odors, VOCs and dust during active excavation and for overnight coverage of contaminated soils at hazardous waste sites. AC-645 can also be applied on top of liquid surfaces.

SPECIAL ODOR CONTROL PROBLEMS

The remediation of hazardous waste sites often includes excavation of soil contaminated with odorous compounds. AC-645 has little or no odor itself, although a pleasant wintergreen or vanilla scent can be added. It forms a barrier between contaminants and the atmosphere and can be applied during active excavation to provide an immediate and effective barrier to minimize odors. It is completely biodegradable and poses no threat to workers, neighboring residents or ground water. AC-645 will not add to soil volume or treatment costs.

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PRODUCT DATA SHEET

LONG DURATION FOAM AC-645

AC-645 can also be applied on top of trucks for emission control during transport of materials such as contaminated soils or sewage sludge. Ammonia tests performed on trucks containing sewage sludge resulted in a drop of concentration levels from 170 ppm prior to foaming down to 6 ppm after coverage with AC-645.

- Minimizes worker exposure
- Maintains fence-line odor and VOC emission limits
- Works on lagoon and pond closures
- Can be applied to near vertical or liquid surfaces

FUGITIVE DUST

At hazardous waste sites, fugitive dust can present a health hazard. AC-645 can be applied on top of the dusty material to prevent any wind-borne emissions. There is no need to mobilize equipment to immediately cover with soil or tarps. The Pneumatic Foam Unit can be filled and placed at the site to be used at a moment's notice.

EMERGENCY SPILL CLEAN UP

In emergency spills, odor and VOC control is often difficult because of the terrain and accident conditions. AC-645 Long Duration Foam can be applied to any shaped object, as well as steep slopes, water, mud, snow and ice. It is non-flammable and non-reactive - difficult spill problems can be accommodated.

METHOD OF APPLICATION

AC-645 Long Duration Foam is supplied in either 450 pound (55 gal.) drums or by bulk load (approximately 46,000 pounds). Bulk shipments can be stored outside in a Rusmar Bulk Storage-Dilution System. The Bulk Storage and Dilution system is comprised of a 7000 gallon heated and stirred chemical storage tank and a microprocessor to accurately dilute and transfer the chemical. AC-645 is designed to be applied with a Rusmar Pneumatic Foam Unit. The Pneumatic Foam Units are available in a variety of sizes to accommodate a range of site conditions and application needs.

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PRODUCT DATA SHEET

LONG DURATION FOAM AC-900 SERIES

GENERAL DESCRIPTION

The AC-900 Series Long Duration Foam products produce an impermeable, flexible membrane that seals a surface to prevent emissions. AC-900 Series foam products utilize foam as a distribution method for latex. After the foam has been applied, the air bubbles begin to collapse and the latex coagulates to form a continuous flexible membrane that adheres to the substrate. AC-900 Series products are designed for use with Rusmar Pneumatic Foam Units.

AC-900 Series foams are recognized by the Environmental Protection Agency and the U.S. Army Corps of Engineers as providing superior emission control for periods up to 6 months. AC-900 Series foams have been specified for use at Superfund and other hazardous waste sites across the United States and Canada.

FEATURES

- Adheres to vertical and irregular surfaces
- Completely controls odors & VOCs
- Prevents erosion
- Easy to use, no mixing necessary
- Available in black, red, green or brown
- Non-hazardous
- Controls dusting
- Repels water
- No temperature limitations
- More effective than tarps

APPLICATIONS

AC-900 Series foams are the technology of choice when conditions demand superior coverage for periods up to 6 months. Some of the more common uses are:

ODOR AND VOC CONTROL

As a medium for controlling odors and VOCs, AC-900 Series has proven to be very effective with diverse applications.

- Can be left in place or disposed of with soil - will not interfere with thermal or bioremediation process
- Extended odor & VOC control of open excavations or exposed trash
- Extended odor & VOC control of stockpiled soils or debris
- Special odor control problems, such as sewage sludge
- Baled trash cover – the membrane seals the surface completely

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PRODUCT DATA SHEET

LONG DURATION FOAM AC-900 SERIES

FUGITIVE DUST

Exposed soil can often become a dust problem in windy locations, presenting a potential health hazard. Hazardous waste sites, receiving periodic shipments of dusty materials, can prevent windborne dust by immediately applying AC-900 Series foam.

- No need to mobilize equipment to immediately cover with soil or tarps. The Pneumatic Foam Unit can be filled and placed at the site to be used at a moment's notice.
- Extended dust control of stockpiled soils or debris

EROSION CONTROL

Graded areas can be covered with AC-900 Series Membrane reducing erosion damage caused by rain, melting snow or ice and wind.

- On outside slopes of the landfill – prevents trash from being exposed
- On landfill caps - prevents erosion before growth of new vegetation
- Stockpiles

SEALING HIGH PERCOLATION SOILS

Sand and other high percolation soils do not effectively repel rain water or melting snow and ice. Covering areas with AC-900 Series foam dramatically reduces soil permeability.

- Improved run-off from inside surfaces of the landfill
- Reduced leachate generation

WASTE TRANSPORTATION

Trucks or railcars transporting trash, odorous or dusty materials can be quickly covered with AC-900 Series foam to form a complete barrier between emissions and the atmosphere.

- No wind blown losses
- Produces a better visual appearance

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PRODUCT DATA SHEET

LONG DURATION FOAM AC-900 SERIES

METHOD OF APPLICATION

AC-900 Series Long Duration Foam products are supplied in either 450 pound (55 gal.) drums or by bulk load (approximately 46,000 pounds). Bulk shipments can be stored outside in a Rusmar Bulk Storage-Dilution System. The Bulk Storage and Dilution system is comprised of a 7000 gallon heated and stirred chemical storage tank and a microprocessor to accurately transfer the chemical.

AC-900 Series products are designed to be applied with a Rusmar Pneumatic Foam Unit. The Pneumatic Foam Units are available in a variety of sizes to accommodate a range of site conditions and application needs.

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REMEDIATION PRODUCT DATA SHEET

PNEUMATIC FOAM UNIT 1600/40

A completely self-contained and portable foam generating system designed to withstand the rugged demands and harsh elements found at remediation sites. Quick start-up time means that emission control is available when you need it. Recommended for medium to large size remediation projects, dredging operations and hazardous waste sites. Can be towed around site with a back-hoe or other large vehicle. Typically, foam is applied using a hand-line.

System includes air compressor, pump, hoses, nozzles, solution storage tank and proprietary foam generating technology. Unit has freeze protection for outdoor storage year-round.

FEATURES

- Simple to operate
- Durable, rugged construction
- No clean-up necessary
- Can be filled and placed aside until needed

SPECIFICATIONS

Solution Storage Tank	1600 Gallons
Coverage Rate	430 Sq. Ft./Min. @3" depth
Coverage Area	18,000 - 22,000 Sq. Ft.
Size	24' L x 8' W x 8'6" H
Weight	17,000 Pounds
Hose	200 Feet of 1-1/2" Diameter
Products	All Long Duration and Soil Equivalent Foam Products
Freeze Protection System	120V or 230V, 30 amp, single phase

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REMEDIATION PRODUCT DATA SHEET

PNEUMATIC FOAM UNIT 400/25

A completely self-contained and portable foam generating system designed to withstand the rugged demands and harsh elements found at remediation sites. Quick start-up time means that emission control is available when you need it. Recommended for small to medium size remediation projects, dredging operations and hazardous waste sites. Can be towed around site with a pick-up truck. Foam is applied using a hand-line.

System includes air compressor, pump, hoses, nozzles, solution storage tank and proprietary foam generating technology. Unit has freeze protection for outdoor storage year-round.

FEATURES

- Simple to operate
- Durable, rugged construction
- No clean-up necessary
- Can be filled and placed aside until needed

SPECIFICATIONS

Solution Storage Tank	400 Gallons
Coverage Rate	270 Sq. Ft./Min. @ 3" depth
Coverage Area per fill	2,000 - 6,000 Sq. Ft.
Size	16'8" L x 8'6" W x 7'8" H
Dry Weight	6,880 Pounds
Hose	200 Feet of 1-1/2" Diameter
Products	All Long Duration and Soil Equivalent Foam Products
Freeze Protection System	120V or 230V, 30 amp, single phase

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Appendix C of CERP

Noise Monitoring Plan

AECOM Environment

Prepared for:
National Grid

Prepared by:
AECOM
New York, New York
February 2015

Noise Monitoring Plan

(Appendix C of the Community Environmental Response Plan)

Former Rockaway Park Manufactured Gas Plant Site; Bulkhead Area Remedial Action
Rockaway Park, Queens County, New York

Contents

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List of Acronyms

ANSI	American National Standards Institute
CEQR	City Environmental Quality Review Technical Manual
dB	Decibels
DNAPL	Dense Non Aqueous Phase Liquid
EPA	Environmental Protection Agency
Leq	Energy equivalent or energy average sound level
Lmax	“Slow response” maximum sound level
MGP	Manufactured Gas Plant
NYSDEC	New York State Department of Environmental Conservation
Project Site	Bulkhead Area, Bulkhead Area, north of the Site and Beach Channel Drive, between Beach 108th Street and Rockaway Freeway
ROD	Record of Decision
Site	Former Rockaway Park MGP Site
SPL	Sound Pressure Level

1.0 Introduction

This Noise Monitoring Plan has been prepared to provide a summary of noise monitoring activities that will be implemented to monitor potential noise impacts resulting from the remedial construction activities at the former Rockaway Park Manufactured Gas Plant (MGP) site (Site) - Bulkhead Area (project site) located in Rockaway Park, Queens County, New York. The Noise Monitoring Plan identifies the relevant criteria, the proposed monitoring locations, and the mitigation procedures for responding to observed exceedances of the noise thresholds. The remedial activities will be implemented according to the New York State Department of Environmental Conservation (NYSDEC) Record of Decision (ROD) to address the residuals left behind from the former MGP operations.

The Noise Monitoring Plan is an “evergreen document” and is intended to be a framework within which noise levels from the excavation and sheet piling activities are documented and recorded. Any changes to the proposed remedial construction activities and the proposed construction phases will be updated in a revised Noise Monitoring Plan as necessary. Evaluations of the noise monitoring program and requirements by the Engineer should be completed periodically to determine if more or less monitoring is required.

This Noise Monitoring Plan does not preclude the use of other mitigation technologies or techniques designated in other design documents.

1.1 Noise Basics

Noise can be defined as unwanted sound. Sound is generated by pressure waves in air. Sound pressure level (SPL) is used to measure the intensity of sound, which is described in terms of decibels. The decibel (dB) is a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level. Sound pressure waves may be of various frequencies. The human ear responds only to a limited range of frequencies. When measuring noise levels, frequencies to which the human ear does not respond must be filtered out. The procedure referred to as “A-scale” weighting best approximates the frequency response of the human ear. Sound levels measured on the A scale are designated by the term dBA.

A number of noise descriptors are used to characterize various aspects of noise that take into account the variability of noise levels over time. Common descriptors, criteria, and guidelines used to characterize noise are discussed below.

1.1.1 **A-Weighting (dBA)**

Noise measurements are most often taken using the "A-weighted" frequency response function. The A-weighted frequency or dBA scale simulates the response of the human ear to sound levels (particularly low-level sound) and has been given prominence as a means for estimating annoyance caused by noise; for estimating the magnitude of noise-induced hearing damage; for use in hearing conservation criteria; for speech interference measurements; and in procedures for estimating community reaction to (general broadband) noise (Clayton, 1978; Cheremisinoff, 1977). Figure 1 gives typical A-weighted sound levels for various noise sources and the typical reactions to these levels (Advanced Engineering Acoustics, 2010). All sound levels referred to in this document are A-weighted, slow response, sound pressure levels.

The two acoustical metrics most frequently used to provide a single number sound level for time-varying sounds over a given time period are the energy equivalent or energy average sound level (L_{eq}) and the "slow response" maximum sound level (L_{max}).

1.1.2 Equivalent Sound Level (Leq)

The equivalent sound level (L_{eq}) is the value of a steady-state sound which has the same A-weighted sound energy as that contained in the time-varying sound. The L_{eq} is a single sound level value for a desired duration which includes all of the time-varying sound energy during the measurement period. The U.S. Environmental Protection Agency (EPA) has selected the L_{eq} as the best environmental noise descriptor primarily because it correlates reasonably well with the effects of noise on people, even for wide variations of environmental sound levels and different time exposure patterns.

The long-term A-weighted energy average sound level, called the 24-hour equivalent sound level, $L_{eq}(24h)$, is the logarithmic average of the individual 24 hourly equivalent sound levels, $L_{eq}(hi)$. Since it has been found that noise is more disturbing in the evening and nighttime when the ambient noise is generally quieter, modifications to the 24-hour L_{eq} have been adopted. The Day-Night sound level (DNL or L_{dn}) is a 24-hour energy average noise level based on the daytime and nighttime hourly average $L_{eq}(h)$ noise levels, with a 10 dB penalty added to each hourly nighttime average noise level.

1.1.3 Maximum Sound Level (Lmax)

The L_{max} is the maximum measured sound level at any instant in time. New York City Local Law No.113 identifies L_{max} as the noise metric to determine whether ambient noise levels are detrimental to life, health and enjoyment to a sensitive property.

1.1.4 Statistical Descriptors

Statistical sound level descriptors such as L10, L50, and L90 are used to represent noise levels that are exceeded, 10, 50, and 90 percent of the time, respectively. L50, the SPL exceeded 50 percent of the time, provides an indication of the median sound level. L90 represents the residual level, or the background noise level, without intrusive noises. The L10 is the sound level that is exceeded 10 percent of the time for a specified monitoring period.

1.2 Noise from Typical Construction Equipment and Operations

The equivalent sound level (L_{eq}) as it relates to construction activity depends on several factors including machine power, the manner of operation and the amount of time the equipment is operated over a given time period. The following provides information on typical levels generated by various construction equipment and provides guidance on determining the noise from construction activities.

The most dominant source of noise for the majority of construction equipment is the engine exhaust. However, for some construction work, such as impact pile driving or pavement breaking, the noise produced by the work process is the dominant source. Similar construction activities can create different noise impacts, depending on the location of the construction site, the terrain, and other intervening features and the type of receptor populations in the vicinity of the construction site.

For most construction activities, different construction equipment operate in one of two modes, *stationary* and *mobile*. *Stationary* equipment are those that operate in one small area for one or more days at a time, with either a steady power cycle operation (e.g., pumps, generators, compressors, etc.) or a periodic impulsive operation (e.g., pile drivers, pavement breakers, etc.). *Mobile* equipment

are those that frequently move around a much larger area of the construction site with power applied in a rapidly changing, non-steady fashion (e.g., bulldozers, loaders, etc.), or move to and from the construction site (e.g., haul trucks, material trucks, etc.). These variations in operating power and location add a great deal of complexity in characterizing the source noise level of a given piece of construction equipment. This complexity can be simplified by determining the equipment noise level at a 50-foot reference distance from the equipment operating at full power and adjusting its full power noise level according to the duty cycle or "usage factor" of the particular construction activity and project phase to determine the characteristic noise level of the operation during each phase.

The New York City Local Law on Citywide Construction Noise Mitigation rule provides typical construction equipment noise reference levels measured in terms of L_{max} at 50 feet distance for those with potential to be used during the construction, and they are shown in Table 1-1.

Society of Automotive Engineers has developed standardized procedures for measuring reference noise levels for the certification of mobile and stationary construction equipment. For informational purposes, typical 50-foot reference noise levels from representative pieces of construction equipment are listed in Appendix A.

Construction activity noise is characterized by the combined duty cycle and resulting noise emission of each piece of equipment. The duty cycle is expressed in terms of the "usage factor" of the equipment, which is the percentage of time during the work period that the equipment is operating under load or at near full power. Typical equipment "usage factor" is shown in Table 1-1.

In addition to the minute-by-minute variations in noise producing activities, construction projects are carried out in several different phases. Each phase has a different equipment mix depending on the work to be accomplished. Some have more continuous noise, while others may have more impact type noise. Typical construction equipment noise levels are given in Appendix A. Construction phase equipment usage factors, combined with receptor distances and equipment noise emissions, can be used in estimating future project noise (See Section 3).

1.3 Receptors

A background noise survey will be conducted prior to mobilization of construction equipment. If an access agreement is already in place, the noise monitoring points will be placed as close as practicable to the receptor property. For properties where an access agreement has not been negotiated, the noise monitoring points will be placed near the property line of the potentially affected property. The following properties are located near the site and will be monitored for any noise impacts resulting from construction activities:

- Residences south of Rockaway Freeway
- Businesses/substation to the West of Site

Table 1-1 Equipment 50 Feet Emission Reference Levels and Usage Factors

Equipment	Noise Level (L_{max}) dBA at 50 feet	Usage Factor (%)
Auger Drill Rig	85	20
Backhoe	80	40
Blasting	94	n/a
Chain Saw	85	20
Clam Shovel (dropping) Trucks	93	20
Air Compressor	80	40
Concrete Saw	90	20
Crane	85	16
Dozer	85	40
Dump Truck	84	40
Front End Loader	80	40
Excavator	85	40
Generator	82	50
Impact Pile Driver	95	20
Jackhammer	85	20
Hoe Ram	90	20
Pump	77	50
Rock Drill	85	20
Roller	85	20
Slurry Trenching Machine	82	50
Soil Mix Drill Rig	80	50
Tractor	84	40
Vibratory Pile Driver	95	20

2.0 Noise Monitoring

The remedial activities will include sheet pile installation, using heavy equipment, hammering activity, subsurface structure demolition, excavation and backfilling, and truck transportation. Noise monitoring will be required for these activities and may be required for other activities as well.

Noise monitoring will be conducted in coordination with the remediation Contractor. The remediation Contractor shall provide the proposed construction sequence to the Construction Manager a minimum of 2 weeks prior to mobilization to allow mobilization for noise monitoring. The remediation Contractor shall provide a minimum of 48-hour notice to the Construction Manager before they mobilize. The Contractor shall provide a minimum of 24-hour notice to the Construction Manager before the Contractor begins any demolition or hammering activities. The Construction Manager shall coordinate placement of the noise monitoring equipment with the remediation Contractor.

Monitoring equipment proposed for the construction noise measurements shall be in compliance with or exceed the criteria for a Type 1 or Type 2 instrument in accordance with the American National Standards Institute (ANSI), S1.4. The sound level meters to be used are capable of collecting a wide range of measurements, taking several measurements simultaneously and automatically storing data at the end of a pre-set time period.

2.1 Noise Monitoring

The planned remedial construction activities will be performed so as to limit the potential for adverse impacts due to noise. The installation of sheet piles and demolition activities might increase noise levels above background conditions.

Noise monitoring will be conducted at the site entrance on Beach Channel Drive as shown in Figure 2:

The number and locations of monitoring points may be adjusted as the field work progresses to obtain the most representative data in proximity to sensitive receptors. Monitors may be re-located based on site activity, field logistics, and access to adjacent properties.

At each location, the noise levels from the construction equipment and truck passbys will be measured during each construction phases. The following construction phases are currently proposed as part of the remedial activity:

- Equipment mobilization;
- Above ground demolition and hammering activities;
- Subsurface structure demolition activities, soil drilling, trenching, and soil excavation;
- Pile driving and installation of subsurface containment barrier

2.1.1 Pre-construction Noise Survey

Given the urban setting around the project site, it is anticipated that the ambient L_{eq} and L_{max} levels are relatively high. In order to establish and identify the construction-generated noise component in

ambient noise during construction period, it is important to conduct a pre-construction noise survey at selected monitoring sites through which appropriate warning thresholds can be reasonably established during the construction period monitoring.

A pre-construction noise survey will be undertaken prior to the initiation of any activity at the project site. The objective of the noise survey will be to establish baseline ambient noise condition caused by vehicular traffic (buses, cars, trucks, and other noise sources) near the sensitive properties selected surrounding the project site. These noise levels will be compared to noise induced during construction and may be used to revise noise warning threshold.

2.1.2 Construction Period Noise Monitoring

Noise monitoring will be conducted based on ANSI standard established requirement including instrumentation, calibration, and ambient weather condition including wind, temperature range, rain condition, etc. Specific monitoring procedures will follow detail steps described in the City Environmental Quality Review Technical Manual (CEQR).

During monitoring, the following procedures will be followed:

- The sound level meter shall be calibrated using an acoustic calibrator, according to the manufacturer's specifications, just before each measurement.
- Noise measurements will be performed using the A-weighting network and the "slow" response of the sound level meter but “fast” response can be used for impulsive noise if applicable.
- The microphone will be fitted with a windscreen.
- The noise monitoring will be measured at approximately four to five feet above the ground surface.
- Monitoring will be performed at least three to four feet away from the nearest acoustically-reflective surface (i.e., fences, buildings, body of the person performing the measurements).
- Noise level measurements will be continuously taken during the daytime during sheet pile installation and excavation activities.
- If, in the estimation of the person performing the measurements, non-project related noise sources contribute significantly to the measured noise level, additional measurements (with the same non-project noise source contributions) shall be repeated when project construction is inactive to determine the non-project ambient background noise level.
- L_{eq} and L_{max} noise measurements will be computed.
- Noise measurements will be performed during the construction activity that has the greatest noise potential.
- Noise measurement data will be stored electronically and summarized with notice upon request (i.e., tables, plotted graphically, etc.) and will also be compared with the baseline survey data.
- Construction activities observed during noise monitoring will be noted.

Noise monitoring equipment will be operated, maintained, and calibrated in accordance with the manufacturer’s instructions and the established quality assurance procedures. Noise monitoring equipment will be checked daily for proper operation. Field validation logs will be maintained on-site.

3.0 Noise Thresholds

3.1 Noise Standards

3.1.1 New York City Code

Construction noise is regulated by the New York City Noise Control Code and by the EPA noise emission standards for construction equipment. New York City has established an enforceable noise code as amended in 2005 and currently effective (as of July 1, 2007).

New York City adopted Title 24 Chapter 2 as the New York City Noise Control Code. Subchapter 1 Section 24-202 of the administrative code of the City of New York was amended by Local Law No. 22 for the year 2002. Subchapter 2 Sections 24-204, 24-205, 24-206, and 24-207 and Subchapter 3 Section 24-218 of the administrative code of the City of New York were amended by Local Law No. 18 for the year 1993. Subchapters 4, 5, and 6 of Chapter 2 of Title 24 of the code were repealed and new Subchapters 4, 5, and 6 were added as amended by Local Law No. 113 for the year 2005 (effective July 1, 2007).

In addition to the Local Laws of the City of New York, the Rules of the City of New York have been amended with the addition of new construction noise rules, written in coordination with the new noise code and are effective as of July 1, 2007. Title 15 of the Rules of the City of New York has been amended by adding a new Chapter 28, "Citywide Construction Noise Mitigation," which establishes a unique noise mitigation plan for each construction site in order to have less noise impact on the surrounding environment. It should be noted that this plan does not meet all the requirements of this rule and will require an additional supplemented mitigation plan specific to the project site and equipment mobilized for use at the project site. The Contractor will be required to comply with all Local Laws and Rules of the City of New York.

Construction noise is usually temporary and of relatively short duration. The local requirements mandate that certain classifications of construction equipment and motor vehicles meet specified noise emissions standards. Also, except for special circumstances, construction is limited to Monday through Friday between the hours of 7 AM to 6 PM. Construction material shall be handled and transported so as to not create an unreasonable noise as defined in Subchapter 5 Section 24-229. Section 24-228 in Subchapter 5 (Prohibited Noise-Specific Noise Sources-Sound Level Standard) states that construction, exhausts, and other devices shall not create an unreasonable noise, defining unreasonable noise as sound attributable to the source or sources that exceeds 85 dB(A) as measured 50 or more feet from the source or sources on a public right-of-way.

Subchapter 4 "Construction Noise Management" of Title 24 of the New York City noise code imposes noise mitigation rules and requires a Noise Mitigation Plan for specific devices or activities (i.e., air compressors, pile drivers, cranes, etc.). The provisions of this code, including specific details and requirements, are discussed in Section 24-220 "Noise Mitigation Plan" of the New York City Noise Code and Title 15 Chapter 28 "Citywide Construction Noise Mitigation" of the rules of the City of New York.

According to the local law restricting short-term construction noise, the following two measures will be monitored during construction period:

- On-site equipment noise will not exceed 85 dBA at any receiving properties.
- Impulsive noise level, if applicable, will not exceed ambient level greater than 15 dBA.

3.1.2 New York State

The NYSDEC has published a policy and guidance document titled Assessing and Mitigating Noise Impacts (NYSDEC, 2000). This document provides guidance on when noise due to projects has the potential for adverse impacts and requires review and possible mitigation in the absence of local regulations. The NYSDEC guidance indicates that local noise ordinances or regulations are not superseded by the NYSDEC guidance. The guidance contains a table identifying expected human reaction to various increases in sound pressure levels. The contents of that table are presented as Table 3-1 below. The New York State guidance indicates that a noise increase of 10 dBA at a residential property boundary deserves consideration of avoidance and mitigation measures in most cases. These guidelines are intended for permanent noise sources and do not apply to temporary noise sources such as construction work; however, these guidelines can be used as reference for the perception of noise.

Table 3-1 Human Reaction to Increases in Sound Pressure Level

Increase in Sound Pressure (dBA)	Human Reaction
Under 5	Unnoticed to Tolerable
5 – 10	Intrusive
10 – 15	Very Noticeable
15 – 20	Objectionable
Over 20	Very Objectionable to Intolerable

Source: New York State Department of Environmental Conservation Program Policy: Assessing and Mitigating Noise Impacts, 2001.

3.2 Noise Threshold Limits

Three “action” noise threshold levels will be used to evaluate the potential for noise level exceedance near the sensitive receptors (Table 3-2). Monitoring to assess the threshold noise levels will be the L_{eq}, measured/evaluated outdoors between sensitive receptors and the construction activity at the project site using a 10 minute average recording. Placement of monitors near sensitive receptors will provide data on noise levels in these areas. Measured sound levels based on a monitored 10-minute average will be compared to the action levels to be finalized after the pre-construction noise survey is completed. The Stop Work Action Level will be anticipated to follow the Local Law-established 85 dBA threshold. However, whether this level is reasonable will be further evaluated after the pre-construction noise survey is completed. At the same time, if any impact equipment operation (e.g., sheet pile, hoe ram) is required, impulsive impact will be monitored as well to determine whether the city noise code-defined threshold is exceeded.

Table 3-2 Preliminary Noise Threshold Levels

Monitoring Action Level	Warning Action Level	Stop Work Action Level
80	85	90

3.3 Anticipated Noise Levels

For reference purposes, a quantitative assessment of the noise levels from the project site construction activities may be completed. The recommended procedure for estimating noise levels from construction activities is as follows:

Calculate each phase's Lmax according to the following method:

L_{max} [equipment type] = ML – 20 $\log_{10}$ (D/50)

Where:

ML = Typical single equipment maximum noise level (L_{max}) at 50 feet, in dBA.

D = Distance from the equipment to the noise-sensitive location, in feet.

Repeat the above calculation for each item of potentially noisy equipment. Then, select the noisiest individual pieces of equipment that operate in their loudest mode at the very same time and combine them logarithmically to estimate the overall maximum construction noise level (L_{max}) at the noise-sensitive location(s) for each project phase, as follows:

L_{max} [overall project at receptor] = 10 $\log_{10}$($\Sigma 10^{(L_{max}\text{[equipment type]}/10)}$)

Calculate each phase's one-hour L_{eq} according to the method recommended by the U.S. Federal Highway Administration (U.S. Department of Transportation, 1977), as follows:

First, the construction phase's one-hour L_{eq} is to be calculated at the sensitive receptor location for each item of potentially noisy equipment using the following equation:

L_{eq}(h) [equipment type] = ML – 20 $\log_{10}$ (D/50) + 10 $\log_{10}$ (N x HP/100)

Where:

ML = Typical single equipment maximum noise level (L_{max}) at 50 feet, in dBA.

D = Shortest distance (feet) from the equipment type to the nearest noise-sensitive location, or if a more sensitive receptor is further away, to the noise-sensitive receptor with the greatest impact.

N = Maximum number of the same equipment type operating hourly on the project during the construction phase.

HP = "Hourly percentage," expressed as the greatest nominal percent of time that the equipment is operated under load at the project site. This factor is based on EPA values or is

estimated based on past experience with similar projects. Thus, the effective usage factor is (EUF) = N x HP/100.

Repeat the above calculations for each item of potentially noisy equipment. Then, the individual contributions of every item of equipment are to be combined logarithmically to obtain the overall construction hourly L_{eq} at the noise-sensitive location(s) for each project phase, as follows:

$$\mathbf{L_{eq}(h)\ [overall\ project\ at\ receptor] = 10\ log_{10}\ (\Sigma 10^{\ (one\text{-}hour\ L_{eq}\ [equipment\ type]\ /\ 10\ )})}$$

The calculated L_{max} and $L_{eq}(h)$ levels can then be compared with the construction noise threshold criteria. Where it is estimated that the criteria would be exceeded, noise mitigation planning can be undertaken.

4.0 Exceedance and Mitigation

Notwithstanding the specific noise levels specified herein, noise mitigation measures listed below will be utilized to minimize, to the greatest extent feasible, the noise levels near the project site:

- Develop and implement a noise monitoring program in order to quantify noise levels at nearby sensitive receptors during construction (this document);
- Inform people living and working in the vicinity about construction method, possible effects, quality control measures, precautions to be used, and channels of communication available to them;
- Route truck traffic and heavy equipment to avoid impacts to sensitive receptors;
- Operate earth-moving equipment on the site as far away from noise-sensitive sites as possible;
- Select demolition methods not involving impact, where possible;
- Minimize the use of impact devices, such as jackhammers, pavement breakers, and hoe rams. Where possible, use concrete crushers or pavement saws rather than hoe rams for tasks such as concrete structure removal;
- Provide impact noise producing equipment, i.e. jackhammers and pavement breaker(s), with noise attenuating shields, shrouds, portable barriers, or enclosures to reduce operating noise;
- Avoid, to the extent possible, use of vibratory rollers and packers near sensitive areas;
- Schedule work to limit weekend and nighttime work;
- Utilize OSHA-compliant quieter-type manually adjustable backup alarms set to their low level;
- Utilize shields, impervious fences, or other physical barriers to inhibit transmission of noise;
- Utilize sound retardant housings or enclosures around noise producing equipment;
- Utilize effective intake and exhaust mufflers on internal combustion engines and compressors;
- Avoid, to the extent possible, the use of pneumatic or gasoline driven saws;
- Disarm all back-up alarms at 8:00 p.m. and do not reactivate until 7:00 a.m. on weekdays and 9:00 a.m. on weekends and local holidays. Signal persons and strobe lights must be used during periods when the back-up alarms are disarmed;
- Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum;
- Route construction equipment and other vehicles carrying spoil, concrete, or other materials over streets and routes that will cause the least disturbance to residents in the vicinity of the activity;
- Maximize physical separation, as far as practicable, between noise generators and noise receptors. Separation includes following measures:

  - Provide enclosures for stationary items of equipment and noise barriers around particularly noisy areas at the project site; and
  - Locate stationary equipment to minimize noise impacts on community.
- Minimize the duration of any high noise activities.

The following procedures are recommended if a measured level exceeds the damage thresholds.

4.1 Noise Mitigation

The mitigation approaches selected for use at the site consist of a combination of methods which will be implemented on a tiered approach. Three primary tiers will be implemented, as necessary, to mitigate noise associated with construction activities. A description of these measures, including applicability and implementability, is presented below and detailed in Appendix B.

4.1.1 Tier 1- Mitigation Measures for General Site Construction

Initial (Tier 1) mitigation measures will be implemented from the start of construction activities to address site-related construction noise levels. Tier 1 includes general mitigation measures for construction operations as listed below and as outlined in Title 15 Chapter 28 of the rules of the City of New York (NYCDEP 28-100 through 28-109).

A complete and accurate general construction noise mitigation plan, in accordance with Title 15 Chapter 28 of the Rules of the City of New York, “Citywide Construction Noise Mitigation”, will be completed by the Contractor and conspicuously posted (NYCDEP 28-100). This Noise Mitigation Plan focuses on noise related to construction activities, but does not address the full requirements of the Rules of the City of New York. It is the responsibility of the Contractor to provide a project site and equipment specific mitigation plan in accordance with the Title 15 Chapter 28 of the Rules of the City of New York, “Citywide Construction Noise Mitigation,” which establishes a unique noise mitigation plan for each construction site in order to have less noise impact on the surrounding environment.

Additionally, construction noise mitigation measures, in accordance with Title 15 Chapter 28 of the rules of the City of New York, will be followed. These required noise mitigation measures for general construction, as per the NYC Noise Code (NYCDEP 28- 101), will include, but not be limited to:

a. *The Contractor will self-certify in its construction noise mitigation plan that all construction tools and equipment have been maintained so that they operate at normal manufacturer’s operating specifications, including at peak loading.*
b. *All construction equipment being operated on site must be equipped with the appropriate manufacturer’s noise reduction device.*
c. *The Contractor shall mitigate noise from construction devices with internal combustion engines by ensuring that the engine’s housing doors are kept closed and by using noise-insulating material mounted on the engine housing that does not interfere with the manufacturer’s guidelines for engine operation or exhaust.*
d. *Portable compressors, generators, pumps, and other such devices shall be covered with noise-insulating fabric to the maximum extent possible that does not interfere with the manufacturer’s guidelines for engine operation or exhaust.*
e. *Vehicle engine idling on site shall be prevented.*

f. Quieter back-up alarms shall be used in pre-2008 model year vehicles when practicable for the job site.

g. The Contractor shall create and utilize a noise mitigation training program, which shall be implemented for all field-worker supervisory personnel including sub-Contractor supervisors.

h. Construction activities may take place during the hours of 7:00 AM to 7:00 PM on weekdays or as specified in the contract documents.

Most modern construction equipment is equipped with engine noise control devices (e.g., exhaust mufflers and acoustic casing enclosures) in accordance with Federal and State regulations. In addition to proper maintenance and operation of construction machinery, several means of controlling construction noise impacts will be employed as needed, and as may be practical, including:

- Operate earthmoving equipment on the project site as far away from noise-sensitive receptors as possible
- Avoid nighttime activity - operate equipment during daylight hours to limit any potential disturbance during the nighttime (sleep interference) periods, to the extent possible, in accordance with the local Noise Ordinance

4.1.2 Tier 2- Mitigation Measures for Site-Specific Construction Activities

Tier 2 mitigation measures include modifications to standard construction operation practices based on specific work activities to be conducted at the project site. Tier 2 mitigation measures include:

4.1.2.1 Construction Activities

The first consideration in the plan is to enforce an operational schedule for running construction equipment to make sure the noise from construction activities would occur in fewer noise-sensitive hours, particularly those during the morning, within which the only noise complaint occurred in the neighborhood.

4.1.2.2 Fence – Height

The height of the fence may be to deflect some of the noise leaving the project site. The construction fence height shall be approximately 11 ft.

4.1.2.3 Fence – Acoustic Insulation

An acoustical insulation material will be attached to the inside of any construction-related fencing, or supports (i.e., Jersey Barriers with fence-posts) that may be installed around the work area or can be attached to the inside of the chain link fence that runs along the site as detailed in the contract documents. This mitigation method may serve to suppress ground level noise generation and may decrease the potential noise levels (and visual impact) to pedestrian foot traffic. The insulation can be BBC-13-2" Acoustical material (or equivalent) that consists of a combination of 2" thick vinyl-faced Quilted Fiberglass Sound Absorber and reinforced loaded vinyl noise barrier (1.5 pounds per square foot) that are bonded together. The installed insulation can extend from the top of the fence to the ground. Seams and joints would overlap approximately 2 inches and self-seal with Velcro strips. The insulation material has grommets installed which are used to fasten the curtain material to the fence.

4.1.3 Tier 3- Focused Response Measures

Tier 3 mitigation includes the identification of focused measures to address localized community feedback on a case-by-case basis. The objective of this approach is to address the concerns of individual community members with mitigation measures specific to their concern and/or circumstance. Tier 3 Measures are intended to be flexible in their implementation and will require direct discussions with individual community members. Some examples of potential Tier 3 Measures include:

4.1.3.1 Focused Inspections/Monitoring

Supplemental monitoring may be conducted immediately adjacent to the receptor properties as well as other properties based on community feedback and/or comparison to prescribed action levels.

4.1.3.2 Interior/Exterior Treatments

Treatments may include the placement of flexible coverings or acoustic materials on interior/exterior openings, windows and/or portions of the walls of businesses or residential dwellings in close proximity to construction activities. Treatment options will likely require additional property access and the cooperation of the affected building owners and/or residents.

4.1.3.3 Temporary Sound Barriers

Small-scale moveable and/or fixed barriers can be erected at locations along the project site perimeter. These barriers, which may be located on public rights-of-way, would be relatively low-profile and consist of sound attenuating material affixed to stationary or moveable platforms or stands. The exact construction and location of these barriers will be dependent on the presence of the aboveground obstructions (and overhead utilities), the existence of viable access points, the nature of the building or use in question, and the results of any focused monitoring.

Appendix B contains a detailed list of possible mitigation measures that can be employed.

4.2 Mitigation Protocol

Detailed review and interpretation of all noise data will be made in order to determine whether construction activities have resulted in an action limit.

In the event that a "Warning Action Level" is reached:

- The Contractor must meet with the Project Team to discuss the need for mitigation actions;
- The Engineer will develop the Tier 2 Mitigation Protocol and prepare a plan of action for the activity or activities responsible for the exceedance;
- If directed by the Engineer or the Construction Manager, the Contractor must implement the plan of action within 24 hours of submittal of the plan of action so that the "Stop Work Action Level" is not reached; and
- The monitoring frequency of the affected instrument will be increased and additional instruments installed if necessary.

In the event that a "Stop Work Action Level" is reached:

- The Contractor must meet with the Project Team to discuss the need for mitigation actions;
- The Engineer will develop the Tier 3 Mitigation Protocol and prepare a plan of action for the activity or activities responsible for the exceedance;
- If directed by the Engineer or the Construction Manager, the Contractor must implement the plan of action within 12 hours of submittal of the plan of action so that the "Stop Work Action Level" is not exceeded further; and
- The Contractor must install additional instrumentation if necessary.

The definition of the required action that must be taken should any instrument achieve an action limit is defined in Table 4-1 below:

Table 4-1 Required Action for "Warning Action Limit" or "Stop Work Action Limit"

Action Limit	Required Action
Warning Action Level	The value of the noise instrumentation reading at which the Engineer and Contractor jointly assess the necessity of either or all of the following: • Evaluate the activity responsible for the exceedance • Install acoustic insulation if necessary • Alter the method of excavation or construction • Alter the rate of excavation or construction • Alter the sequence of excavation or construction • Change excavation or construction machinery • Increase frequency of monitoring of affected instrument
Stop Work Action Limit	The value of the noise instrumentation reading at which the Engineer and Contractor jointly assess the necessity of either or all of the following: • Cease excavation or construction operations • Make site and affected properties secure Take necessary predetermined measures to mitigate movements and assure the safety of the public and the WorkThe Stop Work Action Level for each instrument represents the absolute maximum noise level.

Work procedures will be evaluated and modified to prevent further exceedance of the monitoring criteria. All work activities will only proceed at the discretion of the Engineer and after the source of the exceedance has been determined and corrected.

5.0 References

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Figures

Figure 1-1 Typical Sound Levels of Noise Sources and Expected Reactions

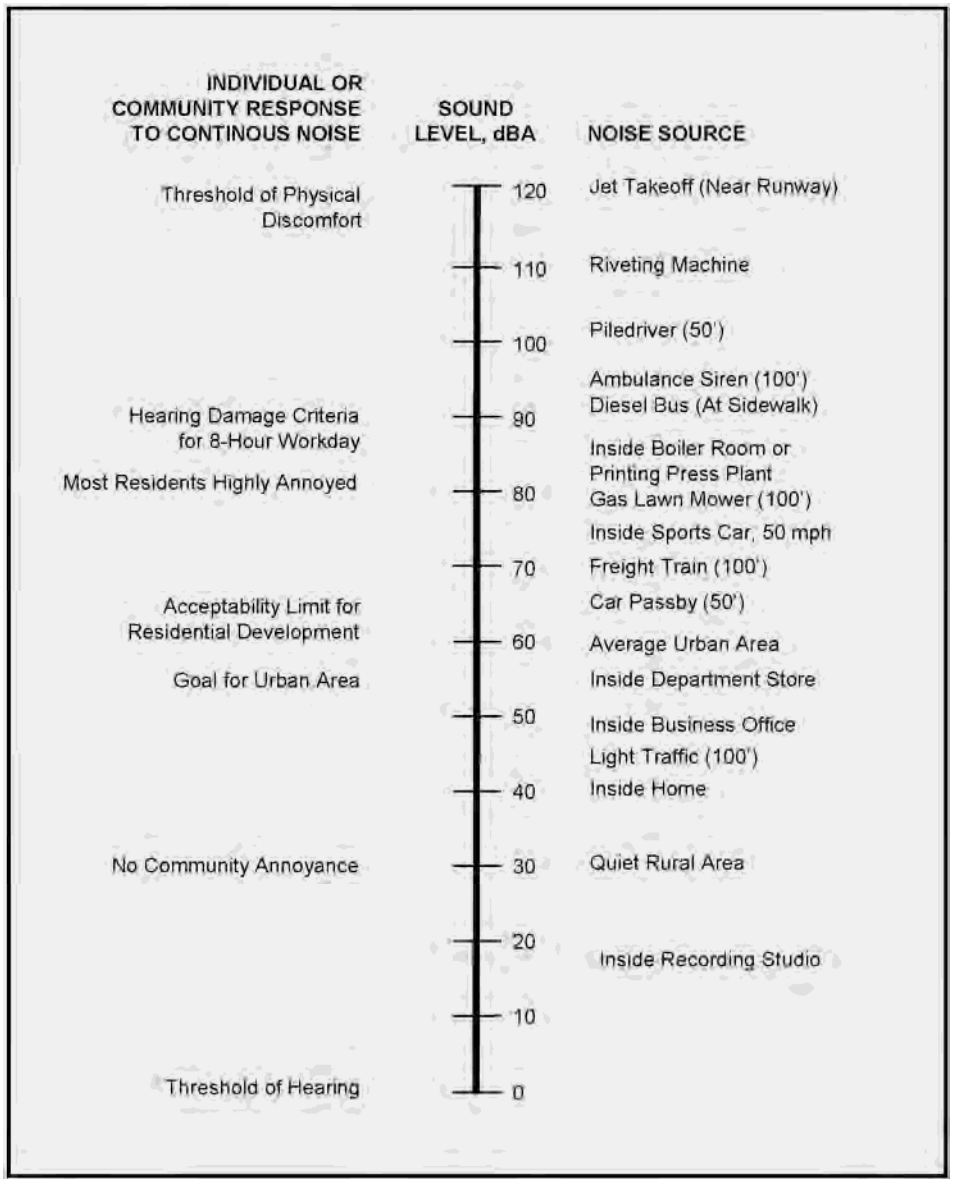

Figure 2-1 Approximate Noise Monitoring Locations

Appendices

Appendix A

Typical Construction Equipment Noise Levels

Appendix A

Typical Equipment Noise, Construction Phases and Use Factors

Figure A-1. Typical Construction Equipment Noise

Equipment Type Noise Source	Dominant Noise Components[1]	50-Foot Noise Level (L_{eq}) dBA[2, 3]	Noise Level Range (L_p) dBA[2, 3]	50-Foot Maximum Noise Level (L_{max}) dBA[2 3]
Air Compressor (portable)[4]	E, C, H, I	81	76-89	89
Air Compressor (stationary)	E, C, H, I	82	76-89	89
Auger, Drilled Shaft Rig	E, C, F, I, W	82	76-89	89
Backhoe	E, C, F, I, H, W	85	81-90	90
Bar Bender	E, P, W	82	78-88	85
Chain Saw	E, W, C	85	72-88	88
Compactor	E, C, F, I, W	82	81-85	85
Concrete Batch Plant	W, E, C	92	80-96	96
Concrete Mixer (small trailer)	W, E, C	67	65-68	68
Concrete Mixer Truck	E, C, F, W, T	85	69-89	89
Concrete Pump Trailer	E, C, H	82	74-84	84
Concrete Vibrator	W, E, C	76	68-81	81
Crane, Derrick	E, C, F, I, T	88	79-90	90
Crane, Mobile	E, C, F, I, T	83	80-85	85
Dozer (Bulldozer)	E, C, F, I, H	80	77-90	90
Excavator	E, C, F, I, H, W	87	83-92	92
Forklift	E, C, I, W	84	81-86	86
Front End Loader	E, C, F, I, H	79	77-90	90
Generator	E, C	78	71-87	87
Gradall	E, C, F, I, W	82	78-85	85
Grader	E, C, F, I, W	85	79-89	89
Grinder	W	80	75-82	82
Hydraulic Hammer	W, E, C, H	102	99-105	105
Impact Wrench	W, P	85	75-85	85
Jack Hammer	P, W, E, C	82	75-88	88
Paver	E, D, F, I	89	82-92	92
Pile Driver (Impact/ Sonic/ Hydraulic)	W, P, E	101 / 96 / 65	94-107 / 90-99 / 65	107 / 99 / 65
Pavement Breaker	W, E, P	82	75-85	85
Pneumatic Tool	P, W, E, C	85	78-88	88
Pump	E, C	76	68-80	80
Rock Drill	W, E, P	98	83-99	99
Roller	E, C, F, I, W	74	70-83	83
Sand Blaster	W, E, C, H, I	85	80-87	87
Saw, Electric	W	78	59-80	80
Scraper	E, C, F, I, W	88	82-91	91
Shovel	E, C, F, I, W	82	77-90	90
Tamper	W, E, C	86	85-88	88
Tractor	E, C, F, I, W	82	77-90	90
Trencher		83	81-85	85
Trucks (Under Load)	E, C, F, I, T	88	81-95	95
Water Truck	W, E, C, F, I, T	90	89-94	94
Other Equipment with Diesel	E, C, F, I	82	75-88	88

Note 1. Ranked noisy components. C=Casing, E=Exhaust, F=Fan, H=Hydraulics, I=Intake air, P=Pneumatic exhaust, T=Transmission, W=Work tool.
Note 2. Table based on EPA studies and measured data from various construction equipment and manufacturer's data.
Note 3. Equipment noise levels are at 50 feet from individual construction equipment and with no other noise contributors.
Note 4. Portable air compressor rated at 75 cfm or greater and operating at greater than 50 psi.

Figure A-2
Typical Domestic Housing Construction Equipment and Use Factors

Equipment Item	50-Foot Leq, dBA	Mitigated1 Leq, dBA	Highest Hourly Use Percentage per Construction Phase				
			Clear	Excavate	Base	Build	Finish
Air Compressor	81	75	--2	10	--	--	25
Backhoe	85	75	2	4	--	--	2
Concrete Mixer	85	75	--	--	4	8	16
Concrete Pump	82	75	--	--	--	--	--
Concrete Vibrator	76	75	--	--	--	--	--
Crane, Derrick	88	75	--	--	--	--	--
Crane, Mobile	83	75	--	--	--	10	4
Dozer	80	75	4	8	--	--	4
Generator	78	75	4	--	--	--	--
Grader	85	75	5	--	--	--	2
Jack Hammer	82	75	--	--	--	--	3
Loader	79	75	4	8	--	--	4
Paver	89	80	--	--	--	--	3
Pile Driver	101	95	--	--	--	--	--
Pneumatic Tool	85	80	--	--	4	10	4
Pump	76	75	--	4	7	--	--
Rock Drill	98	80	--	1	--	--	0.5
Roller	74	74	--	--	--	--	4
Saw, Electric	78	75	--	--	4 (2) 3	10 (2)	4 (2)
Scraper	88	80	5	--	--	--	1
Shovel	82	75	--	2	--	--	--
Truck	88	75	16	40	--	--	16

Note 1. Estimated level obtainable by quieter methods or equipment and implementing feasible noise controls.
Note 2. "--" indicates typically zero or very little use during construction phase.
Note 3: Numbers in parentheses are greatest multiple number of same items in use.

Figure A-3
Typical Large Building and Institutional Construction Equipment and Use Factors

Construction Equipment	50-Foot Leq, dBA	Mitigated1 Leq, dBA	Highest Hourly Use Percentage per Construction Phase				
			Clear	Excavate	Base	Build	Finish
Air Compressor	81	75	--2	100 (2) 3	100 (2)	100 (2)	40 (2)
Backhoe	85	75	04	16	--	--	4
Concrete Mixer	85	75	--	--	40	40	16
Concrete Pump	82	75	--	--	40	8	8
Concrete Vibrator	76	75	--	--	40	10	4
Crane, Derrick	88	75	--	--	--	16	4
Crane, Mobile	83	75	--	--	--	16 (2)	4 (2)
Dozer	80	75	16	40	--	--	16
Generator	78	75	40 (2)	100 (2)	--	--	--
Grader	85	75	8	--	--	--	2
Jack Hammer	82	75	--	10	4	4	4
Loader	79	75	16	40	--	--	16
Paver	89	80	--	--	--	--	10
Pile Driver	101	95	--	--	4	--	--
Pneumatic Tool	85	80	--	--	4	16 (2)	4 (2)
Pump	76	75	--	100 (2)	100 (2)	40	--
Rock Drill	98	80	--	4	--	--	0.5
Roller	74	74	--	--	--	--	--
Saw, Electric	78	75	--	--	4 (3)	100 (3)	--
Scraper	88	80	55	--	--	--	--
Shovel	82	75	--	40	--	--	--
Truck	88	75	16 (2)	40	--	--	16

Note 1. Estimated level obtainable by quieter methods or equipment and implementing feasible noise controls.
Note 2. "--" indicates typically zero or very little use during construction phase.
Note 3: Numbers in parentheses are greatest number of same items in use during any hour.

Figure A-4
Typical Commercial and Industrial Construction Equipment and Use Factors

Construction Equipment	50-Foot Leq, dBA	Mitigated1 Leq, dBA	Highest Hourly Use Percentage per Construction Phase				
			Clear	Excavate	Base	Build	Finish
Air Compressor	81	75	--2	100	40	40	40
Backhoe	85	75	4	16	--	--	4
Concrete Mixer	85	75	--	--	40	16	16
Concrete Pump	82	75	--	--	40	--	8
Concrete Vibrator	76	75	--	--	--	--	--
Crane, Derrick	88	75	--	--	--	4	2
Crane, Mobile	83	75	--	--	--	8	4
Dozer	80	75	4	16	--	--	4
Generator	78	75	40	40	--	--	--
Grader	85	75	5	--	--	--	2
Jack Hammer	82	75	--	10	4	4	4
Loader	79	75	16	16	--	--	4
Paver	89	80	--	--	--	--	12
Pile Driver	101	95	--	--	4	--	--
Pneumatic Tool	85	80	--	--	4	10 (3) 3	4 (3)
Pump	76	75	--	40	100 (2)	40	--
Rock Drill	98	80	--	4	--	--	5
Roller	74	74	--	--	--	--	10
Saw, Electric	78	75	--	--	4 (2)	10 (2)	--
Scraper	88	80	14	--	--	--	8
Shovel	82	75	--	20	--	--	6
Truck	88	75	16 (2)	16 (2)	--	--	16

Note 1. Estimated level obtainable by quieter methods or equipment and implementing feasible noise controls.
Note 2. "--" indicates typically zero or very little use during construction phase.
Note 3: Numbers in parentheses are greatest number of same items in use during any hour.

Figure A-5
Typical Public Works and Roadway Construction Equipment and Use Factors

Construction Equipment	50-Foot Leq, dBA	Mitigated1 Leq, dBA	Highest Hourly Use Percentage per Construction Phase				
			Clear	Excavate	Base	Build	Finish
Air Compressor	81	75	--2	100 (2)3	40	40	40 (2)
Backhoe	85	75	4	40	--	--	16
Concrete Mixer	85	75	--	--	16 (2)	40 (2)	16 (2)
Concrete Pump	82	75	--	--	--	--	--
Concrete Vibrator	76	75	--	--	--	--	--
Crane, Derrick	88	75	--	10	4	4	--
Crane, Mobile	83	75	--	--	--	16	--
Dozer	80	75	4	40	--	--	16
Generator	78	75	100 (2)	40 (2)	40 (2)	40	40 (2)
Grader	85	75	8	--	--	20	8
Jack Hammer	82	75	--	--	--	4	10 (2)
Loader	79	75	4	40	--	--	16
Paver	89	80	--	--	--	--	--
Pile Driver	101	95	--	--	--	--	--
Pneumatic Tool	85	80	--	--	4 (2)	10	4
Pump	76	75	--	40 (2)	100 (2)	40 (2)	--
Rock Drill	98	80	--	4	--	--	--
Roller	74	74	--	--	100	--	--
Saw, Electric	78	75	--	--	4 (2)	--	--
Scraper	88	80	8		20	8	8
Shovel	82	75	4	40	4	--	4
Truck	88	75	16 (2)	16	40 (2)	--	16 (2)

Note 1. Estimated level obtainable by quieter methods or equipment and implementing feasible noise controls.
Note 2. "--" indicates typically zero or very little use during construction phase.
Note 3: Numbers in parentheses are greatest number of same items in use during any hour.

Appendix B

Construction Noise Mitigation Measures

Construction Noise Mitigation Measures

Construction noise mitigation may be achieved using various combinations of equipment source noise reduction, propagation path noise reduction and sensitive receptor noise reduction.

Equipment Source Noise Reduction Methods

Feasible and reasonable equipment noise mitigation measures may need to be implemented to meet the construction noise threshold criteria. Examples of equipment source noise reduction methods to reduce construction noise impacts at sensitive receptor locations are listed in this section. The implementation of one or more of these measures, along with those of the other sections, may be necessary to achieve compliance with the construction noise threshold criteria.

Equipment Noise Reduction:

1. Minimize the use of impact devices, such as jackhammers, pavement breakers, and hoe rams. Where possible, use concrete crushers or pavement saws rather than hoe rams for tasks such as concrete or asphalt demolition and removal.

2. Pneumatic impact tools and equipment used at the construction site shall have intake and exhaust mufflers recommended by the manufacturers thereof, to meet relevant noise limitations.

3. Provide impact noise producing equipment, i.e. jackhammers and pavement breaker(s), with noise attenuating shields, shrouds, portable barriers, or enclosures, to reduce operating noise.

4. Line or cover hoppers, conveyor transfer points, storage bins, and chutes with sound-deadening material (e.g., apply wood or rubber liners to metal bin impact surfaces).

5. Provide upgraded mufflers, acoustical lining, or acoustical paneling for other noisy equipment, including internal combustion engines.

6. Avoid blasting and impact-type pile driving.

7. Use alternative procedures of construction and select a combination of techniques that generate the least overall noise and vibration. Such alternative procedures could include the following:

    a. Use electric welders powered by remote generators.

    b. Mix concrete at non-sensitive off-site locations, instead of on-site.

    c. Erect prefabricated structures instead of constructing buildings on-site.

8. Use construction equipment manufactured or modified to reduce noise and vibration emissions, such as:

    a. Electric instead of diesel-powered equipment.

b. Hydraulic tools instead of pneumatic tools.

c. Electric saws instead of air- or gasoline-driven saws.

9. Turn off idling equipment when not in use for periods longer than 30 minutes.

Operations Noise Reduction Methods:

In no case shall the following mitigation measures alter the project's responsibility for compliance with applicable Federal, state, and local safety ordinances and regulations, as well as project-specific construction specifications.

1. Operate equipment so as to minimize banging, clattering, buzzing, and other annoying types of noises, especially near residential and other noise-sensitive areas during the evening and nighttime hours.

2. To the extent feasible, configure the construction site in a manner that keeps noisier equipment and activities as far as possible from noise sensitive locations and nearby buildings.

3. All back-up alarms should be disarmed at 8:00 p.m. and not reactivated until 7:00 a.m. on weekdays and 9:00 a.m. on weekends and local holidays. Signal persons and strobe lights must be used during periods when the back-up alarms are disarmed.

4. Maximize physical separation, as far as practicable, between noise generators and noise receptors. Separation includes following measures:

    a. Provide enclosures for stationary items of equipment and noise barriers around particularly noisy areas at the project site.

    b. Locate stationary equipment to minimize noise and vibration impacts on community.

5. Minimize noise-intrusive impacts during most noise sensitive hours.

    a. Plan noisier operations during times of highest ambient noise levels.

    b. Keep noise levels relatively uniform; avoid excessive and impulse noises.

    c. Turn off idling equipment.

    d. Phase in start-up and shut-down of project site equipment.

6. Select truck routes for material delivery and spoils disposal so that noise from heavy-duty trucks will have a minimal impact on noise sensitive receptors. Local truck routes will follow those prescribed by the City.

    a. Conduct truck loading, unloading, and hauling operations so noise and vibration are kept to a minimum.

b. Route construction equipment and vehicles carrying soil, concrete or other materials over streets and routes that will cause the least disturbance to residents in the vicinity of construction sites and haul roads.

Incorporating the construction noise mitigation methods and techniques would reduce construction noise and vibration impacts.

Construction Noise Propagation Path Reduction Methods

Feasible and reasonable propagation path mitigation measures may need to be implemented to help meet the construction noise threshold criteria. Examples of propagation path noise reduction methods to reduce construction noise impacts at sensitive receptor locations are listed in this section. The implementation of one or more of these measures, along with those of the other sections, may be necessary to achieve compliance with the construction noise threshold criteria.

Construction Site Noise Barriers

Moveable noise barriers can be positioned and relocated along a construction corridor, while fixed noise barriers can be located at a fixed construction site.

Moveable Construction Noise Blankets

1. For lesser noise reduction, install moveable frame-mounted noise curtains, blankets or enclosures adjacent to or around noisy equipment where required to meet the project noise limits. Noise control shields shall be made of a durable, flexible composite material featuring a noise barrier layer bonded to a weather-protected, sound-absorptive material on the construction-activity side of the noise shield.

2. Provide readily removable and moveable noise shields so that they may be repositioned, as necessary, to provide noise abatement for non-stationary and stationary processes along a construction corridor as the construction process moves.

3. Installation and Maintenance:

    a. Install noise blanket shields with sound-absorptive surfaces facing the noise source.

    b. Maintain the moveable noise shields and repair damage that occurs, including, but not limited to, keeping noise shields clean and free from graffiti and maintaining structural integrity. Promptly repair or replace gaps, holes, and weaknesses in the noise shields, and openings between or under the noise shield blankets.

Moveable Construction Noise Barriers

1. For greater noise reduction, install moveable paneled noise shields, barriers, or enclosures adjacent to or around noisy equipment where required to meet the project noise limits. Noise control shields shall be made of panels featuring a solid panel with a weather-protected, sound-absorptive material on the construction-activity side of the noise shield.

2. Provide readily removable and moveable noise shields so that they may be repositioned, as necessary, to provide noise abatement for non-stationary and stationary processes along a construction corridor as the construction process moves.

3. Installation and Maintenance:

    a. Install paneled noise shields with sound-absorptive surfaces facing the noise source.

    b. Maintain the moveable noise shields and repair damage that occurs, including, but not limited to, keeping noise shields clean and free from graffiti and maintaining structural integrity. Promptly repair or replace gaps, holes, and weaknesses in the noise shields, and openings between or under the noise shield panels.

Fixed Construction Noise Curtains

1. For lesser noise reduction, install frame-mounted sound noise control curtains or noise control blankets in locations adjacent to or around noisy equipment, as required, to meet the noise limits specified in this document and to shield the public from excessive construction noise. Noise control curtains shall be made of a durable, flexible composite material featuring a noise barrier layer bonded to a weather-protected, sound-absorptive material on one or both sides. The supporting structure shall be engineered and erected according to applicable codes.

2. Noise control curtains shall be installed, as necessary, to provide greater noise abatement for non-stationary and stationary processes.

3. Installation, Maintenance, and Removal

    a. Noise control curtains shall be installed without any gaps and with the sound absorptive side facing the construction activity area.

    b. The noise control curtains shall be maintained and promptly repaired if any damage should occur. Gaps, holes, or weaknesses in the curtain, or openings between the curtain and the ground shall be promptly repaired.

    c. The fixed noise control curtains and associated elements shall be completely removed and the site appropriately restored upon the conclusion of the construction activity.

Fixed Noise Control Barriers

1. For greater noise reduction, install solid noise control panels or enclosures in locations adjacent to or around noisy equipment, as required, to meet the noise threshold criteria specified in this document and to shield the public from excessive construction noise. Noise control panels shall be made of a solid, heavy noise barrier material with a weather-protected, sound-absorptive material on the construction-activity side of the barrier. The supporting structure shall be engineered and erected according to applicable codes.

2. Noise control panels shall be erected, as necessary, to provide greater noise abatement for non-stationary and stationary processes.

3. Installation, Maintenance, and Removal

    a. Solid noise control panels shall be installed without any gaps and with the sound absorptive side facing the construction activity area.

    b. The noise control panels shall be maintained and promptly repaired if any damage should occur. Gaps, holes, or weaknesses in the panels or openings between the panels and the ground shall be promptly repaired.

    c. The fixed noise control panels and associated elements shall be completely removed and the site appropriately restored upon the conclusion of the construction activity.

Sensitive Receptor Construction Noise Reduction Methods

Feasible and reasonable receptor noise mitigation measures may be implemented to meet the construction noise threshold criteria. Examples of receptor noise reduction methods to reduce construction noise impacts at sensitive receptor locations are listed in this section. The implementation of one or more of these measures, along with those of the other sections, may be necessary to achieve compliance with the construction noise threshold criteria.

Receptor Building Interior Noise Control Measures

1. For noise reduction at fixed, mid-term construction sites, install removable secondary acoustic window inserts (i.e., Quiet Window or equal) to existing windows in sensitive receptor buildings as required to meet the noise threshold criteria specified in this document.

2. For noise reduction at fixed, long-term construction sites, install permanent replacement acoustic windows with an STC rating 5 dB greater than the construction noise reduction needed. Where sliding doors are exposed to excessive construction noise, acoustic sliding patio doors may also need to be installed. Careful attention must be taken to seal the frame airtight to the existing structure.

3. Install properly fitted, tubular compression-type weather strip gasketing around the door frames (jamb and head) and install automatic drop thresholds and threshold plates to exposed swinging doors. Careful attention must be taken to seal the existing door frame airtight to the existing structure.

Moveable Exterior Receptor Noise Control Barriers

1. For construction along a construction corridor, install moveable paneled noise shields or barriers at noise sensitive receptor sites. Noise control shields shall be made of panels featuring a solid panel with a weather-protected, sound-absorptive material on the construction-activity side of the noise shield.

2. Provide readily removable and moveable noise shields so that they may be repositioned, as necessary, to provide greater noise abatement along a construction corridor as the construction process moves.

3. Installation and Maintenance:

    a. Install paneled noise shields with sound-absorptive surfaces facing the noise source.

    b. Maintain the moveable noise shields and repair damage that occurs, including, but not limited to, keeping noise shields clean and free from graffiti and maintaining structural integrity. Promptly repair or replace gaps, holes, and weaknesses in the noise shields, and openings between or under the noise shield panels.

Fixed Exterior Receptor Noise Control Barriers

1. For noise reduction at fixed construction sites, install solid noise control panels at sensitive receptor locations, as required, to meet the noise threshold criteria specified in this document and to shield the sensitive receptor from excessive construction noise. Noise control panels shall be made of a solid, heavy noise barrier material with a weather-protected, sound-absorptive material on the construction-activity side of the barrier. The supporting structure shall be engineered and erected according to applicable codes.

2. Noise control panels shall be erected, as necessary, to provide greater noise abatement for non-stationary and stationary processes at fixed construction sites.

3. Installation, Maintenance, and Removal

    a. Solid noise control panels shall be installed without any gaps and with the sound absorptive side facing the construction activity area.

    b. The noise control panels shall be maintained and promptly repaired if any damage should occur. Gaps, holes or weaknesses in the panels or openings between the panels and the ground shall be promptly repaired.

    c. The fixed noise control panels and associated elements shall be completely removed and the site appropriately restored upon the conclusion of the construction activity.

Appendix D of CERP

Vibration and Settlement Monitoring Plan

AECOM Environment

Prepared for:
National Grid

Prepared by:
AECOM
New York, New York
February 2015

Vibration and Settlement Monitoring Plan

(Appendix D of the Community Environmental Response Plan)

Former Rockaway Park Manufactured Gas Plant, Bulkhead Area Remedial Action
Rockaway Park, Queens County, New York

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
bgs	below ground surface
COIs	constituents of interest
in/s	inches per second
MGP	Manufactured Gas Plant
NYCDOB	New York City Department of Building
NYSDEC	New York State Department of Environmental Conservation
PPV	Peak Particle Velocity
ROD	Record of Decision
SIRR	Staten Island Rail Road
TFS	Temporary Fabric Structure
VOCs	volatile organic compounds
USBM	United States Bureau of Mines
Project Site	Bulkhead Area, north of the site, between Beach 108th Street and Rockaway Freeway
Site	Rockaway Park Former Manufactured Gas Plant

1.0 Introduction

This Vibration and Settlement Monitoring Plan has been prepared to provide a summary of vibration and settlement monitoring activities that will be implemented to monitor potential vibration and settlement impacts resulting from the remedial construction activities at the former Rockaway Park Manufactured Gas Plant (MGP) site (Site) - Bulkhead Area (project site) in Rockaway Park, Queens County, New York. The remedial activities will be implemented according to the Administrative Order on Consent #D1-0002-98-11 between National Grid and the New York State Department of Environmental Conservation (NYSDEC).

The Vibration and Settlement Monitoring Plan identifies the relevant damage criteria, the proposed monitoring locations, and the mitigation procedures for responding to observed exceedances of the vibration and settlement thresholds.

The Vibration and Settlement Monitoring Plan is intended to be a framework within which the vibration and settlement levels from the excavation and sheet piling activities are documented and recorded. Any changes to the proposed remedial construction activities and the proposed construction phases will be updated in a revised Vibration Monitoring Plan, as necessary. Evaluations of the vibration and settlement monitoring programs and requirements by the Engineer should be completed periodically to determine if more or less monitoring is required.

This Vibration and Settlement Monitoring Plan does not preclude the use of other mitigation technologies or techniques designated in other design documents.

1.1 Vibration Basics

A source (such as using a backhoe hammer to demolish large pieces of subsurface concrete structures) can excite the adjacent ground, creating vibration waves that propagate (or move) through the various soil and rock strata. This could potentially reach the foundations of nearby buildings, street, sidewalks and then spread throughout parts of the structure. Although ground-borne vibration is sometimes noticeable outdoors, it is almost exclusively an indoor problem. The effects of ground-borne vibration can include perceptible movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration effects can range from simply causing annoyance to people inside buildings to minor (cosmetic) damage to walls and ceiling to major structural damage, although the latter is an extremely rare occurrence. Differences in these vibration outcomes are related to the magnitude of the vibration that propagates to nearby structures. Vibrations of greater magnitude may cause building or structure damage, but vibrations at much lower levels may be felt by humans but be too low to cause building damage.

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on the soil or underground structures in the vicinity of the construction site respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels, low rumbling sounds and perceptible vibrations at moderate levels, and slight damage at the highest levels. Ground vibrations from construction activities do not often reach the levels that can damage structures, but they can achieve the audible and perceptible ranges in buildings very close to the project site. A possible exception is

the case of fragile buildings or structure, many of them old, where special care must be taken to avoid damage. The construction vibration action levels include special consideration for such buildings.

Evaluation criteria for determining vibration impacts due to construction activities include thresholds for (1) human perception, annoyance, and interference, (2) damage to fragile and historical buildings, and (3) damage to underground utility pipelines and structures. Although no standardized vibration criteria for construction activities have been established, exceedances of certain vibration levels may typically cause community reactions.

Vibration energy is measured as peak particle velocity (PPV). PPV is appropriate for evaluating vibration associated with construction activities and the resulting stresses that potentially are damaging to buildings. PPV represents the maximum instantaneous positive or negative peak of a vibration signal, and it is commonly used to measure and evaluate impulse vibrations associated with blasting or pile driving. The U.S. Bureau of Mines (USBM) publishes guidelines based on PPV that are frequently used to set acceptable vibration limits for various types of structures.

Excessive vibration levels from construction activities, although temporary in duration, may create a nuisance condition at nearby receptors. Ground-borne vibrations from construction activities rarely reach the levels that can damage structures; however, the vibrations can reach the audible and perceptible ranges in buildings that are very close to those experienced on the active work area [FTA, 2006]. The types of construction activities that typically generate the greatest vibrations are blasting and impact pile driving. As proposed a vibratory hammer will be used for the sheet pile driving activity at the project site which typically generates less vibrations than impact hammer. Pile driving activity is expected to last approximately for two weeks.

Annoyance from vibration occurs when vibration levels exceed the thresholds of human perception. These criteria are well below vibration levels at which damage might be expected to occur in buildings. In other words, a person may be able to feel or perceive vibration at levels that are much lower than levels that could cause structural damage [Jones and Stokes, 2004]. It is important to note that the term “damage,” when used in the context of acceptable levels of ground vibrations, refers to threshold damage as defined by the USBM. The definition states “the occurrence of cosmetic damage; that is, the most superficial interior cracking of the type that develops in all homes independent of blasting.” It should be noted that the occurrence of PPV values greater than the threshold value does not imply that cosmetic cracking will occur but that it could occur.

1.2 Receptors

Structures located near the project site will be subject to a pre- and post-construction survey and vibration monitoring to document their condition before and after the remedial construction. If an access agreement is already in place, the vibration monitoring points will be placed as close as practicable to the existing structures. For properties where an access agreement has not been negotiated, the vibration monitoring points will be placed near the property line of the potentially affected property.

The following structures are located near the project site which will be monitored for any impacts resulting from construction activities:

- Subsurface tunnel structure underneath Beach Channel Drive and Rockaway park
- Rockaway Park bulkhead

- Sewer line beneath Beach Channel Drive median
- Metropolitan Transit Authority (MTA) and New York City Transit (NYCT) railroad tracks and rail yard
- Residences south of Rockaway Freeway
- Businesses/gas substation to the West of the project site
- The wastewater treatment facility to the East of the project site

2.0 Vibration and Settlement Monitoring

The remedial activities will include source material excavation, sheet pile installation along the south side of the project site, fill placement and compaction, and truck transportation. Vibration and settlement monitoring will be required for these activities and may be required for other remedial activities as well.

The vibration and settlement monitoring will be conducted in coordination with the Contractor. The Contractor shall provide the proposed construction sequence to the Construction Manager a minimum of 2 weeks prior to mobilization to allow mobilization for vibration monitoring. The remediation Contractor shall provide a minimum of 48 hours' notice to the Construction Manager before they mobilize. The Contractor shall provide a minimum of 24 hours' notice to the Construction Manager before the Contractor begins any demolition or hammering activities. The Construction Manager shall coordinate placement of the vibration and settlement monitoring equipment with the Contractor.

Monitoring equipment proposed for the construction vibration measurements include Instantel Minimate Plus seismographs, the GeoSonics 3000EZplus, or their equivalents. All the monitoring equipment will be utilized according to the manufacturer's specifications.

2.1 Vibration Monitoring

Vibration monitoring may be conducted at the following locations as shown in Figure 2-1:

- On Beach Channel Drive median
- Near Beach Channel Drive subsurface tunnel
- West corner for the Project Site near gas substation
- Near the bulkhead

Monitoring locations were selected based on their close proximity to the project site, sensitivity to ground-borne vibration, and proximity to typical small businesses along local streets. Vibration monitoring will also be conducted along the newly constructed bulkhead.

2.1.1 Pre-construction Vibration Monitoring

Given the urban setting around the project site, it is important to conduct a pre-construction vibration survey at selected monitoring locations.

2.1.1.1 Vibration Baseline Survey

A pre-construction vibration survey will be undertaken for a week prior to the initiation of any activity at the project site. The vibration monitors will record the vector sum of the wave velocity in inches per second. The objective of the vibration survey is to establish baseline ground motions caused by vehicular traffic (buses, cars, trucks, and other vibration sources) near the sensitive structures selected surrounding the Project Site. These vibration levels will be compared to vibrations induced during construction and may be used to revise threshold limitations for vibration induced damage.

2.1.1.2 Existing Structures Condition Survey

An existing condition survey of the surrounding structures and sidewalk will be performed. Pre-construction surveys will include inspecting structure's and sidewalk's foundations, exterior, and interior elements and documenting any pre-existing defects such as cracks, settlement, subsidence, corrosion, or water damage. Defects that should be monitored during construction will be noted and, where appropriate, crack monitors will be installed prior to the start of construction. The surveys will be documented through notes and photography to establish the pre-construction conditions. At the end of construction, a similar set of photos will be taken for comparison. Post-construction photographs will be compared with the initial pre-construction photographs to establish the growth of any pre-existing cracks or the onset of any new cracks.

2.1.2 Construction Period Vibration Monitoring

At each location, the peak vibration levels from the construction equipment and trucks will be measured during each construction phase. The following construction phases are currently proposed as part of the remedial activity:

- Equipment mobilization;
- Above ground demolition and hammering activities;
- Subsurface structure demolition activities, trenching, and soil excavation;
- Pile driving and installation of subsurface containment barrier

The vibration monitoring plan consist of performing vibration monitoring of construction activities, evaluating it daily, and preparing weekly summary reports of the vibration readings. The vibration monitoring plan will include:

- Developing a layout for the vibration monitoring equipment and a schedule for vibration monitoring. The equipment layout will involve placing monitoring units equipped with geophones capable of triaxial displacement measurements next to buildings and/or structures adjacent to the construction areas. The monitoring units will be installed and secured at locations where firm subgrade is exposed. The layout and schedule will depend on the Contractor's proposed construction sequence.
- Performing continuous vibration monitoring during each of the construction phases to adequately document the ground-borne vibration from the construction activities. American Association of State Highway and Transportation Officials (AASHTO) R-8-96 uses USBM published vibration damage research and establishes a PPV of 2 inches per second (in/s) as the "structural damage threshold limit". PPV limits will be developed that will be used as "warning action limits" and "stop work action limits". These limits will be used as threshold values for the vibration mitigation plan during the construction activities. Vibration levels will be monitored to detect construction operations that cause vibrations above the recommended vibration action limits.
- Performing vibration monitoring continuously from the start to end of each construction work shift. Data recording will commence prior to the start of each shift. At the end of each shift, data collected will be downloaded and reviewed, and a summary report will be submitted.
- If the vibration "warning action limit," which may be revised after pre-construction survey is completed, is exceeded, the situation will be reviewed, and the cause of the vibration will be identified. A corrective action plan will be formulated, implemented, and monitored. If the

vibration “stop work action limit” is exceeded or abnormal monitoring data is recorded, work should stop to allow for review of the vibration data. In the event that the vibrations exceed the stop work action limit, the monitoring units will set off an alarm that will signal for the stop of construction work. The causes of vibration will be investigated and vibration mitigation procedures can then be reviewed and implemented as needed before work proceeds. Additional monitoring units might be required to further mitigate excessive vibrations.

- At the end of construction, the data will be summarized in a report. Summary tables of the warning/action events recorded during the monitoring duration and associated causes observed for each event will be included in this summary memo.

2.1.3 Construction Period Crack Monitoring

Additionally, tell-tale crack monitors (or strain gauges) may also be installed on sidewalk (where necessary) to document the status of existing hairline cracks in the sidewalk structures. Prior to the start of the construction activities, baseline crack gauge measurements may be conducted to identify and document any existing hairline cracks on the sidewalk structure. Furthermore, crack monitor (or strain gauge) measurements will be collected twice a week, typically midweek during the construction activities and at the end of the week after construction is completed. However, if high vibration levels are recorded during the actual vibration monitoring, more frequent crack monitoring may be conducted at the discretion of the Engineer.

The vibration and crack monitoring program will depend on the remedial Contractor’s construction plan and duration of the construction operations. The number and locations of vibration monitoring units will depend on the location and extent of the construction activities being monitored. Depending on levels observed during initial construction, additional vibration monitoring units may be required to evaluate the vibration levels. Periodic evaluations of the vibration monitoring program will be completed to determine the program’s adequacy and continuing requirements.

2.2 Settlement Monitoring

Settlement monitoring will be conducted along the Beach Channel Drive, along the newly installed bulkhead, and over the northern portion of the subsurface tunnel during pre-trenching and sheet pile installation and if necessary during other activities. Settlement monitoring conducted shall consist of settlement points located every 40 feet along the Beach Channel Drive sidewalk and bulkhead and two locations located over the subsurface tunnel within the project site. Monitoring shall be performed for both (x, y) horizontal directions using a GPS system with a ground station. The settlement (vertical displacement) shall be measured using a conventional or digital level. Initial monitoring of each settlement point shall start within 24 hours of sheet pile installation and excavation to obtain a baseline and then when the excavation occurs as described below. The instrument reading schedule for the settlement points shall be:

- Three initial sets of readings prior to any site activities.
- Daily when sheet pile installation is within 10 feet of the Beach Channel Drive settlement points.
- Daily when sheet pile installation is within 20 feet of the subsurface tunnel settlement points.
- Daily when excavating within 15 feet of all settlement points.
- Increase frequency of readings where action limits are reached.

- Monthly after completion of backfilling or until measurements remain stable over three consecutive readings.
- Concurrence to stop monitoring must be obtained from the Engineer in writing.

Additional settlement points may be installed if required by the Engineer. Additional monitoring shall be performed as directed by the Engineer.

3.0 Vibration and Settlement Damage Thresholds

3.1 Vibration Damage Thresholds

The damage thresholds are defined for various buildings and structures depending on the structure's strength and ability to absorb ground-borne vibration. Since all buildings are continually exposed to seismic vibration, buildings are generally designed to withstand elevated ground-borne vibration levels without resulting in stress fractures or hairline cracks. For most buildings, the likelihood of damage or even minor cosmetic damage is highly unlikely unless there are pre-existing faults with the building structure, and there is nearby blasting or excessive pounding from construction equipment (such as pile driving). The generally accepted damage criteria listed in Table 3-1 were developed by the USBM [Nicholls, 1971] as well as European construction and tunnel authorities [Association of Swiss Highway Professionals, 1992].

By definition, the peak particle velocity (PPV) is the maximum rate of change of position (displacement) with respect to time as measured on the ground surface. The velocity amplitudes are given in units of inches per second (in/s) zero to peak amplitude. The frequency of vibration is the number of oscillations that occur in 1 second. The frequency units given are in hertz (cycles per second). The dominant frequency is usually defined as the frequency at the maximum particle velocity, which will be calculated visually from the seismograph strip chart for the half cycle that has its peak, the maximum velocity. The particle velocity must be recorded in three (3) mutually perpendicular axes, with the maximum allowable peak particle velocity being in the maximum measure along any of three axes.

Thresholds of vibration induced cracking are generally site specific and depend on the type and age of the structure, frequency of ground vibration, and type of soil supporting the structure. Research by the USBM and other investigative groups have established criteria relating the occurrence of structural damage to certain frequencies and level of ground motion. According to the USBM, within the range of four (4) to 12 hertz, the maximum particle velocity recommended to preclude the threshold damage to plaster-on-wood for old structures is 0.5 in/s and for historic monuments is 0.1 in/s.

Table 3-1 Construction Vibration Damage Criteria (in PPV)

Land-Use/Building Category	Applicable Receptor ID	Peak Particle Velocity[1]	
		mm/s	in/s
Industrial buildings (and other structures of substantial construction)	--	100	4
Residential, new construction	Gas station/gas substation near west end of the project site	50	2
Residential, poor condition	--	25	1
Residential, very poor condition	--	12.7	0.5
Reinforced-concrete, steel, or timber (no plaster)	--	12.7	0.5
Engineered concrete and masonry (no plaster)	--	7.62	0.3
Non-engineered timber and masonry buildings	Rockaway park tunnel and Beach Channel Drive sidewalk	5.08	0.2
Historic buildings	--	3	0.12
Historic buildings, poor condition	--	2	0.08

[1] PPV levels are reported in both metric and SAE units including millimeters per second (mm/s) and inches per second (in/s).

According to a USBM blasting study, a PPV of 2.0 in/sec is the threshold level at which minor structural damage may begin to occur in 0.01 percent of structures. A PPV of 2.0 in/s is the generally accepted threshold of minor cosmetic damage due to repeated construction activities, and there is research that suggests that many single family residences and other structures can sustain substantially higher vibration levels without damage. However, recent research has demonstrated that historic or fragile buildings or structures may be more susceptible to potential damage at lower levels depending on the condition of their foundations. The New York City Department of Buildings (NYCDOB) has developed a set of policy and procedures (PPN # 10/88) in order to avoid potential damage to historical structures and any existing structure designated by the Commissioner resulting from adjacent construction. The procedures require a monitoring program to reduce the likelihood of construction damages to adjacent historical structures and to detect at an early stage the beginnings of damage so that construction procedures can be changed. PPN # 10/88 includes a PPV threshold of 1.0 in/s for potential vibration damage [NYSDOB, 1988]. Therefore, based on the structure types identified for each monitoring location and the above discussion, the vibration threshold limits to be used for stop work action are summarized in Table 3-2.

Table 3-2 Preliminary Vibration Threshold Limits (in PPV)

Vibration Monitoring Location	Vibration Threshold Limits (PPV)	
	Warning Action Limit (inches/s)	**Stop Work Action Limit (inches/s)**
General, Observational	-	Any complains (third party) or visible movement of objects within neighboring structures, residences, buildings, business or utilities.
V1 – Rockaway Park Tunnel	1.0	2.0
V2 – Sewer line beneath Beach Channel Drive Median	0.5	1.0
V3 – Gas substation to the west of the project site	1.0	2.0
V4 – Rockaway Park Bulkhead	1.0	2.0

Please note that these threshold limits may be revised following the pre-construction baseline vibration monitoring and the tunnel investigation (to be conducted by the Contractors).

Construction vibration should be assessed quantitatively in cases where there is significant potential for impact from construction activities. Such activities include blasting, pile-driving, vibratory compaction, demolition, and drilling or excavation in close proximity to sensitive structures. For reference purposes, a quantitative assessment of the vibration from the project site construction activities has been completed below. The recommended procedure for estimating vibration impact from construction activities is as follows:

- Select the equipment and associated vibration source levels at a reference distance of 25 feet from Table 3-3.
- Make the propagation adjustment according to the following formula [(this formula is based on point sources with normal propagation conditions); FTA, 2006]:

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Where:

$PPV_{(equip)}$ = peak particle velocity in in/s of the equipment adjusted for distance

$PPV_{(ref)}$ = reference vibration level in in/s at 25 feet from Table 3-3

D = distance from the equipment to the receiver.

Apply the vibration damage threshold limits from Table 3-2.

Table 3-3 Vibration Source Levels for Construction Equipment

Equipment		Peak Particle Velocity at 25 ft	
		mm/s	in/s
Pile Driver (impact)	upper range	38.5	1.518
	typical	16.3	0.644
Pile Driver (sonic)	upper range	18.6	0.734
	typical	**4.3**	**0.170**
Clam shovel drop (slurry wall)		5.1	0.202
Hydromill (slurry wall)	in soil	0.2	0.008
	in rock	0.4	0.017
Vibratory Roller		**5.3**	**0.210**
Hoe Ram		**2.3**	**0.089**
Large bulldozer		**2.3**	**0.089**
Caisson drilling		2.3	0.089
Loaded trucks		**1.9**	**0.076**
Jackhammer		**0.9**	**0.035**
Small bulldozer		**0.1**	**0.003**

The above methodology was used to calculate the expected vibration levels at the receptors neighboring the project site. The results are presented below for the remediation construction equipment that would result in the maximum vibrations (pile driver):

Table 3-4 Vibration Impacts Expected at Neighboring Receptors

Receptor	Distance (feet)	Peak Particle Velocity	
		mm/s	in/s
V1 – Rockaway Park Tunnel	10	17.00	0.67
V2 – Sewer line beneath Beach Channel Drive Median	45	1.78	0.07
V3 – Gas substation to the west of the project site	320	0.09	0.00
V4 – Rockaway Park Bulkhead	35	2.60	0.10

A full list of vibration impacts expected from all construction equipment used during the project site remediation for all receptors is included as Appendix A of this document. Please note that a typical value for a pile driver (sonic) was used based on knowledge of site-specific lithography.

As shown in Table 3-4, the installation of sheet piles has the highest probability of exceeding the stop word action limit. Special controls shall be implemented during sheet pile installation to minimize the risk of damage to nearby building and underground structures including:

- Periodic monitoring of any crack gauges installed on the sidewalk during installation of sheet piles
- Telemetric (text messages) alerts for any Warning and Stop Work Action Limits exceedances during installation of sheet piles

- Use of a pneumatic pile driver if mitigation measures listed in Section 4 fail to minimize vibration levels

It is known that vibrations can densify soils. However, only certain soils are susceptible to this type of densification, and very high vibration levels are required to produce this effect. Two extreme soil types have been studied for vibration-induced densification, and they represent the worst case of base materials. These soils are saturated, cohesionless soil and loose, fine, cohesionless soil. Saturated cohesionless soils are susceptible to a vibration effect called liquefaction. Studies observed liquefaction at 2.0 in/s [Seed, 1979; Veyera, 1987], while collapse of loose fine cohesionless soil was found to be insignificant at 2.0 in/s. Both vibration studies subjected the samples to high amplitudes for tens to hundreds of cycles. Long duration vibration events at this amplitude are not typical at construction sites. Thus, if required, a stop work action limit of 0.5 in/s for the tunnel and sewer line, which is a conservative limit, may be established following the results of the pre-construction baseline vibration monitoring, to ensure protection of the structure of the tunnel and sewer line.

3.2 Settlement Thresholds

The settlement threshold levels will be uniform for various locations across the project site and shall be as follows:

Table 3-5 Settlement Limits

Instrument Type	Depth (Feet)	Action Levels (Feet)		
		Warning Action Limit 1	Warning Action Limit 2	Stop Work Action Limit
Settlement Point	0	0.04	0.06	0.08

4.0 Exceedance and Mitigation

Notwithstanding the specific vibration levels specified herein, vibration mitigation measures listed below will be utilized to minimize, to the greatest extent feasible, the vibration levels near the project site:

- Develop and implement a vibration-monitoring program in order to compare vibration levels at nearby sensitive receptors during construction (this document) with the pre-construction baseline condition as well as the vibration threshold limits established in Table 3-1;
- Inform people living and working in the vicinity about construction method, possible effects, quality control measures, precautions to be used, and channels of communication available to them;
- Route truck traffic and heavy equipment to avoid impacts to sensitive receptors;
- Operate earth-moving equipment on the project site as far away from vibration-sensitive sites as possible;
- Phase demolition, earth-moving, and ground-impacting operations so as not to occur in the same time period. The total vibration level produced are significantly less when each vibration source operates separately;
- Select demolition methods not involving impact, where possible. For example, sawing bridge decks into sections that can be loaded onto trucks results in lower vibration levels than impact demolition by pavement breakers, and milling generates lower vibration levels than excavation using clam shell or chisel drops;
- Minimize the use of impact devices, such as jackhammers, pavement breakers, and hoe rams. Where possible, use concrete crushers or pavement saws rather than hoe rams for tasks such as concrete deck removals and retaining wall demolition.
- Avoid vibratory rollers and packers near sensitive areas;
- Schedule work to limit weekend and nighttime work; and
- Minimize the duration of any high vibration activities.

The following procedures are recommended if a measured level exceeds the damage thresholds or if the crack monitors indicate new or larger cracks.

4.1 Vibration and Settlement Mitigation

Detailed review and interpretation of all geotechnical and structural monitoring data will be made in order to determine whether movements, settlements, tilt, and vibrations have reached an action limit.

In the event that a “Warning Action Limit” is reached:

- The Contractor must meet with the Project Team to discuss the need for mitigation actions;
- The Engineer will prepare a plan of action for the activity or activities responsible for the exceedance;

- If directed by the Engineer or the Construction Manager, the Contractor must implement the plan of action within 24 hours of submittal of the plan of action so that the "Stop Work Action Limit" is not reached; and
- The monitoring frequency of the affected instrument will be increased and additional instruments installed, if necessary.

In the event that a "Stop Work Action Limit" is reached:

- The Contractor must cease all construction activities and meet with the Project Team to discuss the need for mitigation actions;
- The Engineer will prepare a plan of action for the activity or activities responsible for the exceedance;
- If directed by the Engineer or the Construction Manager, the Contractor must implement the plan of action within 12 hours of submittal of the plan of action so that the "Stop Work Action Limit" is not exceeded further; and
- The Contractor will install additional instrumentation, if necessary.

The definition of the required action that must be taken should any geotechnical or structural instrument achieve an action limit is defined in Table 4-1 below:

Table 4-1 Required Action for "Warning Action Limit" or "Stop Work Action Limit"

Action Limit	Required Action
Warning Action Limit	The value of the geotechnical or structural instrumentation reading at which the Engineer and Contractor jointly assess the necessity of either or all of the following: • Evaluating the activity responsible for the exceedance • Altering the method of excavation or construction • Altering the rate of excavation or construction • Altering the sequence of excavation or construction • Changing excavation or construction machinery • Increasing frequency of monitoring of affected instrument
Stop Work Action Limit	The value of the geotechnical or structural instrumentation reading at which the Engineer and Contractor jointly assess the necessity of either or all of the following: • Making site and affected properties secure • Taking necessary predetermined measures to mitigate movements and assure the safety of the public and the Work • Restarting excavation or construction operations The Stop Work Action Limit for each instrument represents the absolute maximum permissible ground or structure movement and the maximum permissible vibration.

The on-site crack monitors (strain gauges) will be checked to determine if there has been any change since the last recording. Work procedures will be evaluated and modified to prevent further

exceedance of the monitoring criteria. All work activities will only proceed at the discretion of the Engineer and after the source of the exceedance has been determined and corrected.

4.2 Crack Monitoring Exceedance

In the event that there is a change in an existing crack or if new cracks are observed during visual inspections, all site work should stop until the Engineer can evaluate the integrity of the monitored structures. Similar to the vibration monitoring exceedance, the recent activities and machinery will be evaluated to determine the correlation between the ongoing activities and the onset of structural cracks. Work procedures will be evaluated and modified to prevent further exceedance of the monitoring criteria. All work activities will only proceed at the discretion of the Engineer and after the source of the exceedance has been determined and corrected.

5.0 References

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Figures

Figure 2-1 Approximate Vibration Monitoring Locations

Appendices

Appendix A

Expected Vibration Levels at Receptor Locations

Appendix A - Vibration and Settlement Monitoring Plan
Expected Vibration Levels at Receptor Locations
National Grid Far Rockaway Former MGP Site
Far Rockaway, New York

Receptor	Distance	Equipment	Threshold Peak Particle Velocity at 25 ft		Expected Peak Particle Velocity at Receptor	
			mm/s	in/s	mm/s	in/s
V1 – Rockaway Park Tunnel	10	Vibratory Roller	5.3	0.2	20.95	0.83
	10	Pile Driver (Sonic typical)	4.3	0.2	17.00	0.67
	10	Pile Driver (Sonic upper range)	18.6	0.7	73.52	2.90
	10	Hoe Ram	2.3	0.1	9.09	0.35
	10	Large Bulldozer	2.3	0.1	9.09	0.35
	10	Loaded Truck	1.9	0.1	7.51	0.30
	10	Jackhammer	0.0	0.3	0.14	1.26
	10	Small Bulldozer	0.1	0.0	0.40	0.01
V2 – Beach Channel Drive Median	45	Vibratory Roller	5.3	0.2	2.19	0.09
	45	Pile Driver (Sonic typical)	4.3	0.2	1.78	0.07
	45	Pile Driver (Sonic upper range)	18.6	0.7	7.70	0.30
	45	Hoe Ram	2.3	0.1	0.95	0.04
	45	Large Bulldozer	2.3	0.1	0.95	0.04
	45	Loaded Truck	1.9	0.1	0.79	0.03
	45	Jackhammer	0.0	0.9	0.01	0.37
	45	Small Bulldozer	0.1	0.0	0.04	0.00
V3 – Gas substation to west of the project site	320	Vibratory Roller	5.3	0.2	0.12	0.00
	320	Pile Driver (Sonic typical)	4.3	0.2	0.09	0.00
	320	Pile Driver (Sonic upper range)	18.6	0.7	0.41	0.02
	320	Hoe Ram	2.3	0.1	0.05	0.00
	320	Large Bulldozer	2.3	0.1	0.05	0.00
	320	Loaded Truck	1.9	0.1	0.04	0.00
	320	Jackhammer	0.0	0.2	0.00	0.00
	320	Small Bulldozer	0.1	0.0	0.00	0.00
V4 – Rockaway Park Bulkhead	35	Vibratory Roller	5.3	0.2	3.20	0.13
	35	Pile Driver (Sonic typical)	4.3	0.2	2.60	0.10
	35	Pile Driver (Sonic upper range)	18.6	0.7	11.23	0.44
	35	Hoe Ram	2.3	0.1	1.39	0.05
	35	Large Bulldozer	2.3	0.1	1.39	0.05
	35	Loaded Truck	1.9	0.1	1.15	0.05
	35	Jackhammer	0.0	0.2	0.02	0.12
	35	Small Bulldozer	0.1	0.0	0.06	0.00

Appendix E of CERP

Transportation Plan

AECOM Environment

Prepared for:
National Grid

Prepared by:
AECOM
New York, New York
February 2015

Transportation Plan

(Appendix E of the Community and Environmental Response Plan)

Rockaway Park Former Manufactured Gas Plant Site; Bulkhead Area Remedial Action
Rockaway Park, Queens County, New York
NYSDEC Site No.: 2-41-029

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List of Acronyms

BIC	Business Integrity Commission
cy	cubic yards
DBW	DNAPL Barrier Wall
DNAPL	Dense non-aqueous phase liguid
GVW	Gross Vehicle Weigh
MGP	Manufactured Gas Plant
NYCDOT	New York City Department of Transportation
NYCRR	New York Codes, Rules, and Regulations
Project Site	Bulkhead Area, north of the Site and Beach Channel Drive, between Beach 108th Street and Rockaway Freeway
ROW	Right-of-way
Site	Rockaway Park Former Manufactured Gas Plant site

1.0 Introduction

National Grid USA (National Grid) is responsible for the remediation of the Rockaway Park Former Manufactured Gas Plant (MGP) site (Site) - Bulkhead Area (project site) located in Rockaway Park, Queens County, New York. The Bulkhead Area, where the dense non-aqueous phase liquid (DNAPL) Barrier Wall (DBW) will be installed, is approximately 0.6 acres and is located north of the Site and Beach Channel Drive. The remediation will be performed in 2015 and will involve the pre-drilling and pre-clearing of soil from the alignment, installation of the Waterloo Barrier System along the alignment, off-site disposal of contaminated soil and debris, and importing of clean backfill.

Soil will be disposed of at one of the following disposal facilities:

1. CleanEarth of Southeast Pennsylvania, Inc., located at 7 Steel Road East, Morrisville , PA, 19067

2. Bayshore Soil Management, LLC, located 75 Crows Mill Rd. Keasbey, NJ, 08832

The remediation work will require the transport of the following materials (amounts are approximate):

- Export 40 tons of impacted soil
- Export 20 tons of debris
- Import 2,310 cubic yards (cy) of clean backfill
- Mobilize and demobilize remedial equipment

Transportation required for this work will be performed in accordance with all local, state, and federal laws, as well as with the Project Specifications. The Contractor will obtain proper permits (e.g., Business Integrity Commission (BIC) permit). Additionally, transportation must meet the requirements described in this document. These requirements include truck selection (Section 2), truck loading (Section 3), transportation routes (Section 4), and transportation management (Section 5).

2.0 Truck Selection

Either 18-wheel trailer dumps or tri-axle dump trucks will be used dependent upon local bridge conditions and project site conditions, contract documents, and availability. Trailer dumps typically have an empty weight of 34,000 to 35,000 pounds and may legally have a Gross Vehicle Weight (GVW) of 80,000 pounds. This would allow a dump trailer to carry up to 23 tons of soil (13.5 cy of soil volume at a bulk density of 1.7 tons per cy). Under some circumstances, trucks traveling within New York State may obtain permits to carry up to 30 tons of soil (17.6 cy of soil volume at a bulk density of 1.7 tons per cy).

Tri-axle dump trucks typically have an empty weight of 23,600 pounds to 31,000 pounds and normally carry a GVW of 58,400 pounds. This would allow a tri-axle dump trailer to haul up to 17.5 tons of soil per load (11 cy of soil volume at a bulk density of 1.7 tons per cy). Under some circumstances, trucks traveling within New York State may obtain permits to carry up to 24 tons of soil (14 cy of soil volume at a bulk density of 1.7 tons per cy).

The truck capacities described in this section are from similar past projects. The Contractor shall verify all allowable truck weights for this project.

All trucks will have the required licenses and permits, including 6 New York Codes Rules and Regulations (NYCRR) Part 364 Waste Transporter Permits.

3.0 Truck Loading

The soil that will be removed from the project site will be excavated and loaded in a manner that minimizes the release of odors. Excavated soils will be monitored and managed using odor control methods, such as the application of odor-control foam. In keeping with this plan, the loading and shipping of impacted soils will also need to be performed in a manner that minimizes the potential for the release of odors.

The impacted soil will be loaded with a conventional excavator or front-end loader onto trucks. Each truck will be lined with 10-mil-thick polyethylene sheeting prior to loading by the on-site remediation Contractor. Use of the liner minimizes the need for decontamination of the truck after contaminated soil is dumped at the disposal or treatment facility and provides containment for any residual liquids which may be associated with wet soils. The plastic liner is also wrapped over loaded soils and sealed to minimize odors during transport.

Note that soils with free liquids will not be shipped from the project site. Saturated soils, if any, will be allowed to drain before being loaded onto trucks for shipping.

The trucks will be loaded directly from excavations, or from roll-offs, to ensure impacted material is not spread throughout the project site. Odor-suppressing foam will be applied to the excavations, stockpiles, and material on the trucks, when necessary. Additionally, an odor-masking agent may also be applied to the impacted soil while loading and stockpiling activities are ongoing to reduce nuisance odors.

All trucks will be covered with a tarpaulin supplied by the trucking firm prior to leaving the project site to ensure that no material is blown off the truck during transportation and to minimize the release of odors. Each truck will be dispatched from the project site with the appropriate bill-of-lading or manifest and will follow the prescribed transportation route to its destination. The local noise ordinance will be in effect for the site remediation; therefore, loading can only take place Monday-Friday from 7:00 am to 3:00 pm, unless otherwise approved.

After loading, all trucks will enter a decontamination pad where all residual soil will be removed from the truck body, wheels, and tires to ensure that impacted soil from the project site is not tracked onto the streets of New York City. Tracking, dropping, or depositing of soil or any other material onto local, county, or state roadways or paved parking areas by or from any vehicle is prohibited.

4.0 Transportation Routes

Trucks will be required to enter and exit the project site via I-278 (Gowanus Expressway) and southbound on Prospect Expressway. The entry and exit trucking routes shown on Figures 1 and 2 are for informational purposes only. The Contractor will designate a final truck route plan based on the most updated New York City Department of Transportation (NYCDOT) approved truck routes.

The truck route (Figure 1) shall be as follows:

1. Traveling on I-278 (Staten Island/Brooklyn Queens Expressway)
2. Continue onto I-495 East (Long Island Expressway)
3. Take exit for I-678 (Van Wyke Expressway) South
4. Continue on Nassau Expressway
5. Continue on Rockaway Boulevard
6. Slight right onto Rockaway Turnpike
7. Turn right onto Burnside Avenue
8. Continue on Sheridan Boulevard
9. Continue onto Beach Channel Drive
10. Turn right off of Beach Channel Drive to enter project site.

The alternate trucking route (Figure 2) shall be:

1. Traveling on I-278 (Staten Island/Brooklyn Queens Expressway)
2. Take Exit for 24 for Prospect Expressway
3. Continue onto Ocean Parkway
4. Make U-turn at Beverly Road
5. Turn right onto Church St
6. Turn right onto Flatbush Ave
7. Continue onto Marine Parkway Bridge
8. Continue onto Beach Channel Drive
9. Turn left off of Beach Channel Drive to enter the project site.

5.0 Transportation Management

Truck traffic will be managed in a way to minimize any impact on the vehicular and pedestrian traffic in the Rockaway Park neighborhood of Queens. Specific instructions to contract truckers are provided in Appendix A of this document.

5.1 Truck Staging

An off-site staging area, located across Beach Channel Drive at the Site, has been identified for trucks waiting to be loaded or to deliver due to a lack of space for staging at the project site. Trucks cannot be staged on the streets adjoining the project site, or in other residential areas awaiting entrance into the loading area due to their narrowness and the commercial nature of the neighborhood. Due to tight project site conditions, truck staging will be limited to three (3) trucks prior to loading if space is available on-site. Trucks staged shall not be allowed to idle longer than 5 minutes in duration and shall be in compliance with 6 NYCRR subparts 217-3.

Drivers will be responsible for communicating with on-site staff to ensure that the project site is ready to accept them. When applicable, trucks will collect at the off-site staging area and travel to the project site together in convoys of three trucks. Likewise, convoys of three trucks will travel together when exiting the project site.

5.2 Traffic Control

Due to the narrow nature of the surrounding streets and the limited maneuverability of trailer/ tri-axle dump rigs, there will need to be certified flaggers present whenever trucks enter or exit the project site (on the Beach Channel Drive Entrances). All flaggers will be equipped with the appropriate signage or flags.

The Contractor will be responsible for coordinating, via radio or telephone, careful arrival of trucks to avoid congestion.

Extreme caution must be taken when entering and exiting the project site, as there is likely to be both vehicular and pedestrian traffic very close to the work area.

5.3 Driver Code of Conduct

All truck drivers are expected to adhere to the following code of conduct:

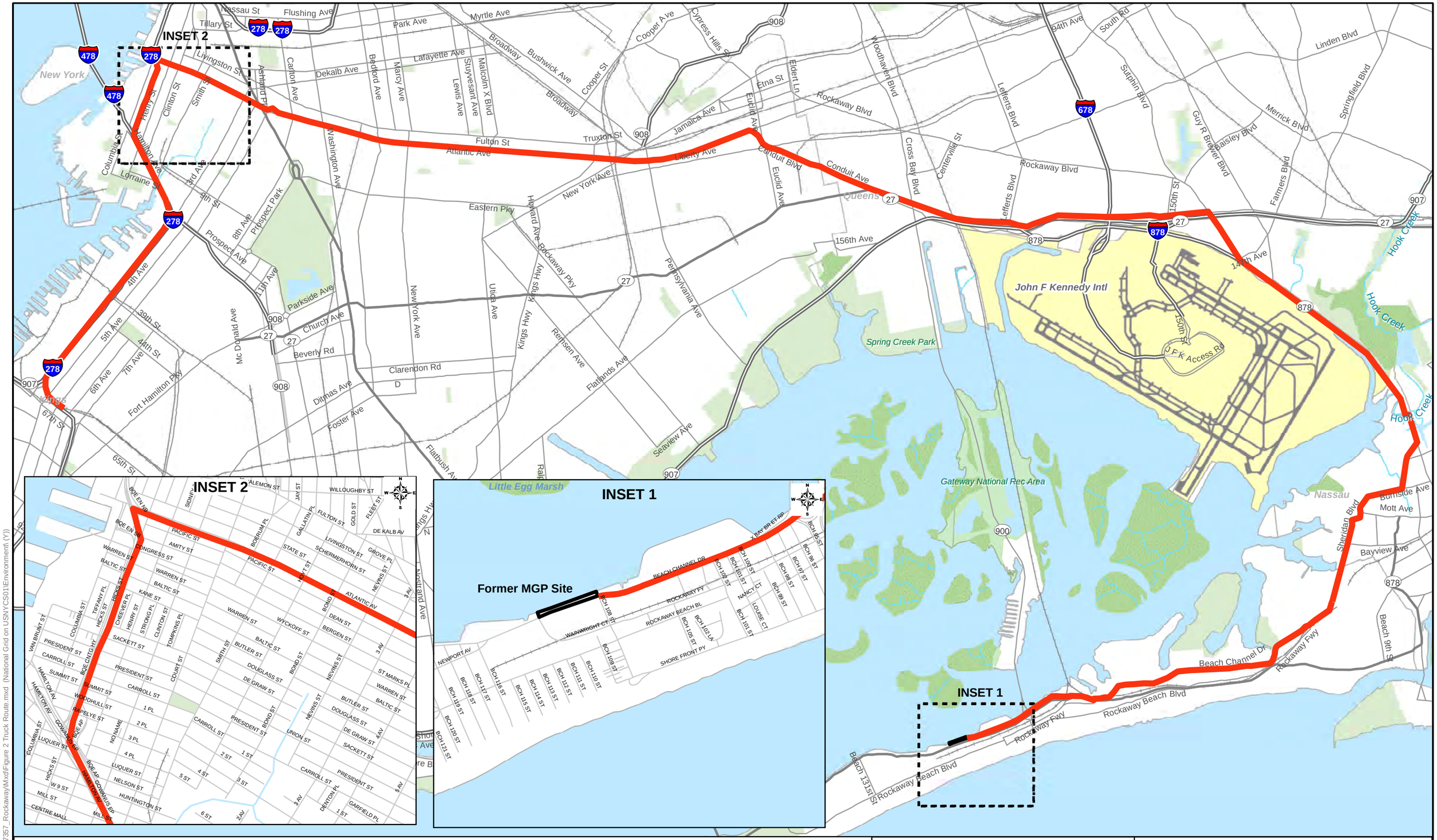
- Drivers must treat safety as a top priority at all times
- Drivers must obey all applicable laws (no speeding, no double parking, etc.)
- Drivers must act in a professional manner (no spitting, no cursing, etc.)

5.4 Traffic Accidents and Releases

In the event that a loaded truck is involved in an incident that results in a release of the transported materials, the cleanup shall follow local and State DOT spill response procedures. The remediation Contractor will contact all involved parties immediately, including the Construction Manager, Engineer

(AECOM), and National Grid representatives. The remediation Contractor and/or transporter will be responsible for the cleanup of any releases which may occur during transport to the disposal facility. It will be the responsibility of the remediation Contractor to keep all haul routes and public rights-of-way (ROW) free of any project site materials due to transportation operations.

Figures


INSET 2
INSET 1
Former MGP Site
Legend
Truck Route
0 0.5 1 2
Miles
N
W E
S
Nassau St
Flushing Ave
Tillary St
Park Ave
Myrtle Ave
Broadway
Bushwick Ave
Cooper Ave
Cypress Hills St
Lafayette Ave
Dekalb Ave
Livingston St
Atlantic Ave
Fulton St
Truxton St
Jamaica Ave
Rockaway Blvd
Conduit Blvd
Conduit Ave
Liberty Ave
New York Ave
Eastern Pky
Prospect Ave
Parkside Ave
Church Ave
Beverly Rd
Clarendon Rd
Foster Ave
Ditmas Ave
Flatbush Ave
Seaview Ave
Flatlands Ave
Rockaway Pkwy
Kings Hwy
Utica Ave
Nostrand Ave
Pennsylvania Ave
Fort Hamilton Pkwy
39th St
44th St
5th Ave
6th Ave
7th Ave
4th Ave
67th St
65th St
Washington Ave
Bedford Ave
Marcy Ave
Lewis Ave
Stuyvesant Ave
Malcolm X Blvd
Carlton Ave
Ashland Pl
Smith St
Clinton St
Henry St
Hamilton Ave
Columbia St
Lorraine St
3rd Ave
9th St
8th Ave
Prospect Pk
Mc Donald Ave
11th Ave
New York
Howard Ave
Elder Ln
Etna St
Euclid Ave
Woodhaven Blvd
Cross Bay Blvd
Centerville St
Lefferts Blvd
South Rd
94th Ave
Sutphin Blvd
Guy R Brewer Blvd
Baisley Blvd
Merrick Blvd
Springfield Blvd
Linden Blvd
Farmers Blvd
150th St
147th Ave
156th Ave
John F Kennedy Intl
JFK Access Rd
Spring Creek Park
Gateway National Rec Area
Little Egg Marsh
Hook Creek
Nassau
Burnside Ave
Mott Ave
Bayview Ave
Sheridan Blvd
Beach 9th St
Beach Channel Dr
Rockaway Fwy
Rockaway Beach Blvd
Beach 131st St
Beach Channel Dr
Rockaway Beach Blvd
Rockaway Fwy
New York
Queens
Kings
INSET 2
PACIFIC ST
AMITY ST
CONGRESS ST
WARREN ST
BALTIC ST
KANE ST
ATLANTIC AV
DEAN ST
BERGEN ST
WYCKOFF ST
BUTLER ST
DOUGLASS ST
DE GRAW ST
SACKETT ST
PRESIDENT ST
CARROLL ST
SUMMIT ST
WOODHULL ST
1 PL
2 PL
3 PL
4 PL
NO NAME
LUQUER ST
NELSON ST
HUNTINGTON ST
CENTRE MALL
MILL ST
W 9 ST
HICKS ST
COLUMBIA ST
VAN BRUNT ST
HAMILTON AV
GOWANUS EP
BOE EN SB
BOE EN NB
BOE LINTGHY
BOE AP
BOE RP
BOERUM PL
GALLATIN PL
FULTON ST
GOLD ST
FLEET ST
DE KALB AV
LIVINGSTON ST
SCHERMERHORN ST
GROVE PL
STATE ST
HOYT ST
BOND ST
NEVINS ST
3 AV
2 AV
4 AV
5 AV
6 ST
4 ST
3 ST
2 ST
1 ST
5 ST
DENTON PL
GARFIELD PL
SMITH ST
COURT ST
TOMPKINS PL
CLINTON ST
STRONG PL
HENRY ST
CHEEVER PL
TIFFANY PL
ST MARKS PL
UNION ST
INSET 1
BEACH CHANNEL DR
ROCKAWAY FY
ROCKAWAY BEACH BL
SHORE FRONT PY
WAINWRIGHT CT
NEWPORT AV
NANCY CT
LOUISE CT
BCH 86 ST
BCH 96 ST
BCH 98 ST
BCH 99 ST
BCH 100 ST
BCH 101 ST
BCH 102 LA
BCH 105 ST
BCH 108 ST
BCH 109 ST
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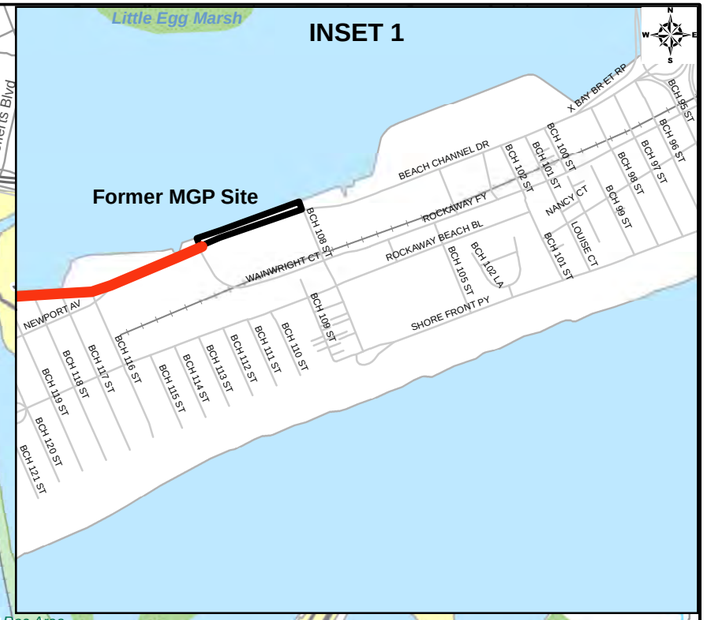
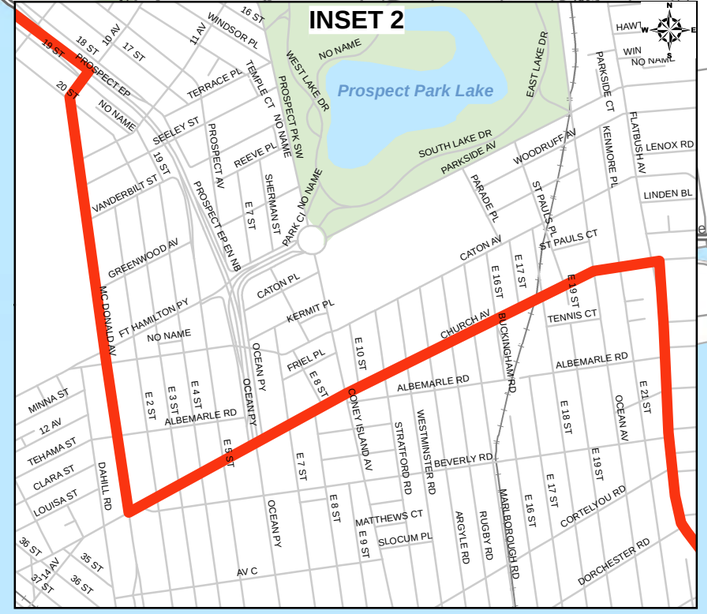
BCH 111 ST
BCH 112 ST
BCH 113 ST
BCH 114 ST
BCH 115 ST
BCH 116 ST
BCH 117 ST
BCH 118 ST
BCH 119 ST
BCH 120 ST
BCH 121 ST
NATIONAL GRID
FORMER MGP, ROCKAWAY PARK, NY
TRUCK ROUTE
DATE: 12/16/2014
DRWN: XW
JOB #: 60285723
FIGURE 1
AECOM
\\usnycs01\Gis\work\60137357_Rockaway\Mxd\Figure 2 Truck Route.mxd (National Grid on USNYCS01\Environment\ (Y))

INSET 1



INSET 2



Legend

Truck Route

0 0.5 1 2 Miles

N W E S

NATIONAL GRID
FORMER MGP, ROCKAWAY PARK, NY

DATE: 12/16/2014	DRWN: XW	JOB #: 60285723

TRUCK ROUTE

FIGURE 2

AECOM

J:\Rem_Eng\Project Files\National Grid\01765- Rockaway Park MGP Bulkhead\GIS\Mxd\Figure 1 Truck Route.mxd (National Grid on USNYCS01\Environment\ (Y))

Appendix A

Instruction to Truckers

Guidelines for Truck Drivers

1. All truckers must provide permits at the staging area.

2. Trucks are not allowed onsite before **7:00am** for any reason. Loading can only take place Monday-Friday from 7:00 am until 3:00 pm. Trucks must offload at the disposal facility the same day truck is loaded.

3. Trucks will be required to enter and exit the site via I-278 (Gowanus Expressway) and southbound on Prospect Expressway.

4. The truck route (Figure 1) shall be as follows:

    1) Traveling on I-278 (Staten Island/Brooklyn Queens Expressway)
    2) Continue onto I-495 East (Long Island Expressway
    3) Take exit for I-678 (Van Wyke Expressway) South
    4) Continue on Nassau Expressway
    5) Continue on Rockaway Boulevard
    6) Slight right onto Rockaway Turnpike
    7) Turn right onto Burnside Avenue
    8) Continue on Sheridan Boulevard
    9) Continue onto Beach Channel Drive
    10) Turn right off of Beach Channel Drive to enter Site.

    The alternate trucking route (Figure 2) shall be:

    1) Traveling on I-278 (Staten Island/Brooklyn Queens Expressway)
    2) Take Exit for 24 for Prospect Expressway
    3) Continue onto Ocean Parkway
    4) Make U-turn at Beverly Road
    5) Turn right onto Church St
    6) Turn right onto Flatbush Ave
    7) Continue onto Marine Parkway Bridge
    8) Continue onto Beach Channel Drive
    9) Turn right onto Rockaway Freeway
    10) Turn left onto Beach 108th Street
    11) Turn left onto Beach Channel Drive
    12) Turn right off of Beach Channel Drive to enter Site.

    A **staging area** located across Beach Channel Drive at the former Rockaway Park MGP site has been identified for trucks waiting to be loaded or to deliver, due to a lack of space for staging at the Site. Trucks must **remain** in staging area until radioed by contractor.

5. Stay in cab during loading, shut off the truck once in loading position.

6. Each truck will be lined with 6-mil-thick polyethylene sheeting prior to loading.

7. All trucks will be covered with a tarpaulin supplied by the trucking firm prior to leaving the Site.

8. After loading, all trucks will enter a decontamination pad where all residual soil will be removed from the truck body, wheels, and tires.

9. Trucks must off load at the disposal facility the same day they are loaded, must leave Site with enough time before facility closes.

10. All trucking traffic must obey New York City traffic regulations. In the event of a violation, immediate action, up to and including permanent driver dismissal from the project, will be taken. Particular care must be taken in sensitive areas, along residential streets, and near historic structures.

11. In the event that a loaded truck is involved in an incident that results in a release of the transported materials, the cleanup shall follow local and State Department of Transportation spill response procedures, and Site Contractor shall be notified immediately. Truck must remain at the scene of the accident or spill until clean up is complete.