78-02 QUEENS BOULEVARD

QUEENS, NEW YORK

Remedial Action Work Plan

NYC VCP Project Number:
OER Project Number: 15EHAZ298Q

Prepared for:

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MARCH 2015

REMEDIAL ACTION WORK PLAN
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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYS DEC	New York State Department of Environmental Conservation
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental

	Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PCBs	Professional Engineer Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

CERTIFICATION

I, Andrew R. Levenbaum, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 78-02 Queens Boulevard Site (NYC OER Project Number 15EHAZ298Q).

I, Paul P. Stewart am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 78-02 Queens Boulevards Site (NYC OER Project Number 15EHAZ298Q).

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

_____
Name

_____
NYS PE License Number

_____
Signature

_____
Date

PE Stamp

_____
QEP Name

_____
QEP Signature

_____
Date

EXECUTIVE SUMMARY

Times Development Inc. is working with the NYC Office of Environmental Remediation (OER) to investigate and remediate a 10,325-square foot site located at 78-02/06 Queens Boulevard in Queens, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 78-02/06 Queens Boulevard in the Elmhurst section in Queens, New York and is identified as Block 2453 and Lots 42 and 44 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,325-square feet and is bounded by Queens Boulevard, followed by a 1-story commercial building to the north, a 1-story automotive repair shop to the south, a 7-story vacant hotel to the east, and Hillyer Street, followed by a 1-story commercial building to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is vacant and consists of a dirt and gravel lot.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of an 11 story mixed-use hotel and residential building. Layout of the proposed site development is presented in Figure 3. The current zoning designation is commercial (C4-2). The proposed use is consistent with existing zoning for the property.

The proposed redevelopment of the property includes a full build out of the property with a full cellar. The cellar with footings will be installed to a depth of 15’ below ground surface. There is an estimated 144,500 cubic yards of soil to be excavated, which is equal to approximately 8,600 tons of soil The cellar will be utilized for 30 parking spaces and utility rooms. The level at grade will consist of a driveway, hotel lobby, kitchen and restaurant, administrative offices and a community facility, there are no landscaped areas proposed. Floors 2

through 8 will be utilized for hotel lodging and community facilities, while floors 9 through 11 will be utilized for residential living space. The final height of the building is projected to be 137'. There will be approximately 890 square feet of retail usage, 1,200 square feet of commercial usage, 21 units of residential usage and 98 units of hotel usage.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

Summary of Environmental Findings

1. Elevation of the property is approximately 23 feet above sea level.
2. Depth to groundwater ranges from 7.18 to 7.66 feet at the Site.
3. Groundwater flow is generally from south to north beneath the Site.
4. Bedrock was not encountered during the scope of the investigation.
5. The stratigraphy of the site, from the surface down, consists of gray-brown fill materials mixed with sand to approximately 2', followed by light brown to brown clay mixed with medium sands to 10'.
6. Soil/fill samples collected during the RI were compared to NYSDEC Part 375-6.8 Unrestricted Use (Track 1) and Restricted Residential Use (Track 2) Soil Cleanup Objectives (SCOs). Soil sampling showed that no VOCs except for acetone (max 150 µg/kg) was detected above Track 1 SCOs. Two pesticides including 4,4'-DDT (max of 58 µg/kg), and 4,4'-DDE (max of 4.7 µg/kg) and one PCB, Aroclor 1260 (max of 120 µg/kg) were detected above their respective Track 1 SCOs. A total of 7 SVOCs were detected above their respective Restricted Residential SCOs in the shallow soil samples. Benzo(a)pyrene (max of 15,000 µg/kg), indeno(1,2,3-c,d)pyrene (max of 5,600 µg/kg) benzo(a)anthracence (max of 19,000 µg/kg), benzo(b)fluoranthene (max of 18,000 µg/kg), dibenzo(a,h)anthracene (max of 2,300 µg/kg), chrysene (max of 19,000 µg/kg), benzo(k)fluoranthene (max of 5,300 µg/kg). Metals including barium (max of 488 ug/kg), cadmium (max of 2.85 µg/kg), copper (max of 141 µg/kg), mercury (max of 0.32 µg/kg), nickel (max of 37.4 µg/kg), zinc (max of 854 µg/kg) and lead (max of 1,420 ug/kg) exceeded their respective Unrestricted Use SCOs. And of these metals, barium,

cadmium, mercury and lead also exceeded Restricted Residential Use SCOs. The majority of soil contamination is restricted to shallow soils and is indicative of historic fill materials.

7. Groundwater samples collected during the RI were compared to NYSDEC 6NYCRR Part 703.5 Groundwater Quality Standards (GQS). Groundwater sampling showed that no SVOCs were detected above laboratory method detection limits. One VOC, acetone was detected above it's GQS with a concentration of 61 µg/L. Several metals were identified in the groundwater samples and only selenium (max of 10.2 µg/L) exceeded its GQS in the filtered groundwater.

8. Soil vapor samples collected during the RI were compared to the compounds listed in Table 3.1 Air Guideline Values Derived by the NYSDOH located in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion. All of the detected compounds were below their respective guidance values. Soil vapor samples collected during the subsurface investigation showed all four samples contained low levels of petroleum and chlorinated VOCs. Several low level concentrations were detected for petroleum related and chlorinated VOCs. Petroleum related compounds (BTEX were detected at a maximum concentrations of 221 µg/m^3. Most compounds were detected at less than 20 µg/m^3. Highest levels were detected for acetone (maximum of 722 µg/m^3) and ethanol (maximum of 290 µg/m^3). The chlorinated VOC, Tetrachloroethylene (PCE) was identified in two of the four soil vapor samples at a maximum concentration of 47.7 µg/m^3. Carbon Tetrachloride was detected in the same two soil vapor samples at a maximum concentration of 3.96 µg/m^3. 1,1,1-Trchloroethane (TCA) and Trichloroethylene (TCE) were not detected in any soil vapor samples. PCE concentrations were below the monitoring and mitigation levels detected by NYSDOH matrix.

Summary of the Remedy

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and

guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s).
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. The entire footprint of the Site or describe which part will be excavated to a depth of approximately 15 feet below grade for development purposes. A small portion of property will be excavated to the depths of 20 feet below grade for elevator pit(s). Approximately 8,600 tons of soil/fill will be removed from the Site.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
8. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
9. Removal of underground storage tanks (USTs) (if encountered) and closure of petroleum

spills (Spill number of existing spill or if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.

10. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of Track 1 SCOs.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
14. Dewatering in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site disposal or be treated as necessary to meet New York City Department of Environmental Protection (NYCDEP) requirements, and discharged to the sewer system through NYCDEP permit.
15. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
16. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements will be implemented as part of new development and will constitute Engineering and

Institutional controls:

17. As part of new development, a 60-mil waterproofing/vapor barrier system TAMKO® TW-60 Self-Adhering Sheet Waterproofing membrane will be installed beneath the building slab as well as behind foundation sidewalls of the proposed building below grade. In addition, the roof deck over the cellar will receive two coats of waterproofing fluid membrane (Sikalastic DeckPro Traffic and Waterproofing System) over a 10" thick concrete slab with a 2" rigid insulation and an additional 4" concrete.

18. As part of new development, construction and maintenance of an engineered composite cover consisting of 12-18" thick concrete footings, 10" concrete foundation slab and ramps and 7" concrete driveway. The city sidewalks will be 4-5" concrete. to prevent human exposure to residual soil/fill remaining under the Site. There will be no areas of landscaping;

19. As part of new development, construction of a ventilated parking garage as per NYC Building Department's codes and requirements.

20. If Track 1 is not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual materials, including plans for operation, maintenance, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency; and

21. If Track 1 SCOs are not achieved, the property will continue to be registered with an E-Designation by the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

NYC VOLUNTARY CLEANUP PROGRAM

78-02 Queens Boulevard

NYC OER SITE NUMBER: 15EHAZ298Q

Affiliation	Name	Phone	Email address
OER Project Manager (or)	Amanda Duchesne	212-341-2077	aduchesne@dep.nyc.gov
Site Project Manager	Simon Chen	718-321-3899	simonchen@timesdevelopment.com
Consultant	Theresa Burkard	516-441-5800	theresab@actenvirons.com
Property Owner	Times Development Inc	718-321-3899	simonchen@timesdevelopment.com
Document Repository	Lefrak City Library 98-30 57th Avenue Corona, NY 11368	718-592-7677	Hours Monday 9:00-8:00 Tuesday 1:00-6:00 Wednesday 10:00-6:00 Thursday 12:00-8:00 Friday 10:00-6:00 Saturday and Sunday Closed
www.nyc.gov/oer	www.nyc.gov/oer		

COMMUNITY PROTECTION STATEMENT

The NYC Office of Environmental Remediation (OER) provides governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan ("cleanup plan") describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Remedial Investigation and Cleanup Plan Under the oversight of the NYC OER, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

Site Safety Coordinator This project has a designated Site safety coordinator to implement the CHASP. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is identified at the beginning of the Community Protection Statement.

Worker Training Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan or CAMP. Results will be regularly reported to the NYC Office of Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager or NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document.

Quality Assurance This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Stormwater Management To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation will conform to requirements of Department of Buildings and will be conveyed to OER before the start of the remedial action.

Signage While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program, provides project contact names and numbers, and locations of project documents can be viewed.

Complaint Management The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager, the NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

Soil Chemical Testing and Screening All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

Trucks and Covers Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the

property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for public review online. A link to the online document repository and the public library with Internet access nearest the Site are listed on the first page of this Community Protection Statement document

Long-Term Site Management If long-term protection after the cleanup is needed, the property owner will be required to comply with an ongoing Site Management Plan (if Track 1 is not achieved) that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are established through a city environmental designation. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

Times Development Inc. is working with the Office of Environmental Remediation (OER) to investigate and remediate a property located at 78-02/06 Queens Boulevard in the Elmhurst section of Queens, New York (the "Site"). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 78-02/06 Queens Boulevard in the Elmhurst section in Queens, New York and is identified as Block 2453 and Lots 42 and 44 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,325-square feet and is bounded by Queens Boulevard, followed by a 1-story commercial building to the north, a 1-story automotive repair shop to the south, a 7-story vacant hotel to the east, and Hillyer Street, followed by a 1-story commercial building to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is vacant and consists of a dirt and gravel lot.

1.2 PROPOSED REDEVELOPMENT PLAN

The proposed future use of the Site will consist of an 11 story mixed-use hotel and residential building. Layout of the proposed site development is presented in Figure 3. The current zoning designation is commercial (C4-2). The proposed use is consistent with existing zoning for the property.

The proposed redevelopment of the property includes a full build out of the property with a full cellar. The cellar with footings will be installed to a depth of 15' below ground surface. There is an estimated 144,500 cubic yards of soil to be excavated, which is equal to approximately 8,600 tons of soil. The cellar will be utilized for 30 parking spaces and utility rooms. The level at grade will consist of a driveway, hotel lobby, kitchen and restaurant, administrative offices and a community facility, there are no landscaped areas planned. Floors 2 through 8 will be utilized for hotel lodging and community facilities, while floors 9 through 11 will be utilized for residential living space. The final height of the building is projected to be 137'. There will be approximately 890 square feet of retail usage, 1,200 square feet of commercial usage, 21 units of residential usage and 98 units of hotel usage.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The site is located at 76-02/06 Queens Boulevard in the Elmhurst section of Brooklyn. The surrounding area site consists of an auto repair shop, a vacant hotel, residential homes and commercial buildings. The zoning for the area is C4-2 commercial. There are no sensitive receptors such as schools, hospitals or day care facilities within a 500-foot radius of the site.

Figure 4 shows the surrounding land usage.

1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, 78-02 Queens Boulevard*", dated January, 2015 (RIR).

Summary of Past Uses of Site and Areas of Concern

A Phase I Environmental Site Assessment was completed on January 2nd, 2014 by Advanced Cleanup Technologies, Inc. (ACT). The previous usage of the property consisted of a one-story sheet metal works building with a basement in 1932. By 1951 a one-story auto house was added to the site. By 1981, a one-story used auto sales building was added to the property. As of 2002,

the auto house and sheet metal works building were demolished, leaving the auto sales building through 2006. The Phase I identified the following Recognized Environmental Conditions (RECs):

- Historical industrial use of the subject property.
- Historical industrial use of the adjacent property to the south.
- An open petroleum spill at the adjacent property to the south.

ACT recommended a Phase II Subsurface Investigation should be performed to determine the extent, if any, that RECs had impacted the environmental quality of the subject property.

The AOCs identified for this site include:

1. Portions of the property historically utilized for industrial usage.

Summary of the Work Performed under the Remedial Investigation

Times Development Inc. performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Performed a Ground-Penetrating Radar survey over exterior portions of the site;
3. Installed seven soil borings across the entire project Site, and collected thirteen soil samples for chemical analysis from the soil borings to evaluate soil quality;
4. Installed three groundwater monitoring wells throughout the Site to establish groundwater flow and collected three groundwater samples for chemical analysis to evaluate groundwater quality;
5. Installed four soil vapor probes around Site perimeter and collected four samples for chemical analysis.

Summary of Environmental Findings

1. Elevation of the property is approximately 23 feet above sea level.

2. Depth to groundwater ranges from 7.18 to 7.66 feet at the Site.

3. Groundwater flow is generally from south to north beneath the Site.

4. Bedrock was not encountered during the scope of the investigation.

5. The stratigraphy of the site, from the surface down, consists of gray-brown fill materials mixed with sand to approximately 2', followed by light brown to brown clay mixed with medium sands to 10'.

6. Soil/fill samples collected during the RI were compared to NYSDEC Part 375-6.8 Unrestricted Use (Track 1) and Restricted Residential Use (Track 2) Soil Cleanup Objectives (SCOs). Soil sampling showed that no VOCs except for acetone (max 150 µg/kg) was detected above Track 1 SCOs. Two pesticides including 4,4'-DDT (max of 58 µg/kg), and 4,4'-DDE (max of 4.7 µg/kg) and one PCB, Aroclor 1260 (max of 120 µg/kg) were detected above their respective Track 1 SCOs. A total of 7 SVOCs were detected above their respective Restricted Residential SCOs in the shallow soil samples. Benzo(a)pyrene (max of 15,000 µg/kg), indeno(1,2,3-c,d)pyrene (max of 5,600 µg/kg) benzo(a)anthracence (max of 19,000 µg/kg), benzo(b)fluoranthene (max of 18,000 µg/kg), dibenzo(a,h)anthracene (max of 2,300 µg/kg), chrysene (max of 19,000 µg/kg), benzo(k)fluoranthene (max of 5,300 µg/kg). Metals including barium (max of 488 ug/kg), cadmium (max of 2.85 µg/kg), copper (max of 141 µg/kg), mercury (max of 0.32 µg/kg), nickel (max of 37.4 µg/kg), zinc (max of 854 µg/kg) and lead (max of 1,420 ug/kg) exceeded their respective Unrestricted Use SCOs. And of these metals, barium, cadmium, mercury and lead also exceeded Restricted Residential Use SCOs. The majority of soil contamination is restricted to shallow soils and is indicative of historic fill materials.

7. Groundwater samples collected during the RI were compared to NYSDEC 6NYCRR Part 703.5 Groundwater Quality Standards (GQS). Groundwater sampling showed that no SVOCs were detected above laboratory method detection limits. One VOC, acetone was detected above it's GQS with a concentration of 61 µg/L. Several metals were identified in the groundwater samples and only selenium (max of 10.2 µg/L) exceeded its GQS in the filtered groundwater.

8. Soil vapor samples collected during the RI were compared to the compounds listed in Table 3.1 Air Guideline Values Derived by the NYSDOH located in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion. All of the detected compounds were below their respective guidance values. Soil vapor samples collected during the subsurface investigation showed all four samples contained low levels of petroleum and chlorinated VOCs. Several low level concentrations were detected for petroleum related and chlorinated VOCs. Petroleum related compounds (BTEX were detected at a maximum concentrations of 221 $\mu g/m^3$. Most compounds were detected at less than 20 $\mu g/m^3$. Highest levels were detected for acetone (maximum of 722 $\mu g/m^3$) and ethanol (maximum of 290 $\mu g/m^3$). The chlorinated VOC, Tetrachloroethylene (PCE) was identified in two of the four soil vapor samples at a maximum concentration of 47.7 $\mu g/m^3$. Carbon Tetrachloride was detected in the same two soil vapor samples at a maximum concentration of 3.96 $\mu g/m^3$. 1,1,1-Trchloroethane (TCA) and Trichloroethylene (TCE) were not detected in any soil vapor samples. PCE concentrations were below the monitoring and mitigation levels detected by NYSDOH matrix.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Groundwater

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

Soil

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

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process under is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Land use; and
- Sustainability.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

Alternative 1 involves:

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs have been achieved with post-excavation endpoint sampling. If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level is complete,

additional excavation will be performed to ensure complete removal of soil that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup, but a vapor barrier/ waterproofing system would be installed beneath the basement foundation and behind foundation sidewalls of the new building as a part of development to prevent any potential future exposures from off-Site soil vapor.
- Placement of a final cover over the entire Site as part of construction.

Alternative 2 involves

- Establishment of Site-Specific (Track 4) SCOs (listed in Section 4.2).
- Removal of all soil/fill exceeding Track 4 Site-Specific SCOs and confirmation that Track 4 Site-Specific SCOs have been achieved with post-excavation endpoint sampling. Excavation for construction of the new building's cellar level would take place to a depth of approximately 15 feet across the entire Site. If soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation, additional excavation will be performed to meet Track 4 Site-Specific SCOs.
- Placement of a cover system over the entire Site to prevent exposure to remaining soil/fill;
- Installation of a waterproofing/vapor barrier system beneath the building slab and along foundation side walls to prevent potential exposures from soil vapor;
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of sensitive Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval;
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. The SMP will note that the property owner and property owner’s successors and assigns must comply with the approved SMP; and

- The property will continue to be registered with an E-Designation at the NYC Buildings Department.
- Continued registration as an E-designated property to memorialize the remedial action and the Engineering and Institutional Controls required by this RAWP.

3.1 THRESHOLD CRITERIA

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and the environment by removing contaminated soil/fill exceeding Track 1 Unrestricted Use SCOs and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater.

Alternative 2 would achieve comparable protections of human health and the environment by excavating the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site-Specific SCOs, as well as by placement of Institutional and Engineering controls, including a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls including a Site Management Plan and continued "E" designation of property would ensure that the composite cover system remains intact and protective. Establishment of Track 4 Site-Specific SCOs would minimize the risk of contamination leaching into groundwater.

For both Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil/Materials Management Plan and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by

city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing a vapor barrier below and sub-grade ventilated parking .

3.2 BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCOs and Protection of Groundwater SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a waterproofing/vapor barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls, as part of development. In addition, the cellar floor of the building will contain a ventilated garage per City Department of Buildings codes.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by installing a waterproofing/vapor barrier system below the new building's basement slab and continuing the vapor barrier around foundation walls. A Site Management Plan would ensure that these controls remained protective for the long term. In addition, the cellar floor of the building will contain a ventilated garage per City Department of Buildings codes.

Health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) that comply with the applicable SCGs shall be implemented during Site redevelopment under this RAWP. For both Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

Short-term effectiveness and impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

Both Alternatives 1 and 2 have similar short-term effectiveness during their respective implementations, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts could potentially be higher for Alternative 1 if excavation of greater amounts of historical fill material is encountered below the excavation depth of the proposed building. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

An additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Approximately 10,147, 25-ton capacity truck trips would be necessary to transport fill and soil excavated during Site development. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flaggers will be used to protect pedestrians at Site entrances and exits.

The effects of these potential adverse impacts to the community, workers and the environment would be minimized through implementation of corresponding control plans including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. Both alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a Construction Health and Safety Plan (CHASP) would be protected from on-Site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of Engineering Controls/Institutional Controls (ECs/ICs) that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs.

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCOs. Removal of on-Site contaminant sources will prevent future groundwater contamination.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs; a composite cover system across the Site, maintaining use restrictions, establishing an SMP to ensure long-term management of ICs, ECs, and maintaining continued registration as an E-designated property (if E site) to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity.

Both alternatives would result in removal of soil contamination exceeding their respective SCOs, providing the highest level, most effective and permanent remedy over the long-term with respect to a remedy for contaminated soil, which will eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination will also be eliminated as part of the remedy.

Reduction of toxicity, mobility, or volume of contaminated material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that

are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Track 1 Unrestricted Use SCOs.

Alternative 2 would remove most of the historic fill at the Site, and any remaining on-Site soil beneath the new building will meet Track 4 Site-Specific SCOs.

Alternative 1 would eliminate a greater total mass of contaminants on Site. The removal of soil to 15 feet for the new development in both scenarios would probably result in relatively minor differences between these two alternatives.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The techniques, materials and equipment to implement both remedial Alternatives 1 and 2 are readily available and have been proven effective in remediating the contaminants associated with the Site. They use standard materials and services that are well established technology. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

Cost effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site

management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Since historic fill at the Site was found during the RI to only extend to a depth of up to 2 feet below grade, and the new building requires excavation of the entire Site to a depth of 15 ft, the costs associated with both Alternative 1 and Alternative 2 will likely be the comparableLong-term costs for Alternative 2 are likely higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan creates an approach that combines the remedial action with the redevelopment of the Site, including the construction of the building foundation and subgrade structures. The remedial plan is also cost effective in that it will take into consideration the selection of the closest and most appropriate disposal facilities to reduce transportation and disposal costs during the excavation of historic fill and other soils during the redevelopment of the Site.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial permitting associated with the proposed site development, no adverse community opinion is anticipated for either alternative. This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix 2. Observations here will be supplemented by public comment received on the RAWP.

Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the

general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes an 11-story mixed-use commercial hotel and residential building. Following remediation, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, both of which are appropriate for its planned residential use. The reasonably anticipated future use of the Site and its surroundings will be documented by the applicant in the NYC VCP application, which will include the following conclusions:

The proposed redevelopment of the Site is compatible with its current zoning and is consistent with recent development patterns. The areas surrounding the site are urban and consist of predominantly mixed residential and commercial buildings in zoning districts designated for commercial and residential uses. The development would replace an underutilized site with a modern residential building. The proposed development would create new employment opportunities, living space, and economic and fiscal benefits to the City and State in the form of economic revitalization and tax revenue.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs or Track 4 Site-Specific SCOs, which are appropriate for its planned residential use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area with limited proximity to fish or wildlife. Both alternatives would

prevent any potential exposure pathways of contaminant migration affecting fish or wildlife. Municipal water supply wells are not present in this part of City; therefore, groundwater from the Site cannot affect municipal water supply wells or recharge areas. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. Both alternatives are equally protective of natural resources and cultural resources.

Improvements in the current environmental condition of the property achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse.

Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

While Alternative 2 would potentially result in lower energy usage based on reducing the volume of material transported off-Site, both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. The New York City Clean Soil Bank program may be utilized for reuse of native soils. To the extent practicable, energy efficient building materials, appliances, and equipment will be utilized to complete the development. A complete list of green remedial activities considered as part of the NYC VCP is included in the Sustainability Statement, included as Appendix 3.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The preferred remedial action alternative is the Track 1 Alternative. The preferred remedial action alternative achieves protection of public health and the environment for the intended use of the property. The preferred remedial action alternative will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Perform additional site characterization sampling of soil, groundwater or soil vapor if required (explain number of samples and media).
6. Completion of a Waste Characterization Study prior to excavation activities. Waste characterization soil samples will be collected at a frequency dictated by disposal facility(s).
7. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. The entire footprint of the Site or describe which part will be excavated to a depth of approximately 15 feet below grade for development purposes. A small portion of

property will be excavated to the depths of 20 feet below grade for elevator pit(s). Approximately 8,600 tons of soil/fill will be removed from the Site.

8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.

9. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.

10. Removal of underground storage tanks (USTs) (if encountered) and closure of petroleum spills (Spill number of existing spill or if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.

11. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.

12. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of Track 1 SCOs.

13. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.

14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.

15. Dewatering (if needed) in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site disposal or be treated as necessary to meet New York City Department of Environmental Protection (NYCDEP)

requirements, and discharged to the sewer system through NYCDEP permit.

16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

17. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements will be implemented as part of new development and will constitute Engineering and Institutional controls:

18. As part of new development, a 60-mil waterproofing/vapor barrier system TAMKO® TW-60 Self-Adhering Sheet Waterproofing membrane will be installed beneath the building slab as well as behind foundation sidewalls of the proposed building below grade. In addition, the roof deck over the cellar will receive two coats of waterproofing fluid membrane (Sikalastic DeckPro Traffic and Waterproofing System) over a 10" thick concrete slab with a 2" rigid insulation and an additional 4" concrete.

19. As part of new development, construction and maintenance of an engineered composite cover consisting of 12-18" thick concrete footings, 10" concrete foundation slab and ramps and 7" concrete driveway. The city sidewalks will be 4-5" concrete. to prevent human exposure to residual soil/fill remaining under the Site. There will be no areas of landscaping;

20. As part of new development, construction of a ventilated parking garage as per NYC Building Department's codes and requirements.

21. If Track 1 is not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual materials, including plans for operation, maintenance, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency; and

22. If Track 1 SCOs are not achieved, the property will continue to be registered with an E-Designation by the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track 1 SCOs are proposed for this project. If 6 NYCRR Part 375, Table 6.8(a) Track 1 Unrestricted Use is not achieved, the 6 NYCRR Part 375, Table 6.8(b) Track 2 (Residential/Restricted Residential/Commercial/Industrial) SCOs will be used as amended by the following Site-Specific Track 4 SCOs:

Contaminant	**Track 4 SCOs**
Total SVOCs	250 ppm
Lead	1,000 ppm
Mercury	2.0 ppm

These SCOs were established during RAWP scoping meeting.

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 4. The entire property is going to be excavated to allow for the full cellar.

Discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 8,600 tons.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-point Sampling

End-point samples will be analyzed for compounds and elements as described below utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs performing end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values.

Confirmation End-point Sampling Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. 3 confirmation samples will be collected from the base of the excavation at locations to be determined by OER. To evaluate attainment of Track 4 Site-specific SCOs, analytes will include those for which SCOs have been developed, including list from above, i.e. SVOCs and metals according to analytical methods described above. If Track 1 Unrestricted Use SCOs are pursued, samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals according to analytical methods described above.

Additional Hotpsot Sampling If hotspots are identified during the remedial program, hotspot removal actions will be performed to ensure that hot-spots are fully removed. Analytes for end-point sampling will be those parameters that are driving the hot-spot removal action and will be approved by OER. Analysis will be performed according to analytical methods described above. Frequency for hot-spot end-point sample collection is as follows:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.

2. For excavations 20 to 300 feet in perimeter:

- For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
- For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.

4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and "finger print analysis" and required regulatory reporting (i.e. spills hotline) will be performed.

Quality Assurance/Quality Control

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

One blind duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. One trip blank will be submitted to the laboratory with each shipment of soil samples. Trip blanks will not be used for samples to be analyzed for metals, SVOCs or pesticides.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or "cold-paks" to maintain a temperature of $4^{o}C$.

Dedicated disposable sampling materials will be used for the collection endpoint samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. Decontamination of non-dedicated sampling equipment will consist of the following:

- Gently tap or scrape to remove adhered soil
- Rinse with tap water
- Wash with alconox® detergent solution and scrub
- Rinse with tap water
- Rinse with distilled or deionized water

Field blanks will be prepared by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers.

Import and Reuse of Soils

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 4. Soil import is not anticipated at this time.

4.3 ENGINEERING CONTROLS

The excavation required for the proposed Site development will achieve Track 1 Unrestricted Use SCOs. Track 1 remedial actions do not require Engineering Controls. However, the following elements will be incorporated into the foundation design as part of the development: composite cover system and soil vapor barrier. If Track 1 is not achieved, these elements will constitute Engineering Controls that will be employed in the remedial action to address residual contamination remaining at the Site.

- composite cover system consisting of asphalt covered roads, concrete covered sidewalks, concrete building slab, and clean imported soil in landscaped areas;
- soil vapor barrier; and
- ventilated garage.

Composite Cover

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system is comprised of a 10-inch thick concrete building slab beneath the areas of proposed cellar and ramps, which will encompass the entire property. The driveways will consist of a 7" concrete slab. There are no proposed landscaped areas for the building.

- The foundation wall thickness will range between 12-18" of concrete;
- The cellar slab and ramps will consist of approximately 10" thick concrete;
- The concrete sidewalk over the cellar will consist of a 10" thick slab covered by two coats of waterproofing fluid membrane (Sikalastic DeckPro Traffic and Waterproofing System) with a 2" rigid insulation and an additional 4" concrete;
- The driveways on city sidewalks will have 7" of concrete.

If Track 1 Unrestricted Use SCOs are not achieved at the Site, the composite cover system will be a permanent engineering control. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover

system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RAR.

Vapor Barrier

As part of new development, migration of potential soil vapor from onsite or offsite sources in the future will be mitigated with a combination of building slab and vapor barrier. The vapor barrier will consist of a 60-mil waterproofing/vapor barrier system TAMKO® TW-60 Self-Adhering Sheet Waterproofing membrane installed beneath the entire building slab as well as behind foundation sidewalls of the proposed parking cellar below grade in accordance with the manufacturer specifications. In addition, the roof deck over the cellar will receive two coats of waterproofing fluid membrane (Sikalastic DeckPro Traffic and Waterproofing System) over concrete slab with a 2" rigid insulation and 4" concrete.

The project's Professional Engineer licensed by the State of New York will have primary direct responsibility for overseeing the implementation of the vapor barrier. Product specification sheets are provided in Figure 9. The Remedial Action Report will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty**.**

If Track 1 Unrestricted Use SCOs are not achieved at the Site, the vapor barrier system (as part of the composite cover system) will be a permanent engineering control. The composite cover system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RAR.

Ventilated Parking Garage

As part of development, cellar will be used as a parking garage.

The cellar garage will be ventilated per codes and requirements of NYC Department of Buildings.

4.4 INSTITUTIONAL CONTROLS

Track 1 remedial actions do not require Engineering Controls. If Track 1 SCOs are not achieved, Institutional Controls (IC) will be utilized in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs will be established in a Declaration of Covenant and Restrictions (DCR) assigned to the property by the titleholder and will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

Institutional Controls for this remedial action are:

- Continued registration of the E-Designation for the property if Track 1 SCOs are not achieved. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the SMP which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a SMP in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and IC's. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(l)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;

- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for residential and commercial use and will not be used for a higher level of use without prior approval by OER.

4.5 SITE MANAGEMENT PLAN

Site Management is not required for Track 1 remedial actions. However, if Track 1 SCOs are not achieved, Site Management will be the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Brownfield Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of EC's; (4) inspection and certification of EC's; and (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled by OER on a periodic basis to be established in the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by July 31 of the year following the reporting period.

4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Data and information reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Known and Potential Contaminant Sources

Based on the results of the RIR, the contaminants of concern are:

Soil:

SVOCs: Benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, chrysene, benzo(k)fluoranthene exceeded SCOs,

Metals: barium, cadmium, copper, mercury, nickel, zinc and lead exceeding SCOs.

Groundwater: Selenium and lead.

Soil Vapor: All compounds detected at trace concentrations. .

Nature, Extent, Fate and Transport of Contaminants

The information compiled during investigations has confirmed the presence of contaminated fill material from surface grade to an approximate depth of 2 feet bgs. SVOCs and metals are

present in the historic fill materials throughout the Site. Metal and SVOC contaminants found in soil were not detected in the groundwater samples at concentrations above their respective GQSs. The trace levels of petroleum and chlorinated VOCs identified in the soil vapor were well below guidance issued by New York State DOH and were not found in any of the on-Site soil samples collected.

Receptor Populations

On-Site Receptors: Because the site is currently vacant and an undeveloped dirt and gravel lot, access to Site is restricted by an 6-foot high, chained and locked, perimeter fence. Onsite receptors are limited to trespassers and site representatives and visitors granted access to the property. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers and visitors.

Off-Site Receptors: Potential off-site receptors within a 400-foot radius of the Site include: adult and child residents; commercial and construction workers; pedestrians; trespassers; and passerby based on the following:

1. Commercial Businesses (up to 400 foot) – existing and future
2. Residential Buildings (up to 400 foot) – existing and future
3. Building Construction/ Renovation (up to 400 foot) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to 400 foot) – existing and future
5. Schools (up to 400 foot) – existing and future

Potential Routes of Exposure

Three potential primary routes exist by which chemicals can enter the body: ingestion, inhalation, and dermal absorption. Exposure can occur based on the following potential media:

- Ingestion of groundwater or fill/ soil;
- Inhalation of vapors or particulates; and

- Dermal absorption of groundwater or fill/ soil.

Potential Exposure Points

Current Conditions: The site is currently a locked vacant dirt and gravel lot. Therefore, there are limited potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill. Groundwater is marginally contaminated with trace metals and is not exposed at the site, and because the site is served by the public water supply, groundwater is not used at the site and there are no potential for exposure. Because the site is currently undeveloped, there is no potential for soil vapor to accumulate on site.

Construction/ Remediation Activities: During the remedial action, onsite workers will come into direct contact with surface soils, subsurface soils, and groundwater, as a result of on-Site construction and excavation activities. Due to the depth of groundwater, contact with groundwater is expected. On-Site construction workers potentially could ingest, inhale or have dermal contact with any exposed impacted soil, and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan, dust controls, and through the implementation of the Community Air-Monitoring Program and a Construction Health and Safety Plan.

Proposed Future Conditions: Under future remediated conditions, all soils in excess of Track 1 SCOs will be removed. The site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and engineering controls (vapor barrier/parking garage) will prevent any exposure to potential for inhalation via soil vapor intrusion. The site is served by the public water supply, and groundwater is not used at the site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

Overall Human Health Exposure Assessment

There are potential exposure pathways for the current site condition based on exposed soils. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There is no complete exposure pathway under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated

use of the site, which includes a mixed-use commercial and residential structure, site-wide impervious surface cover cap, and a subsurface waterproofing/vapor barrier system for the building and a cellar level parking garage. The vapor barrier system will prevent potential vapor intrusion. The composite cover system will prevent contact with residual soil or groundwater. If Track 1 remedy is not achieved, continued protection after the remedial action will be achieved by the implementation of site management including periodic inspection and certification of the performance of remedial controls. Under current conditions, on-Site exposure pathways exist for those given access to the Site or trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program, the Soil/Materials Management Plan, and a Construction Health and Safety Plan. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 PROJECT ORGANIZATION AND OVERSIGHT

Principal personnel who will participate in the remedial action include Yisong Yang (ACT) as the designated Site Safety Officer, Timothy Young (ACT) as the alternate Site Safety Officer and Theresa Burkard (ACT) as the Project Manager. The Professional Engineer (PE) and Qualified Environmental Professional (QEP) for this project are Andrew R. Levenbaum and Paul P. Stewart, respectively.

5.2 SITE SECURITY

Site access will be controlled by a steel construction fence and gated entryway.

5.3 WORK HOURS

The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. The hours of operation will be conveyed to OER during the pre-construction meeting.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Yisong Yang. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour

refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the CHASP. That document will define the specific project contacts for use in case of emergency.

5.5 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance

of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 AGENCY APPROVALS

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 SITE PREPARATION

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed incompliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Mark-Out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

Dewatering

- Dewatering would be required in order to excavate the contaminated soil and fill material below the saturated zone or water table (expected to be seven to eight feet below grade). Dewatering for this site would require a pumping system, settling tanks, possibly a

treatment system, and the appropriate NYCDEP permits for discharged the groundwater into the sewer system.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from holes, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will by collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and OER will be notified and

corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of OER. If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362. If the source of the spill is ongoing and can be identified, it should be stopped it this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

Storm Response Reporting

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website (www.nyc.gov/oer) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 TRAFFIC CONTROL

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on Figure 10.

5.9 DEMOBILIZATION

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (*e.g.*, soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 REPORTING AND RECORD KEEPING

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

Record Keeping and Photo Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 COMPLAINT MANAGEMENT

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and

- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Continue registration of the property with an E-Designation by the NYC Department of Buildings.

- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

I, _____, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the Site name or address Site (NYC OER Project Number number and NYC VCP Project Number XXCVCPXXXX).

I, _____, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the Site name or address Site (NYC OER Project Number number and NYC VCP Project Number XXCVCPXXXX). (Optional)

I certify that the OER-approved Remedial Action Work Plan dated month day year and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

_____
Name

_____
NYS PE License Number

_____
Signature

_____
Date

PE Stamp

_____
QEP Name

_____
QEP Signature

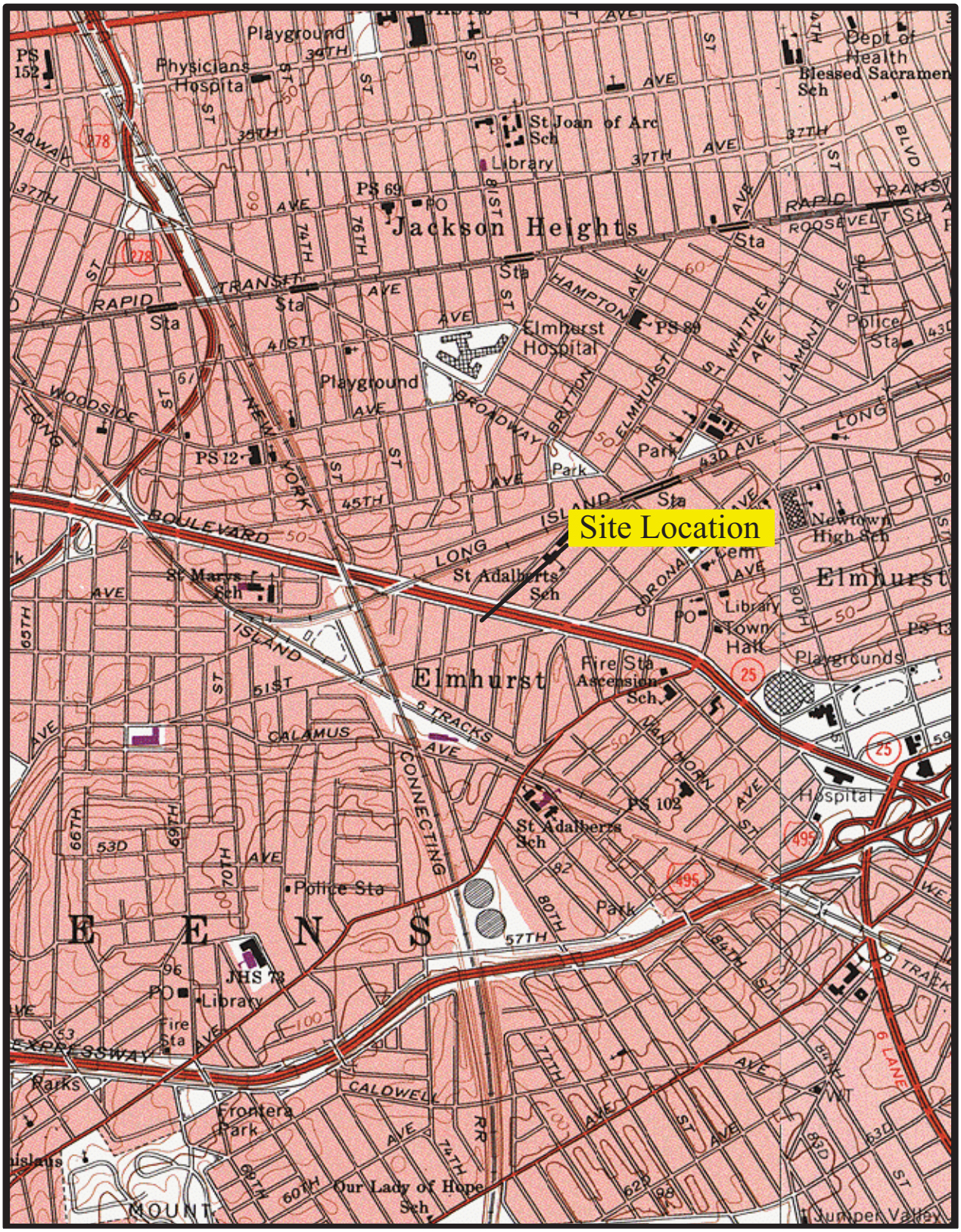
_____
Date

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 24 month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	1	1
Remedial Excavation	2	24
Demobilization	26	2
Submit Remedial Action Report		

FIGURE 1



From USGS 7.5 Minute Topographic Map Of Brooklyn, NY Quadrangle

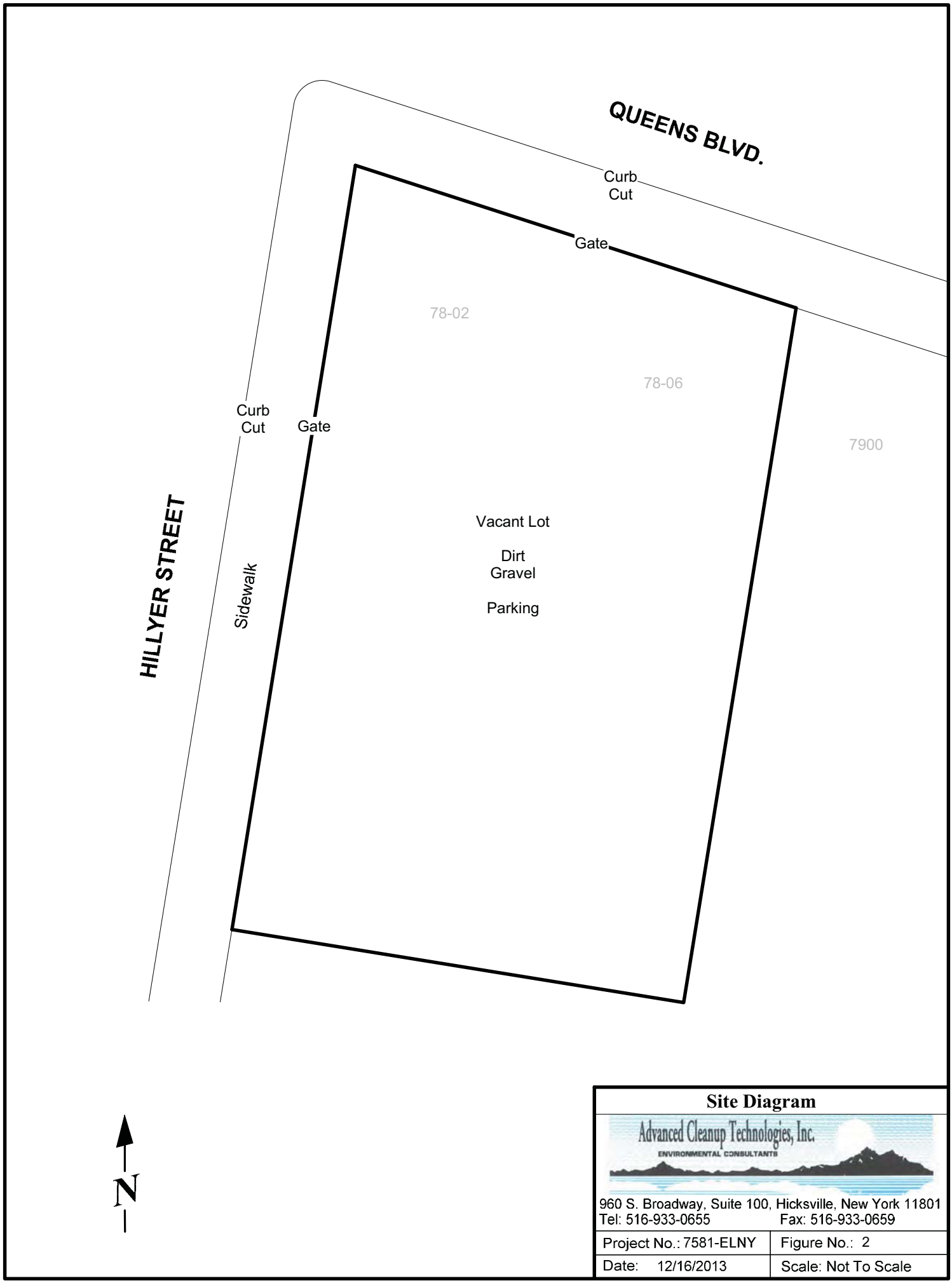
N

Locational Diagram

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
960 S Broadway, Suite 108, Hicksville, New York 11801
Tel: 516-933-0655 Fax: 516-933-0659

Project No.: 7581-ELNY	Figure No.: 1
Date: 12/05/2013	Scale: 1 inch = 2000 feet

FIGURE 2

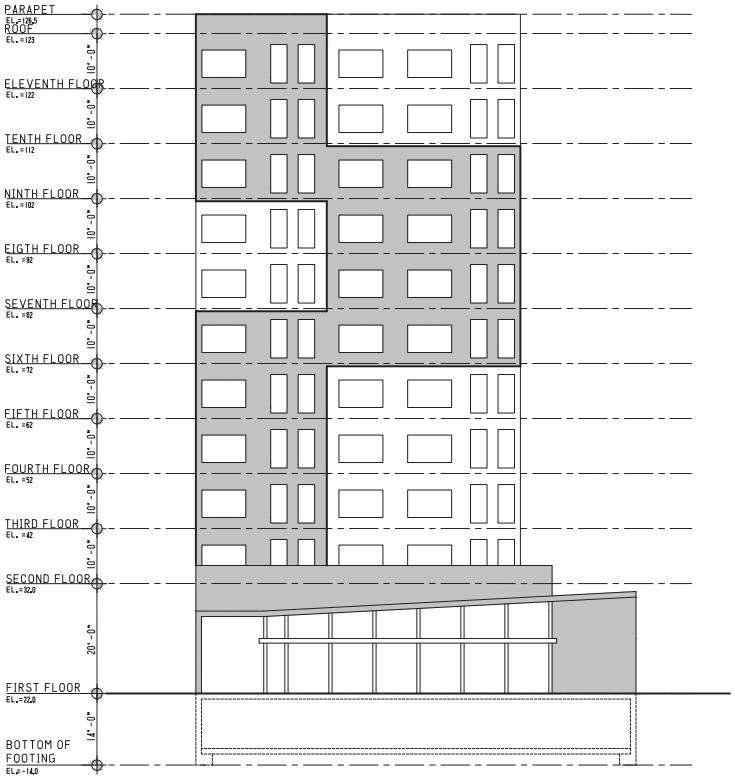


Site Diagram

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
960 S. Broadway, Suite 100, Hicksville, New York 11801
Tel: 516-933-0655 Fax: 516-933-0659

Project No.: 7581-ELNY	Figure No.: 2
Date: 12/16/2013	Scale: Not To Scale

FIGURE 3



01 QUEENS BOULEVARD ELEVATION
SCALE: 3/32" = 1'-0"

02 HILLYER STREET ELEVATION
SCALE: 3/32" = 1'-0"

KAMBANIS
ARCHITECT P.L.L.C
32-75 STEINWAY STREET, SUITE 201
ASTORIA NY, 11103
TEL : 718.606.9903
FAX : 718.606.8933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN N

PROJECT
78-02 QUEENS BLVD

DRAWING TITLE
BUILDING ELEVATIONS

SEAL & SIGNATURE

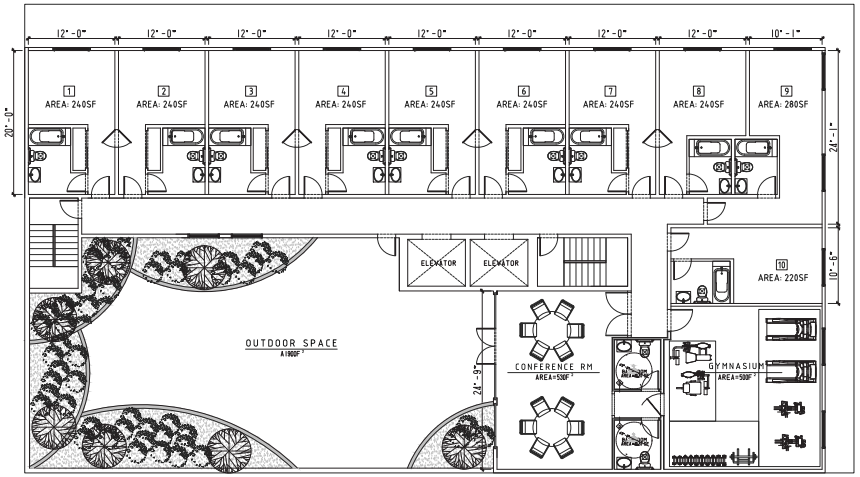
DATE: 07/1/14 | DRAWING BY:
SCALE: AS NOTED | CHECKED BY:

DWG NO:
A-300.00

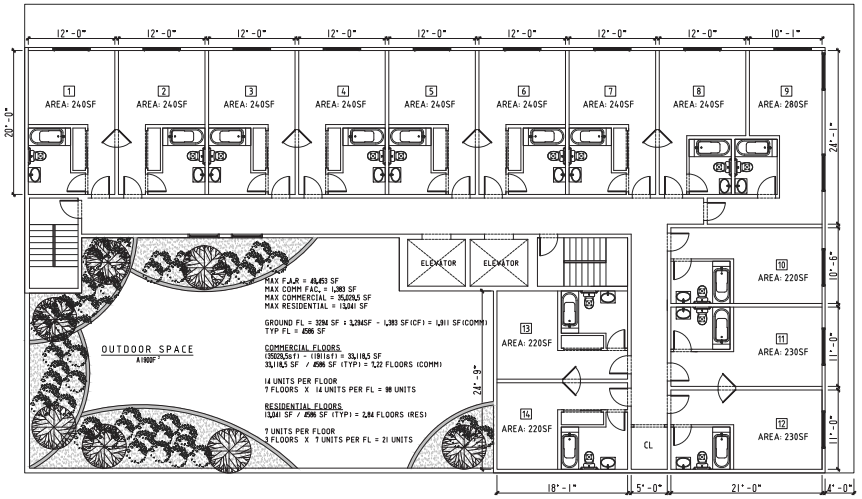
SHEET NO: 8

BSCAN STICKER

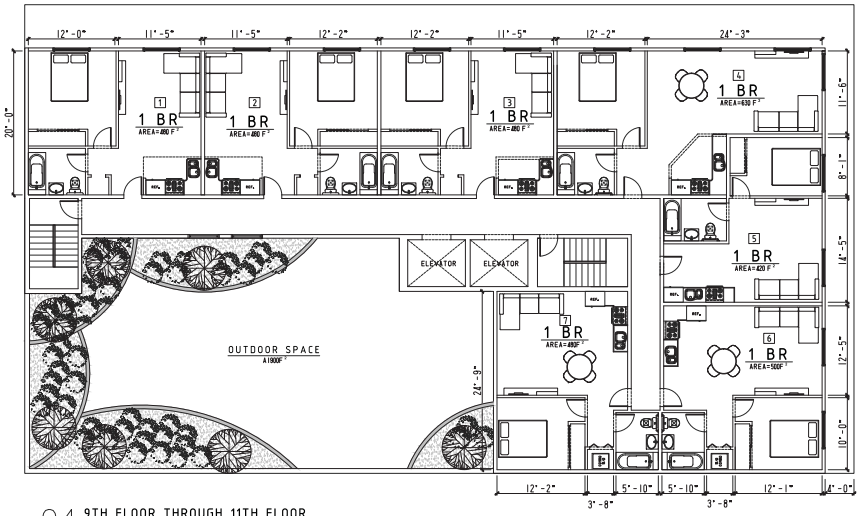
DOB APPROVAL STAMP



02 2ND FLOOR
SCALE: 3/32" = 1'-0"



03 3RD FLOOR THROUGH 8TH FLOOR
SCALE: 3/32" = 1'-0"



04 9TH FLOOR THROUGH 11TH FLOOR
SCALE: 3/32" = 1'-0"

KAMBANIS
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32-75 STEINWAY STREET, SUITE 201
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CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN N

PROJECT
78-02 QUEENS BLVD

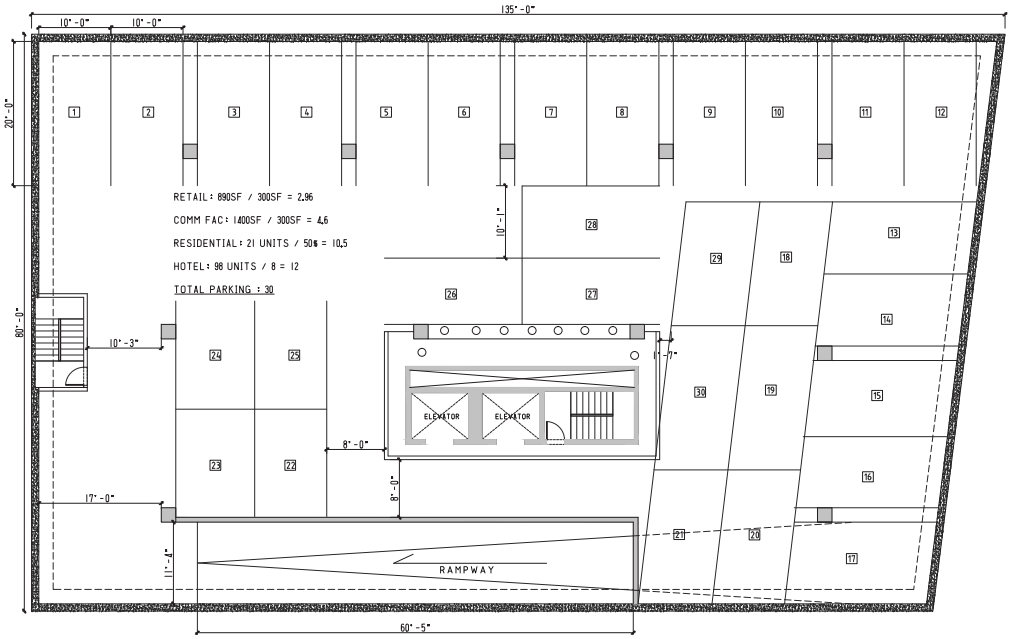
DRAWING TITLE

SEAL & SIGNATURE

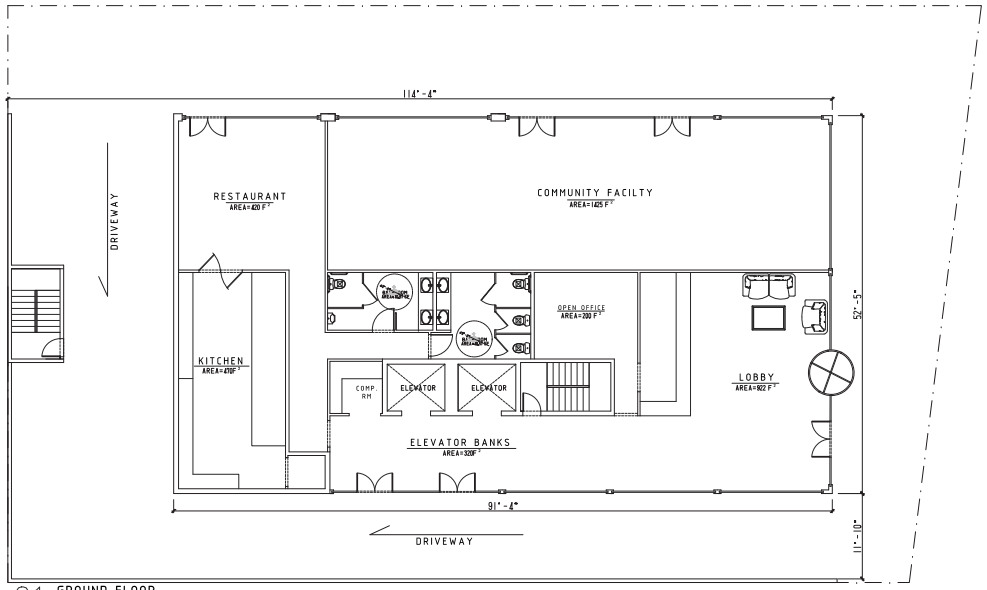
DATE: 07/1/14 | DRAWING BY:
SCALE: AS NOTED | CHECKED BY:
DWG NO:
SHEET NO:

BSCAN STICKER

DOB APPROVAL STAMP



00 CELLAR FLOOR
SCALE: 3/32" = 1'-0"



01 GROUND FLOOR
SCALE: 3/32" = 1'-0"

KAMBANIS
ARCHITECT P.L.L.C
32-75 STEINWAY STREET, SUITE 201
ASTORIA NY, 11103
TEL : 718.606.9903
FAX : 718.606.8933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN N

PROJECT
78-02 QUEENS BLVD

DRAWING TITLE

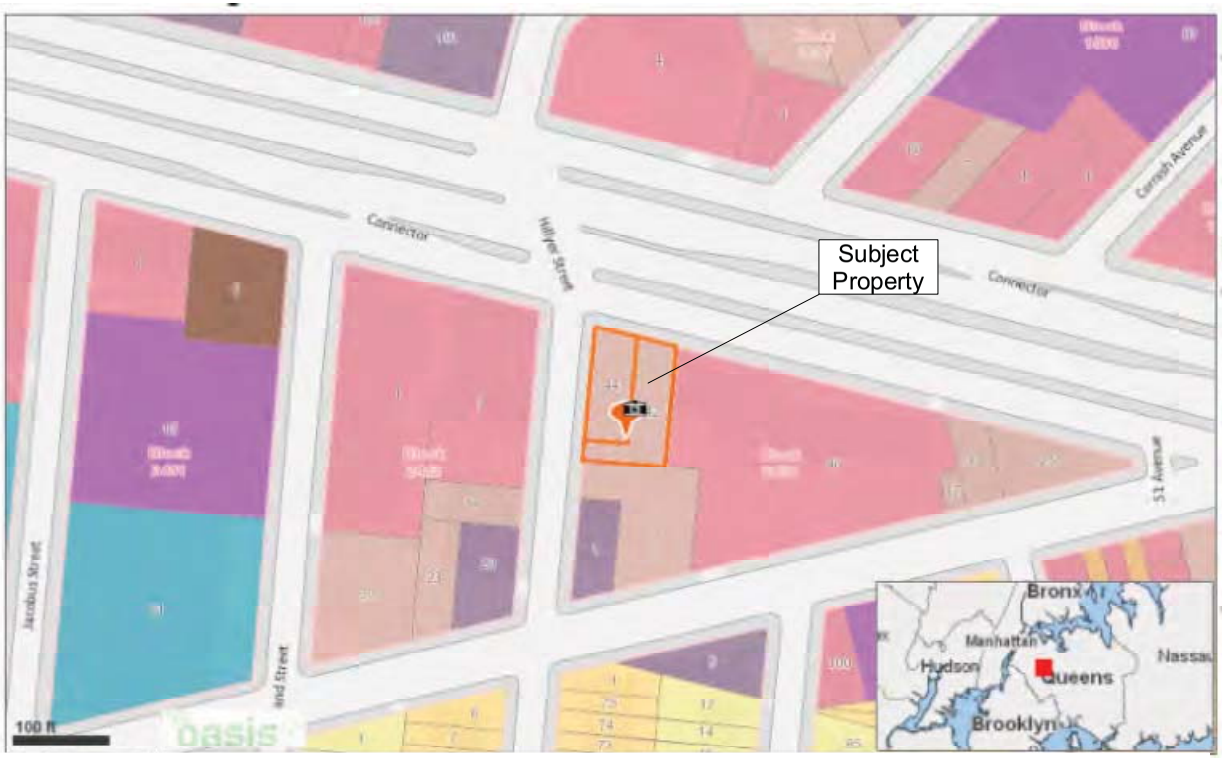
SEAL & SIGNATURE

DATE: 07/1/14 | DRAWING BY:
SCALE: AS NOTED | CHECKED BY:
DWG NO:
SHEET NO:

BSCAN STICKER

DOB APPROVAL STAMP

FIGURE 4



Source: oasis.net

Legend

Transit, Roads, Reference Features

Roads, ferries, commuter rail, neighborhood names

- Roads
- Major Roads
- Interstate Highways
- Tunnels
- Neighborhood/Town Labels
- County Boundaries
- Ferry
- Commuter Rail
- NYC subway routes and stations

Parks, Playgrounds, & Open Space

- Parks & Public Lands
- Forested Areas (NJ)
- Community Gardens
- School property with garden
- Playgrounds
- Green Spaces Along Streets
- Golf Courses
- Baseball/Soccer/Football Fields
- Tennis/Basketball/Handball Courts & Tracks
- Cemeteries

Land Use

Block/Lot Boundaries

(Building footprints in gray)

- 1 & 2 Family Residential
- Multi-family Residential
- Mixed Use
- Open space & outdoor recreation
- Commercial
- Institutions
- Industrial
- Parking
- Transportation / Utilities
- Vacant Lots

(Not all items in the legend may be visible on the map.)

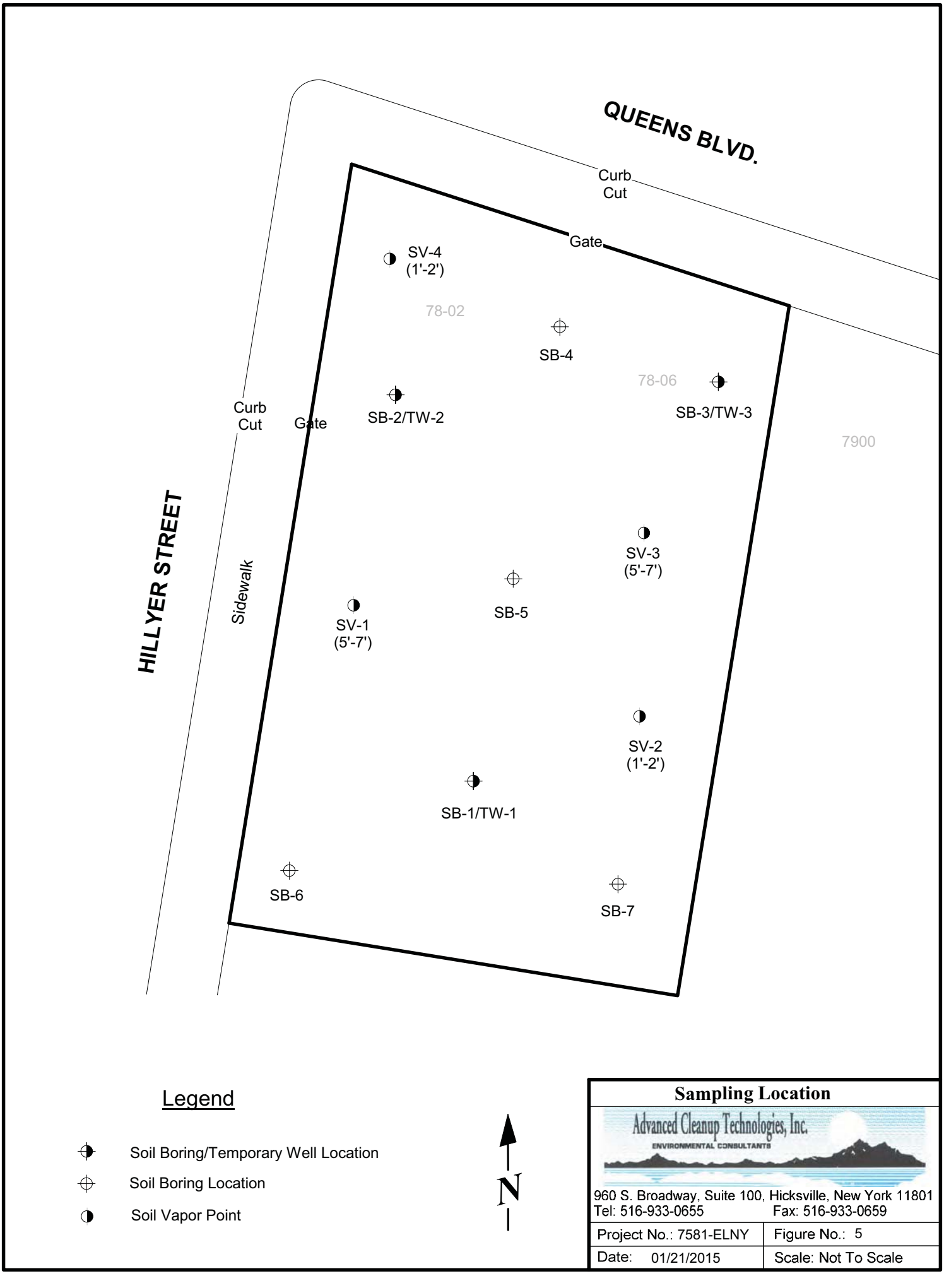
N

Surrounding Land Use Diagram

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
110 Main Street, Suite 103, Port Washington, New York 11050
Tel: 516-441-5800 Fax: 516-441-5511

Project No.: 7581-ELNY	Figure No.: 4
Date: 01/20/2015	Scale: Not To Scale

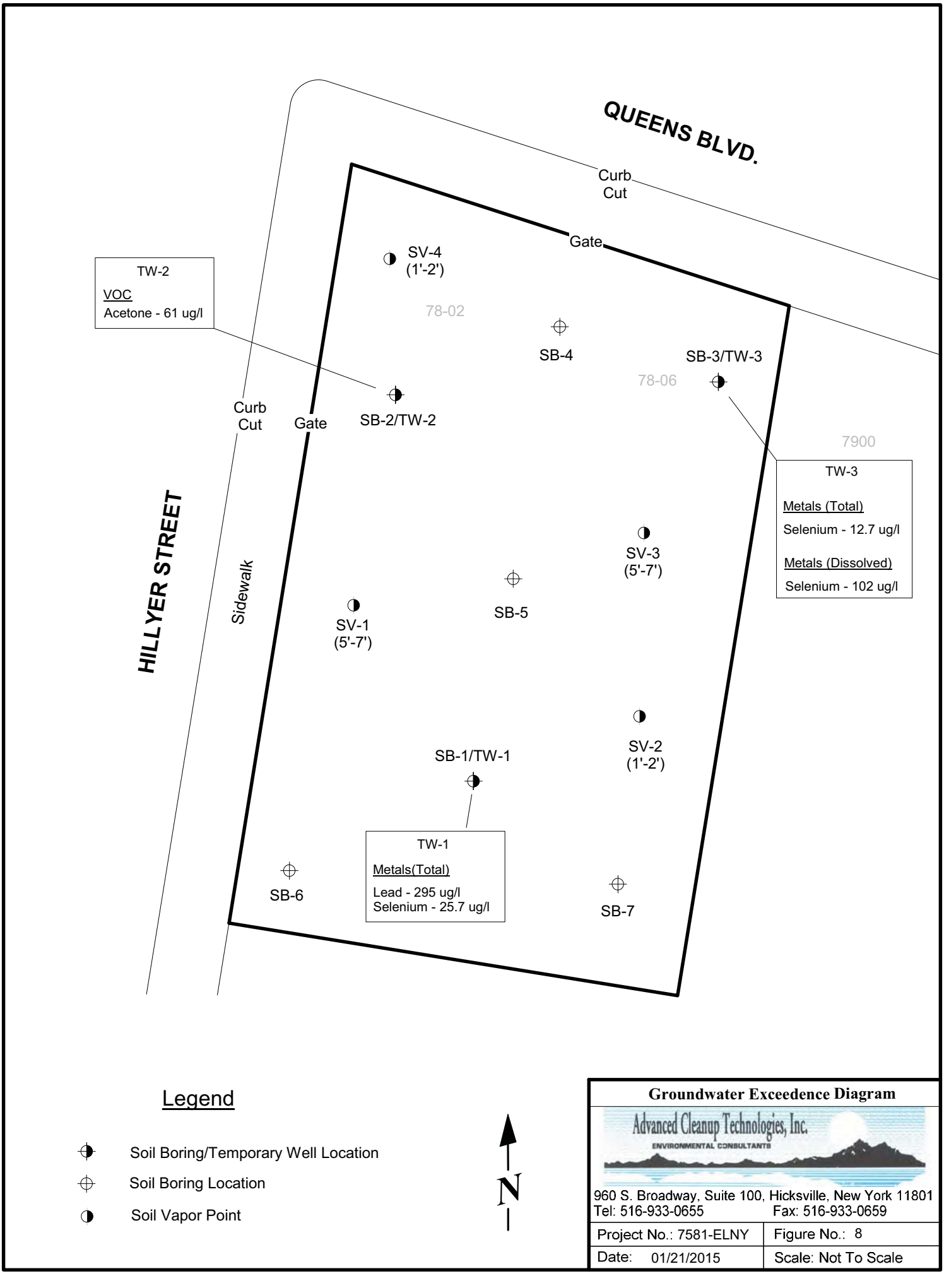
FIGURE 5



Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
960 S. Broadway, Suite 100, Hicksville, New York 11801
Tel: 516-933-0655 Fax: 516-933-0659

Project No.: 7581-ELNY	Figure No.: 5
Date: 01/21/2015	Scale: Not To Scale

FIGURE 6



Legend

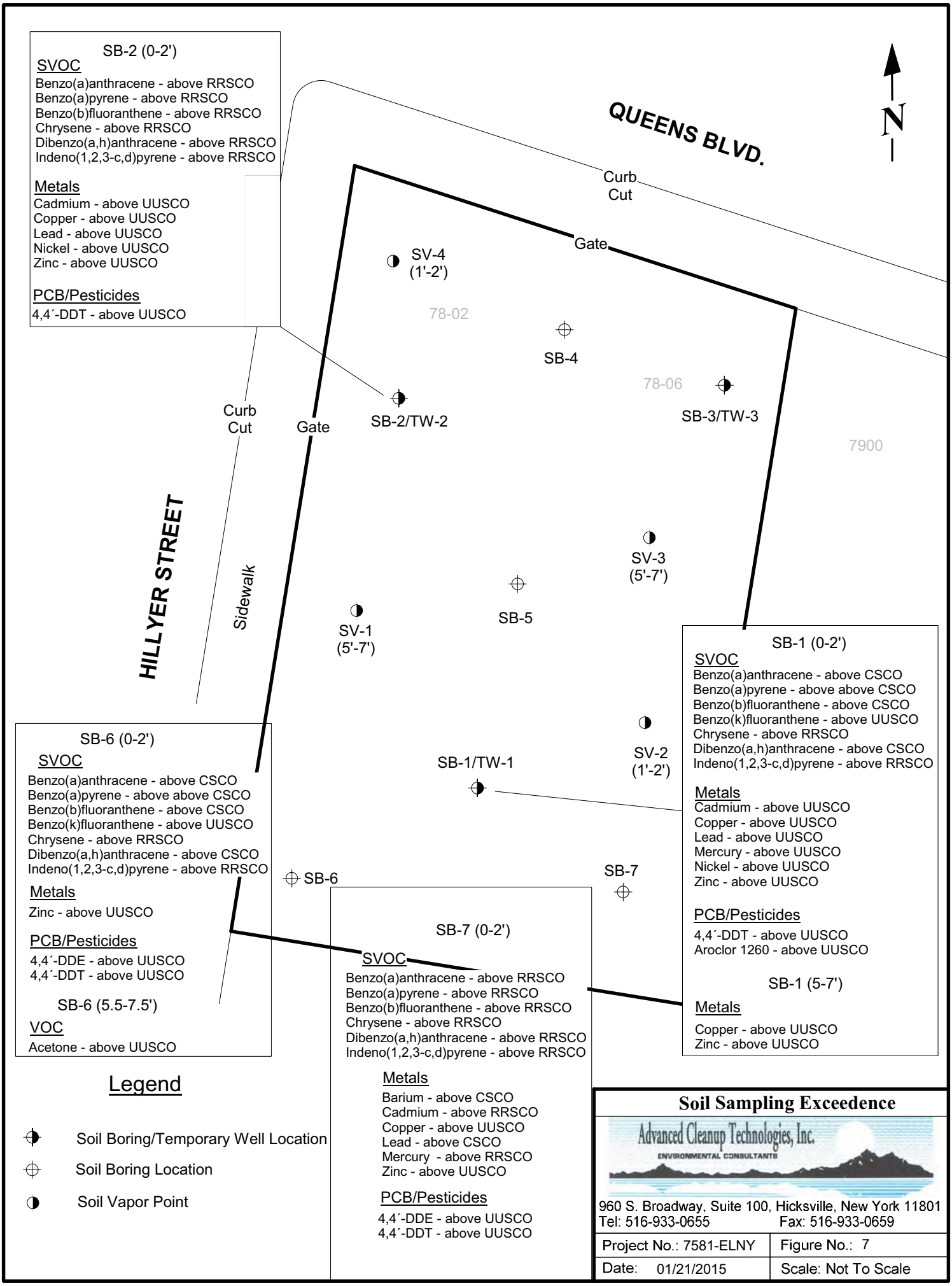
- Soil Boring/Temporary Well Location
- Soil Boring Location
- Soil Vapor Point

N

Groundwater Exceedence Diagram

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
960 S. Broadway, Suite 100, Hicksville, New York 11801
Tel: 516-933-0655 Fax: 516-933-0659

Project No.: 7581-ELNY	Figure No.: 8
Date: 01/21/2015	Scale: Not To Scale


SB-2 (0-2')
SVOC
Benzo(a)anthracene - above RRSCO
Benzo(a)pyrene - above RRSCO
Benzo(b)fluoranthene - above RRSCO
Chrysene - above RRSCO
Dibenzo(a,h)anthracene - above RRSCO
Indeno(1,2,3-c,d)pyrene - above RRSCO
Metals
Cadmium - above UUSCO
Copper - above UUSCO
Lead - above UUSCO
Nickel - above UUSCO
Zinc - above UUSCO
PCB/Pesticides
4,4´-DDT - above UUSCO
QUEENS BLVD.
N
Curb Cut
Gate
SV-4 (1'-2')
78-02
SB-4
78-06
SB-3/TW-3
Curb Cut
Gate
SB-2/TW-2
7900
HILLYER STREET
Sidewalk
SV-3 (5'-7')
SB-5
SV-1 (5'-7')
SB-1 (0-2')
SVOC
Benzo(a)anthracene - above CSCO
Benzo(a)pyrene - above above CSCO
Benzo(b)fluoranthene - above CSCO
Benzo(k)fluoranthene - above UUSCO
Chrysene - above RRSCO
Dibenzo(a,h)anthracene - above CSCO
Indeno(1,2,3-c,d)pyrene - above RRSCO
Metals
Cadmium - above UUSCO
Copper - above UUSCO
Lead - above UUSCO
Mercury - above UUSCO
Nickel - above UUSCO
Zinc - above UUSCO
PCB/Pesticides
4,4´-DDT - above UUSCO
Aroclor 1260 - above UUSCO
SB-1 (5-7')
Metals
Copper - above UUSCO
Zinc - above UUSCO
SV-2 (1'-2')
SB-1/TW-1
SB-6 (0-2')
SVOC
Benzo(a)anthracene - above CSCO
Benzo(a)pyrene - above above CSCO
Benzo(b)fluoranthene - above CSCO
Benzo(k)fluoranthene - above UUSCO
Chrysene - above RRSCO
Dibenzo(a,h)anthracene - above CSCO
Indeno(1,2,3-c,d)pyrene - above RRSCO
Metals
Zinc - above UUSCO
PCB/Pesticides
4,4´-DDE - above UUSCO
4,4´-DDT - above UUSCO
SB-6 (5.5-7.5')
VOC
Acetone - above UUSCO
SB-6
SB-7
SB-7 (0-2')
SVOC
Benzo(a)anthracene - above RRSCO
Benzo(a)pyrene - above RRSCO
Benzo(b)fluoranthene - above RRSCO
Chrysene - above RRSCO
Dibenzo(a,h)anthracene - above RRSCO
Indeno(1,2,3-c,d)pyrene - above RRSCO
Metals
Barium - above CSCO
Cadmium - above RRSCO
Copper - above UUSCO
Lead - above CSCO
Mercury - above RRSCO
Zinc - above UUSCO
PCB/Pesticides
4,4´-DDE - above UUSCO
4,4´-DDT - above UUSCO
Legend
Soil Boring/Temporary Well Location
Soil Boring Location
Soil Vapor Point
Soil Sampling Exceedence
Advanced Cleanup Technologies, Inc.
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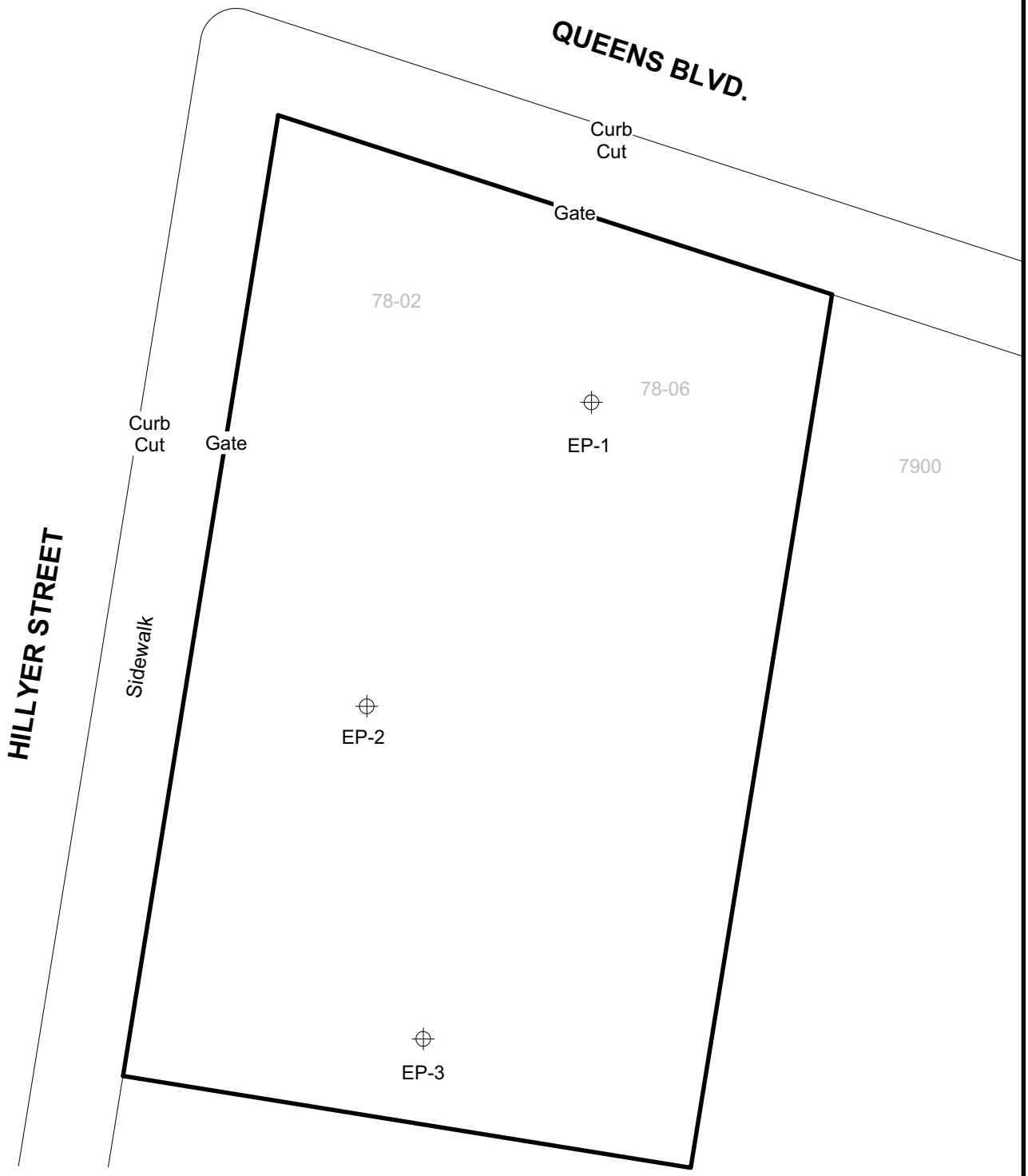
960 S. Broadway, Suite 100, Hicksville, New York 11801
Tel: 516-933-0655 Fax: 516-933-0659
Project No.: 7581-ELNY
Figure No.: 7
Date: 01/21/2015
Scale: Not To Scale

FIGURE 7



Legend

⊕ Proposed Confirmation Endpoint Sampling Locations

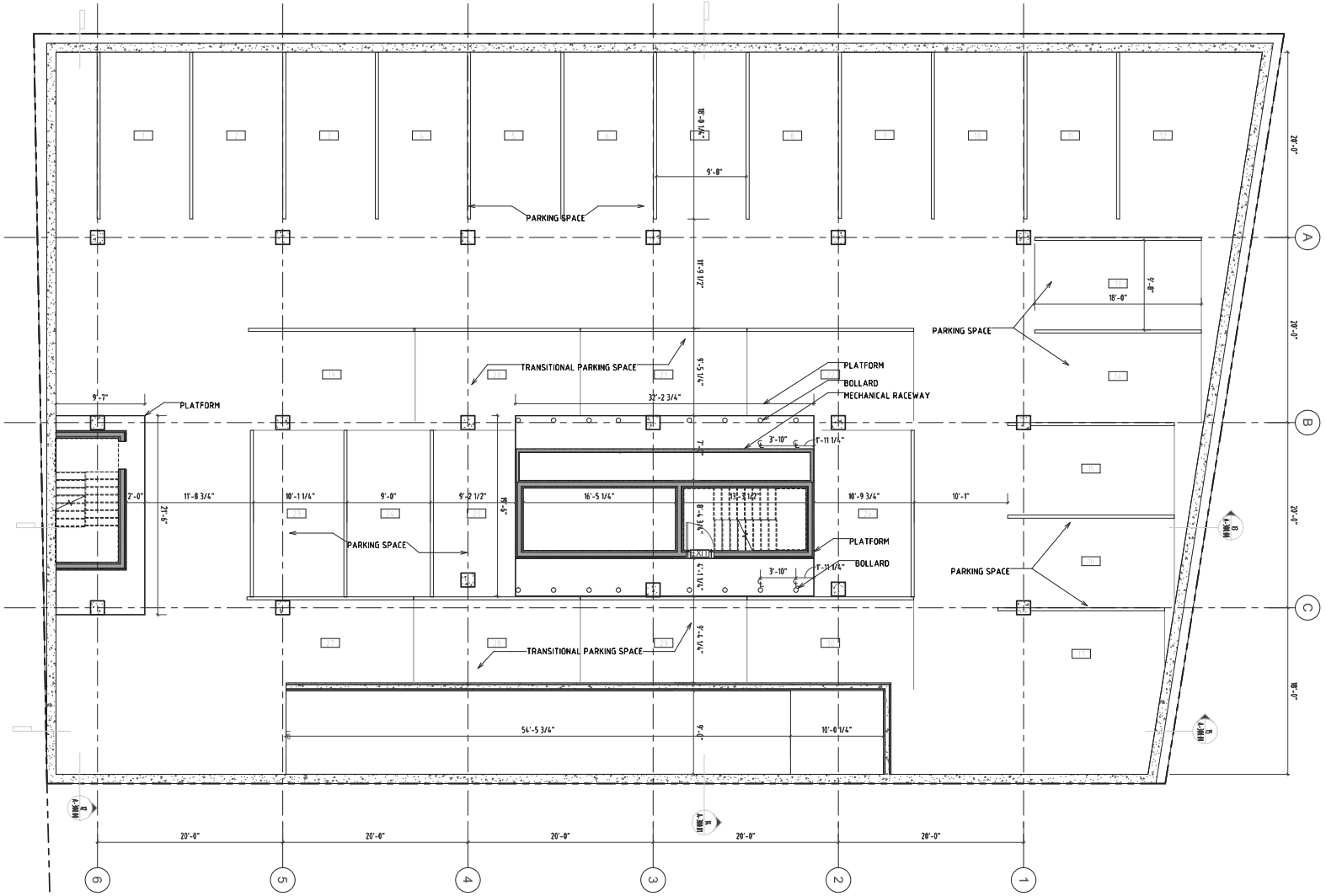
N

Endpoint Sampling Diagram

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
960 S. Broadway, Suite 100, Hicksville, New York 11801
Tel: 516-933-0655 Fax: 516-933-0659

Project No.: 7581-ELNY	Figure No.: 7
Date: 02/23/2015	Scale: Not To Scale

FIGURE 8



01 CELLAR FLOOR PLAN
SCALE: 3/16" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
31-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
CELLAR PLAN

SEAL & SIGNATURE

DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

DWG NO:
A-100.01

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP

FIGURE 9

TAMKO® TW-60
Self-Adhering Sheet Waterproofing Membrane

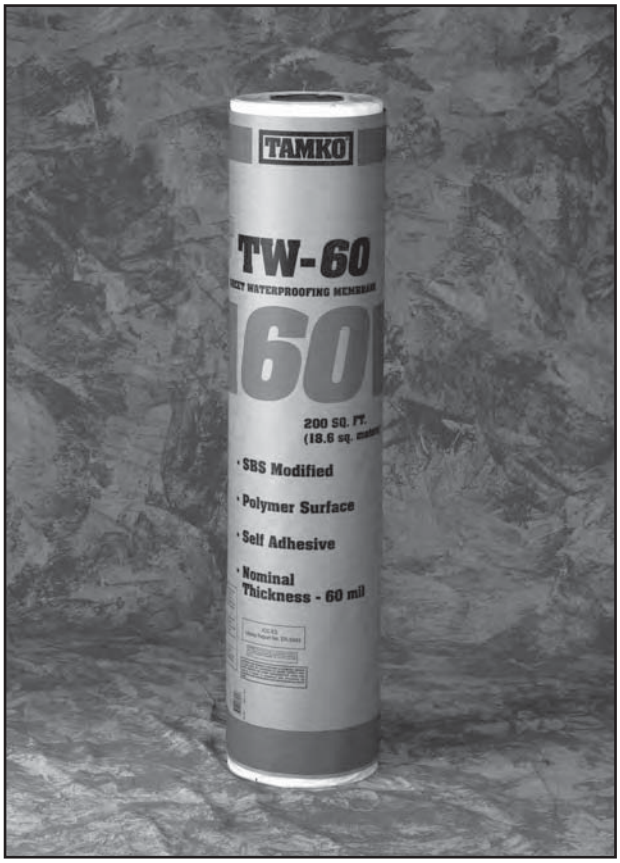
PRODUCT DATA

DESCRIPTION
TAMKO® TW-60 is a flexible, self-adhering rubberized asphalt sheet membrane with a polymer film on the surface and a removable treated release film on the adhesive side.

USES
TW-60 is especially well suited for below-grade waterproofing of foundation walls, tunnels, earth shelters, and similar structures. TW-60 is also suitable for waterproofing plaza decks, parking decks, balconies, and terraces.

ADVANTAGES
- Excellent tensile, elongation, and permeance characteristics.
- Rubberized asphalt sheet and polymer surfacing provide superior waterproofing protection.
- Treated release film for easier installation and handling.
- Available in factory pre-cut widths of 6", 9", 12", 18", and 39-3/8" rolls.
- High temperature resistance up to 240°F.
- Available in Winter and Summer Grade formulations.
- ICC-ES ESR-2260.

LIMITATIONS
- Membrane or primer must not be applied to damp, frosty or contaminated surfaces.
- Membrane must not be left exposed to sunlight for more than 30 days.
- Membrane must not come into contact with products containing coal-tar pitch.
- Best applied between the temperatures of 35°F and 90°F.



PRODUCT DATA*

Asphalt Modifier	Styrenic Block Copolymer
Product Thickness	60 mil

Roll Width	Roll Size	Coverage per Ctn.	Rolls per ctn.
6"	6" x 61'	183 sq. ft.	6
9"	9" x 61'	183 sq. ft.	4
12"	12" x 61'	183 sq. ft.	3
18"	18" x 61'	183 sq. ft.	2
39-3/8"	39-3/8" x 61'	200 sq. ft.	1 roll/wrapper

*All values stated as nominal at time of manufacture.

TYPICAL PHYSICAL PROPERTIES

Property	Test Method	Typical Value
Tensile, Membrane	ASTM D 412 (C)	425 psi
Tensile, Film	ASTM D 882	6300 psi
Elongation**	ASTM D 412 (C)	600% (min.)
Permeance	ASTM E 96 (BW)	0.05 perms (max.)
Low Temp. Flexibility	ASTM D 1970 (modified)[1]	Unaffected @ -20°F
Crack Cycling (100 cycles)	ASTM C 836	Unaffected @ -15°F
Peel Strength	ASTM D 903	9.0 lb/in. width (min.)
Lap Adhesion	ASTM D 1876	5.5 lb/in. width
Puncture Resistance	ASTM E 154	60 lb. (min.)
Hydrostatic Head	ASTM D 5385	231 ft. (min.)
Resistance to Soil Organisms (Fungi)	ASTM E 154	No effect (Permeability)

**% elongation to ultimate failure of rubberized asphalt membrane.

[1] Testing done using the procedure in ASTM D 1970 with adhesive side away from the mandrel.

TAMKO® TW-60
Self-Adhering Sheet Waterproofing Membrane
APPLICATION INSTRUCTIONS

SURFACE PREPARATION

Concrete-
The surface must be dry and have a smooth (not broomed) finish and be free of form release agents, voids and sharp protrusions. Forms should be removed as quickly as possible. On a horizontal deck do not apply membrane when forms are in place, unless the forms are vented. Concrete should be allowed to cure for a minimum of 7 days. Curing agents containing wax, oil, or pigment should not be used. Any holes or voids must be repaired with non-shrink grout. Cracks greater than 1/16" in width shall be cut out to a minimum of 1/4" with a minimum depth of 1/4" and sealed using a sealant suitable for use with rubberized asphalt per sealant manufacturer, prior to the installation of the sheet membrane. **Note: On masonry surfaces mortar joints must be flush to the face of the concrete block or brick and have a thorough parge coat.**

Expanded / Extruded Polystyrene (EXP/XPS) or Insulated Concrete Forms (ICF)-
Ultraviolet radiation in sunlight causes a rapid deterioration of the EPS surface which can create a chalky or dusty layer which could interfere with the membrane adhesion. If this occurs, or if the surface of the EPS is dirty, brush off the excess dirt and dust to provide a clean dry surface for the application of the membrane. Joints and voids in the surface over 1/4" should be filled with non-shrink grout, expandable foam or compatible crack filler.

Priming-
Priming is required on concrete and masonry surfaces, but may not be necessary on EPS/XPS and ICF surfaces that are clean and dry and have not developed a dusty layer due to sun exposure. Select either TWP-1*** Primer or TWP-2 Water-Based Primer, as appropriate, for the surface to be primed. DO NOT USE products containing solvents on EPS/XPS or ICF surfaces. Thoroughly mix the primer. Apply at recommended coverage rates with a sprayer or long nap roller and allow to dry as specified in the primer's application instructions. Drying times may vary according to weather conditions.

Flashing-
All penetrations and drains must be flashed with TW-60 membrane, extending the membrane a minimum of 6" on all sides. All cracks and joints must be sealed with a sealant suitable for use with rubberized asphalt per sealant manufacturer, and flashed with a 12" wide strip of TW-60 membrane centered on the axis of the corners.

HORIZONTAL APPLICATION

Starting at the low point of the surface and working to the high point, install TW-60 membrane by simultaneously rolling the sheet into place while removing the release film. Side laps should be 2 1/2", and end laps should be 5". Stagger all end laps. All terminating edges should be sealed with TWM-1 Mastic. Roll the entire membrane as soon as possible with a minimum 75 lb. garden roller wrapped with indoor/outdoor carpet.

If a flood test is required by the design professional, it should be conducted before the application of a protection layer. Check for leaks and make repairs immediately. Before flood testing be sure the structure is capable of withstanding the dead load of the water. Re-test after repairs have been made.

When TAMKO TW-60 is utilized as a waterproofing membrane in accordance with TAMKO Waterproofing Construction Detail TW-10 "Typical Balcony / Entry / Breezeway Outside Edge Detail" flood testing of the installation is considered good practice. The decision regarding necessity of a flood test is the responsibility of a design professional. When utilizing TW-60 as a waterproofing membrane on horizontal applications for balconies - the balcony must have a built-in positive slope away from the wall.

VERTICAL APPLICATION

Install TW-60 Sheet Membrane in lengths of 8' or less. Overlap edge seams 2 1/2". On walls above 8', apply in 8' sections, starting at the lowest point with the higher section overlapping the lower section 5". Use heavy hand pressure or a suitable roller to press membrane firmly against wall.

Terminations when applying to a concrete surface:
TW-60 sheet should be installed over the top of a wall or over the edge of a slab. If the membrane must terminate on a vertical surface, use a reglet or counter flashing. Press terminating edge firmly with a hammer handle or similar tool. Apply TWM-1 Mastic to all terminating edges.

TW-60 Sheet Membrane shall be installed on the base of the foundation wall, over the edge of the footing and the terminating edge pressed firmly against the vertical surface of the footing. Apply TWM-1 Mastic to all terminating edges including both vertical and horizontal.

Note: Failure to use adequate pressure at terminating edges will result in poor seal, potential leak and may affect coverage under the limited warranty. The use of mastic is not a substitute for a good seal.

Terminations when applying to EPS / XPS and ICF:
Apply a thick (min 3/8") bead of sealant suitable for use with rubberized asphalt and EPS / XPS and/or ICF per sealant manufacturer, at the termination of the waterproofing membrane and smooth with a putty knife to seal the termination. A non-deteriorating termination bar is required at the head of the waterproofing membrane.

MEMBRANE PROTECTION

Vertical surfaces must be protected immediately following installation of the membrane. Horizontal surfaces should be protected immediately. If a flood test is required the horizontal surface shall be protected immediately following the flood test. If the flood test is delayed, a temporary protection layer must be installed to protect the membrane from future operations and other trades. When TW-60 is utilized as a waterproofing membrane in accordance with TAMKO Waterproofing Construction Detail TW-10 "Typical Balcony / Entry / Breezeway Outside Edge Detail" flood testing of the installation is considered good practice. The decision regarding necessity of a flood test is the responsibility of a design professional.

***WARNINGS AND HAZARDS**
TWP-1 contains combustible solvents. Avoid exposure to sparks, open flame, heat, and other forms of ignition. Use in well-ventilated areas. Avoid breathing vapors. Refer to MSDS for detailed product information and warnings.

TAMKO® TW-60

PRODUCT DATA

Self-Adhering Sheet Waterproofing Membrane

APPLICATION INSTRUCTIONS

(CONTINUED)

PROTECTION COURSE FOR USE WITH TAMKO TW-60 WATERPROOFING MEMBRANE

Horizontal Application Protection Course

For horizontal applications where membrane protection is required in TAMKO's application instructions, another manufacturer's protection course that is designed for horizontal installations may be used in conjunction with TAMKO's TW-60 waterproofing membrane, provided the minimum requirements shown below are satisfied.

Vertical Application Protection Course

For vertical applications where membrane protection is required in TAMKO's application instructions, another manufacturer's protection course that is designed for vertical installations may be used in conjunction with TAMKO's TW-60 waterproofing membrane, provided the minimum requirements shown below are satisfied.

Protection Course Minimum Requirements

Asphalt composition boards used as protection course shall comply with ASTM D6506 Standard Specification for Asphalt Based Protection Board for Below-Grade Waterproofing.

Cellular polystyrene insulation used as protection course shall comply with ASTM C578 Specification for Rigid, Cellular Polystyrene Insulation, Types IV, V, VI, VII, X, or XII.

Fan-folded extruded polystyrene insulation used as protection course shall have compressive strength exceeding 15 psi when tested in accordance with ASTM D1621 Test Method for Compressive Properties of Rigid Cellular Plastics and maximum water absorption of 0.4% when tested in accordance with ASTM C272 Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.

Plastic drainage panels used as protection course shall have puncture strength exceeding 50 lbs when tested in accordance with ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

BACK FILL

Back fill must be clean fill with no rocks, pails or wood. After back fill is in place, it must be tamped with a tamper to compress the fill.

REPAIRING MINOR DAMAGE TO THE TW-60 MEMBRANE

Patch Repair:

Minor damaged areas of TAMKO TW-60 Membrane that are no larger than 4" by 4" in size (e.g. tears, holes, fishmouths, and delaminations) can be repaired by installing a patch of TW-60 extending a minimum of 12" beyond the damaged area on all sides.

End Lap Repair:

Loose end laps no wider than 4" can be repaired by cutting and removing the loose material and applying a patch that extends 12" beyond the area on all sides.

A patch Repair or an End Lap Repair must begin with removal of dust, dirt, and other materials that may interfere with adhesion from the area receiving the patch. Remove or cut non-adhered, torn, or otherwise damaged membrane as necessary, creating a fully-adhered surface to receive the patch. The underlying substrate must not be damaged while performing a Patch Repair or an End Lap Repair.

Install the TW -60, applying sufficient pressure by hand or with a roofing seam roller to promote adhesion to the underlying material. Seal the edges of the patch by applying a 1/4" to 3/8" bead of TWM-1 mastic; smooth the bead with a trowel.

INSTALLATION OF TW-60 OVER PREVIOUSLY INSTALLED LAYER OF TW-60

A second layer of TAMKO TW-60 Self-Adhering Sheet Waterproofing Membrane may be applied over an existing layer of TW-60 provided that appropriate surface preparation of the existing material is successfully accomplished.

As required for direct installation to a substrate, the surface of the existing layer must be free of dust, dirt and other materials or conditions that could interfere with adhesion of the second layer. Irregularities in the installed TW-60 must be corrected prior to installation of the second layer; this includes removing or cutting non-adhered, torn , or otherwise damaged membrane or surface film. Take care to prevent damage to underlying substrates, such as insulated concrete forms, with these types of corrections. Side and end laps of the second layer must not coincide with side and end laps of the first layer.

The decision for surface suitability of the first layer is subjective and rests with the applicator; TAMKO assumes no responsibility for improper application (refer to TAMKO Waterproofing Limited Warranty) of the first or second layer, including improper application due to poor adhesion from an improper surface.

Upon installation of the second layer of TW-60, the first layer of TW-60 is recognized as part of the assembly substrate and considered "sold AS IS" and without warranty of any kind.

Failure to properly apply TAMKO TW-60 Self-Adhering Sheet Waterproofing Membrane according to the Application Instructions may affect coverage under the applicable 5-year limited warranty.

TAMKO® TW-60
Self-Adhering Sheet Waterproofing Membrane

CAUTION: This product contains crystalline silica. Crystalline silica has been classified as a "known" human carcinogen by the International Agency for Research on Cancer (IARC) and the National Toxicology Program. The National Institute for Occupational Safety and Health has concluded that the fumes of heated roofing asphalt are a potential occupational carcinogen. The physical nature of this product may help limit any inhalation or dermal hazard during application and/or removal. However, physical forces such as sawing, grinding or drilling during demolition work and heating or burning may increase the inhalation or dermal exposure hazard of this product. Take precautions to prevent breathing and contact with skin.

Information included in this product data sheet was current at time of printing. To obtain a copy of the most current version of this product data sheet, visit us online at tamko.com or call us at 800-641-4691.

This product is covered by a 5-year limited warranty. For information regarding or a copy of TAMKO's limited warranty, contact your local TAMKO representative, visit us online at tamko.com, or call us at 800-641-4691.

tamko.com

Corporate	220 West 4th Street, Joplin, Missouri 64801	800-641-4691
Central District	220 West 4th Street, Joplin, Missouri 64801	800-641-4691
Northeast District	4500 Tamko Drive, Frederick, Maryland 21701	800-368-2055
Southeast District	2300 35th Street, Tuscaloosa, Alabama 35401	800-228-2656
Southwest District	7910 South Central Expressway, Dallas, Texas 75216	800-443-1834
Western District	5300 East 43rd Avenue, Denver, Colorado 80216	800-530-8868

TAMKO® BUILDING PRODUCTS

ICC EVALUATION SERVICE

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ICC-ES Evaluation Report

ESR-2260

Reissued July 2014

This report is subject to renewal October 1, 2016.

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 25 00—Water-Resistive Barriers/Weather Barriers
Section: 07 27 00—Air Barriers

REPORT HOLDER:

TAMKO BUILDING PRODUCTS, INC.
220 WEST FOURTH STREET
JOPLIN, MISSOURI 64801
(417) 624-6644
www.tamko.com

EVALUATION SUBJECT:

TAMKO® TW MOISTURE WRAP, AND TAMKO® TW-60™, TW FLASH-N-WRAP® 25 and TW FLASH-N-WRAP® 40

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2012, 2009 and 2006 *International Residential Code®* (IRC)
- 2012, 2009 and 2006 *International Energy Conservation Code®* (IECC)

Properties evaluated:

- Water resistance
- Air leakage

2.0 USES

TAMKO® TW MOISTURE WRAP, TAMKO® TW-60™, TW FLASH-N-WRAP® 25 and TW FLASH-N-WRAP® 40 are self-adhering membranes used as a water-resistive barrier on exterior walls of buildings of Type V-B construction (IBC) and construction permitted under the IRC. The membranes are alternatives to the water-resistive barriers specified in IBC Section 1404.2 and IRC Section R703.2. The products may also be used as air barrier materials under IRC Section N1102.4.1 and IECC Sections 402.4 and 502.4.

3.0 DESCRIPTION

3.1 TW MOISTURE WRAP:

TW MOISTURE WRAP is a flexible, self-adhering, rubberized asphalt sheet membrane with a nominal thickness of 0.040 inch and an approximate weight of 18 pounds per 100 square feet. The membrane is available in various size rolls. The membrane is black with a polymeric film on the exterior surface and a release film on the other surface.

3.2 TW-60™:

TW-60™ is a flexible, self-adhering, rubberized asphalt sheet membrane with a nominal thickness of 0.060 inch and an approximate weight of 23 pounds per 100 square feet. The membrane is available in various size rolls. The membrane is black with a polymeric film on the exterior surface and a release film on the other surface.

3.3 TW FLASH-N-WRAP® 25:

TW FLASH-N-WRAP® 25 is a flexible, self-adhering, rubberized asphalt sheet membrane with a nominal thickness of 0.025 inch and an approximate weight of 13 pounds per 100 square feet. The membrane is available in various size rolls. The membrane is black with a reflective aluminum film on the exterior surface and a release film on the other surface

3.4 TW FLASH-N-Wrap® 40:

FLASH-N-WRAP® 40 is a flexible, self-adhering, rubberized asphalt sheet membrane with a nominal thickness of 0.040 inch and an approximate weight of 20 pounds per 100 square feet. The membrane is available in various size rolls. The membrane is black with a reflective aluminum film on the exterior surface and a release film on the other surface.

3.5 Primers and Mastics:

3.5.1 TAMKO® TWP-1 Quick Dry Primer: A rubberized primer, packaged in 5-gallon (18.9 L) pails.

3.5.2 TAMKO® TWP-2 Water-Based Primer: A water-based rubberized primer, packaged in 5-gallon (18.9 L) pails.

3.5.3 TAMKO® TWM-1 Mastic: A trowel-grade rubberized, bitumen mastic packaged in 3-gallon (11.4 L) pails and 10.5- and 29-ounce (298 and 822 g) tubes.

3.6 Air Barriers:

The products described in this report have an air leakage rate not exceeding 0.02 L/s/m^2 at 75 Pa [0.004 cfm/ft^2 at 0.3 w.g. (1.57 psf)] when used as an air barrier material under IRC Section N1102.4.1 and IECC Section 402.4 or 502.4.

4.0 INSTALLATION

When used as a water-resistive barrier or an air barrier, TW MOISTURE WRAP and TW-60™, TW FLASH-N-WRAP® 25 and TW FLASH-N-WRAP® 40 must be

installed after wall framing is completed. The exterior wall surfaces must be dry and free of dirt, dust or other foreign matter that would inhibit adhesion. When application is to concrete substrates, the concrete must be allowed to cure for a minimum of seven days prior to application. The membranes must be installed when the ambient air and surface temperatures are 40°F (4.4°C) or higher.

When TW MOISTURE WRAP, TW-60™, TW FLASH-N-WRAP® 25 and TW FLASH-N-WRAP® 40 are installed over cast-in-place concrete, pre-cast concrete, concrete masonry block, DensGlass®, DensGlass Gold®, or any other surface where the adhesion is found to be marginal, the substrate surface must be primed with either TAMKO® TWP-1 or TWP-2 primer prior to membrane installation.

The membranes must be unrolled and cut to the desired length. Approximately 12 inches of the release film is removed from the back side of the membrane and the membrane must be centered over the area to be covered. The membrane must be firmly pressed or rolled against the substrate. The remainder of the release film is removed while the membrane must be smoothed into place over the remainder of the area to be covered. Installation must begin from the lowest point and proceed with higher sections overlapping the lower section. The membranes must be overlapped a minimum of 4 inches (152 mm) at vertical seams and 2 inches (51 mm) at horizontal seams. All seams and terminations must be sealed in accordance with the manufacturer's published installation instructions.

At rough openings for doors and windows, the membranes must be installed in accordance with the manufacturer's published installation instructions. The doors and windows must be installed in accordance with the respective manufacturer's installation instructions and flashed in accordance with the requirements of the applicable code.

The manufacturer's published installation instructions and this report are to be strictly adhered to. If requested by the code official, a copy of this report is to be available at the jobsite during installation.

5.0 CONDITIONS OF USE

The TAMKO® TW MOISTURE WRAP, TAMKO® TW-60™, TW FLASH-N-WRAP® 25 and TW FLASH-N-WRAP® 40 membranes described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

5.2 The membranes are limited to use on buildings of Type V-B construction (IBC) and construction permitted by the IRC.

5.3 TW MOISTURE WRAP and TW-60™ membranes have a permeance rating of 1 perm (5.7×10^{-11} kg/Pa s · m^2) or less when tested in accordance with ASTM E96, Procedure A. Therefore, the membranes are limited to use as a water-resistive barrier where exception 1, 2 or 3 of Section 502.5 of the 2006 *International Energy Conservation Code*®, as applicable, is satisfied.

5.4 In areas adopting the IBC, the membranes must not be installed where Grade D building paper is required.

5.5 This report is based on air barrier rates for products as an air barrier only. The design and evaluation of the air barrier assembly, of which these products are a component, is outside the scope of this report.

6.0 EVIDENCE SUBMITTED

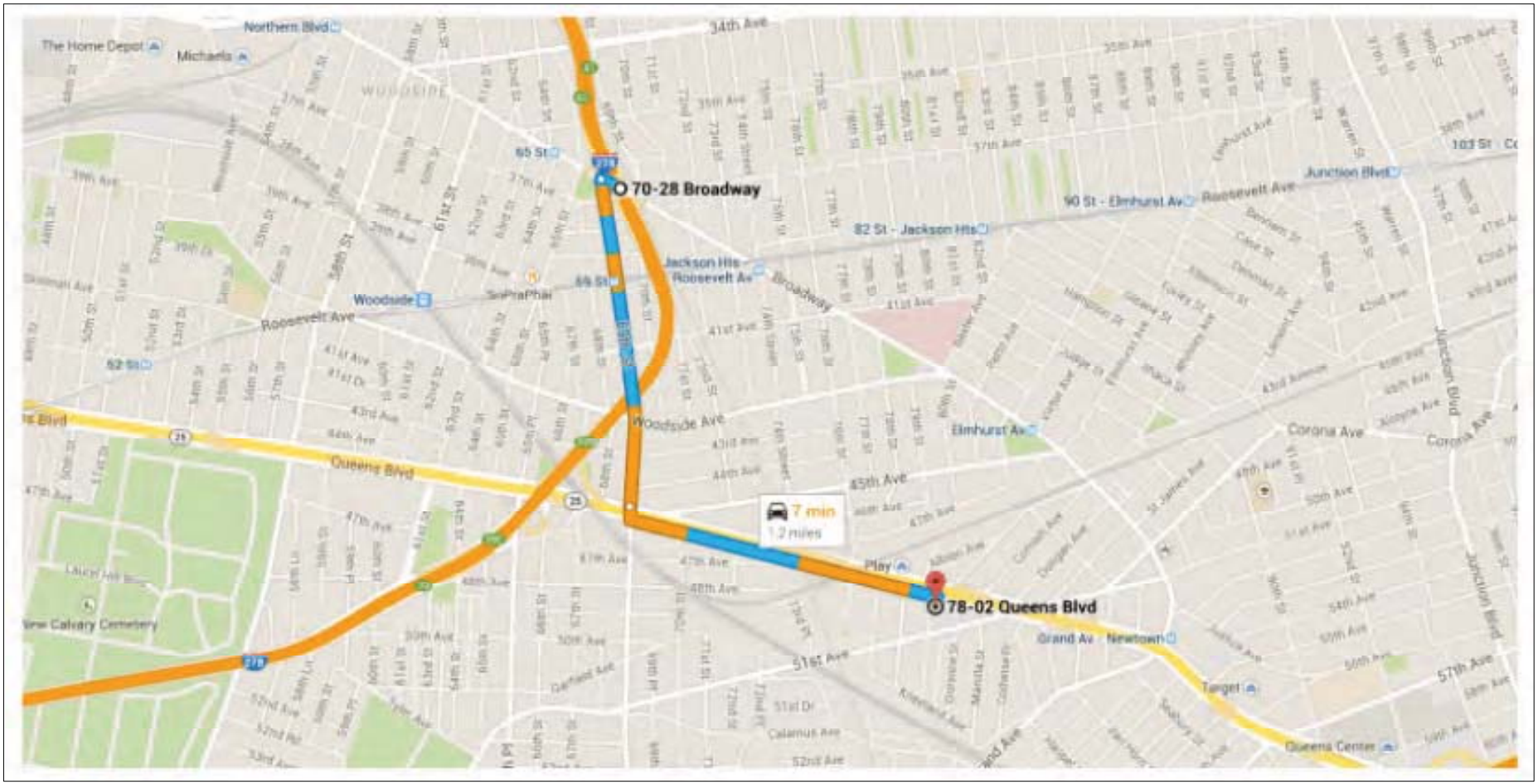
Data in accordance with the ICC-ES Acceptance Criteria for Water-resistive Barriers (AC38), dated February 2008.

7.0 IDENTIFICATION

The membranes described in this report are identified by a label, on the container of each roll of membrane, bearing the manufacturer's name (TAMKO Building Products, Inc.) and address, the product name and the evaluation report number (ESR-2260). TAMKO TWM-1 Mastic, and TWP-1 and TWP-2 primers, are identified by a label on the pail or tube, bearing the manufacturer's name and the product name.

TW Flash-N-Wrap 25 and TW Flash-N-Wrap 40 were previously recognized in ESR-1984 and may be labeled with either ESR-1984 or ESR-2260.

FIGURE 10



Source: Google Maps

N

Truck Route

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
110 Main Street, Suite 103, Port Washington, New York 11050
Tel: 516-441-5800 Fax: 516-441-5511

Project No.: 7581-ELNY	Figure No.: 10
Date: 02/23/2015	Scale: Not To Scale

Tables

Table 1

Volatile Organic Compounds in Soil (ug/kg-dry)
EPA Method 8260
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	UUSCO [1]	Standard RRSCO [2]	CSCO [3]	SB-1 (0-2') 1/13/14	SB-1 (5-7') 1/13/14	SB-2 (0-2') 1/15/14	SB-2 (7-9') 1/15/14	SB-3 (0-2) 1/13/14	SB-3 (5-7') 1/13/14	SB-4 (2-4') 1/15/14
1,1,1-Trichloroethane	680	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
1,1,2,2-Tetrachloroethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,1,2-Trichloroethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,1-Dichloroethane	270	26,000	240,000	<15	<14	<15	<14	NR	<12	<16
1,1-Dichloroethene	330	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
1,2,4-Trichlorobenzene	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,2-Dibromo-3-chloropropane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,2-Dibromoethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,2-Dichlorobenzene	1,100	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
1,2-Dichloroethane	20	3,100	30,000	<15	<14	<15	<14	NR	<12	<16
1,2-Dichloropropane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
1,3-Dichlorobenzene	2,400	49,000	280,000	<15	<14	<15	<14	NR	<12	<16
1,4-Dichlorobenzene	1,800	13,000	130,000	<15	<14	<15	<14	NR	<12	<16
2-Butanone	120	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
2-Hexanone	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
4-Methyl-2-pentanone	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Acetone	50	100,000	500,000	**19**	**17**	<15	<14	NR	**15**	<16
Benzene	60	4,800	44,000	<15	<14	<15	<14	NR	<12	<16
Bromodichloromethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Bromoform	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Bromomethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Carbon disulfide	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Carbon tetrachloride	760	2,400	22,000	<15	<14	<15	<14	NR	<12	<16
Chlorobenzene	1,100	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
Chloroethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Chloroform	370	49,000	350,000	<15	<14	<15	<14	NR	<12	<16
Chloromethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
cis-1,2-Dichloroethene	250	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
cis-1,3-Dichloropropene	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Cyclohexane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Dibromochloromethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Dichlorodifluoromethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Ethylbenzene	1,000	41,000	390,000	<15	<14	<15	<14	NR	<12	<16
Isopropylbenzene	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Methyl Acetate	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Methyl tert-butyl ether	930	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
Methylcyclohexane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Methylene chloride	50	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
Styrene	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Tetrachloroethene	1,300	19,000	150,000	<15	<14	<15	<14	NR	<12	<16
Toluene	700	100,000	500,000	<15	<14	<15	<14	NR	<12	<16
trans-1,2-Dichloroethene	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
trans-1,3-Dichloropropene	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Trichloroethene	470	21,000	200,000	<15	<14	<15	<14	NR	<12	<16
Trichlorofluoromethane	NS	NS	NS	<15	<14	<15	<14	NR	<12	<16
Vinyl chloride	20	900	13,000	<15	<14	<15	<14	NR	<12	<16
Xylenes (Total)	260	100,000	500,000	<15	<14	<15	<14	NR	<12	<16

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory standard
NR = No Recovery
NS = No Standard

Table 1 (Continued)

Volatile Organic Compounds in Soil (ug/kg-dry)
EPA Method 8260
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	UUSCO [1]	Standard RRSCO [2]	CSCO [3]	SB-4 (5-7') 1/15/14	SB-5 (0-2') 1/13/14	SB-5 (5.5-7.5') 1/13/14	SB-6 (0-2') 1/13/14	SB-6 (5.5-7.5') 1/13/14	SB-7 (0-2') 1/13/14	SB-7 (5-7) 1/13/14
1,1,1-Trichloroethane	680	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
1,1,2,2-Tetrachloroethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,1,2-Trichloroethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,1-Dichloroethane	270	26,000	240,000	<14	<13	<13	<12	<14	<12	<13
1,1-Dichloroethene	330	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
1,2,4-Trichlorobenzene	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,2-Dibromo-3-chloropropane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,2-Dibromoethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,2-Dichlorobenzene	1,100	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
1,2-Dichloroethane	20	3,100	30,000	<14	<13	<13	<12	<14	<12	<13
1,2-Dichloropropane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
1,3-Dichlorobenzene	2,400	49,000	280,000	<14	<13	<13	<12	<14	<12	<13
1,4-Dichlorobenzene	1,800	13,000	130,000	<14	<13	<13	<12	<14	<12	<13
2-Butanone	120	100,000	500,000	<14	<13	<13	<12	**31**	<12	<13
2-Hexanone	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
4-Methyl-2-pentanone	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Acetone	50	100,000	500,000	<14	<13	<13	<12	**150**	**21**	**23**
Benzene	60	4,800	44,000	<14	<13	<13	<12	<14	<12	<13
Bromodichloromethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Bromoform	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Bromomethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Carbon disulfide	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Carbon tetrachloride	760	2,400	22,000	<14	<13	<13	<12	<14	<12	<13
Chlorobenzene	1,100	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
Chloroethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Chloroform	370	49,000	350,000	<14	<13	<13	<12	<14	<12	<13
Chloromethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
cis-1,2-Dichloroethene	250	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
cis-1,3-Dichloropropene	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Cyclohexane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Dibromochloromethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Dichlorodifluoromethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Ethylbenzene	1,000	41,000	390,000	<14	<13	<13	<12	<14	<12	<13
Isopropylbenzene	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Methyl Acetate	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Methyl tert-butyl ether	930	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
Methylcyclohexane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Methylene chloride	50	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
Styrene	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Tetrachloroethene	1,300	19,000	150,000	<14	<13	<13	<12	<14	<12	<13
Toluene	700	100,000	500,000	<14	<13	<13	<12	<14	<12	<13
trans-1,2-Dichloroethene	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
trans-1,3-Dichloropropene	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Trichloroethene	470	21,000	200,000	<14	<13	<13	<12	<14	<12	<13
Trichlorofluoromethane	NS	NS	NS	<14	<13	<13	<12	<14	<12	<13
Vinyl chloride	20	900	13,000	<14	<13	<13	<12	<14	<12	<13
Xylenes (Total)	260	100,000	500,000	<14	<13	<13	<12	<14	<12	<13

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory standard
NS = No Standard

Table 2

Semi Volatile Organic Compounds in Soil (ug/kg-dry)
EPA Method 8270
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	UUSCO [1]	Standard RRSCO [2]	CSCO [3]	SB-1 (0-2') 1/13/14	SB-1 (5-7') 1/13/14	SB-2 (0-2') 1/15/14	SB-2 (7-9') 1/15/14	SB-3 (0-2) 1/13/14	SB-3 (5-7') 1/13/14	SB-4 (2-4') 1/15/14
1,1´-Biphenyl	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2,2´-oxybis(1-chloropropane)	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2,4,5-Trichlorophenol	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
2,4,6-Trichlorophenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2,4-Dichlorophenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2,4-Dimethylphenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2,4-Dinitrophenol	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
2,4-Dinitrotoluene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2,6-Dinitrotoluene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2-Chloronaphthalene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2-Chlorophenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
2-Methylnaphthalene	NS	NS	NS	**550**	<400	<370	<400	NR	<380	<350
2-Methylphenol	330	100,000	500,000	<390	<400	<370	<400	NR	<380	<350
2-Nitroaniline	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
2-Nitrophenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
3,3´-Dichlorobenzidine	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
3-Nitroaniline	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
4,6-Dinitro-2-methylphenol	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
4-Bromophenyl-phenylether	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
4-Chloro-3-methylphenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
4-Chloroaniline	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
4-Chlorophenyl phenyl ether	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
4-Methylphenol	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
4-Nitroaniline	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
4-Nitrophenol	NS	NS	NS	<980	<1,000	<920	<1,000	NR	<960	<880
Acenaphthene	20,000	100,000	500,000	**2,100**	<400	<370	<400	NR	<380	<350
Acenaphthylene	100,000	100,000	500,000	<390	<400	<370	<400	NR	<380	<350
Acetophenone	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Anthracene	100,000	100,000	500,000	**4,500**	<400	**1,000**	<400	NR	<380	<350
Atrazine	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Benzaldehyde	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Benzo(a)anthracene	1,000	1,000	5,600	**12,000**	<400	**3,200**	<400	NR	<380	<350
Benzo(a)pyrene	1,000	1,000	1,000	**9,700**	<400	**2,600**	<400	NR	<380	<350
Benzo(b)fluoranthene	1,000	1,000	5,600	**10,000**	<400	**3,300**	<400	NR	<380	<350
Benzo(g,h,i)perylene	100,000	100,000	500,000	**2,700**	<400	**1,200**	<400	NR	<380	<350
Benzo(k)fluoranthene	800	3,900	56,000	**3,200**	<400	**1,800**	<400	NR	<380	<350
Bis(2-chloroethoxy)methane	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Bis(2-chloroethyl)ether	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Bis(2-ethylhexyl)phthalate	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Butyl benzyl phthalate	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Caprolactam	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Carbazole	NS	NS	NS	**2,500**	<400	**420**	<400	NR	<380	<350
Chrysene	1,000	3,900	56,000	**12,000**	<400	**3,000**	<400	NR	<380	<350
Dibenzo(a,h)anthracene	330	330	560	**1,400**	<400	**430**	<400	NR	<380	<350
Dibenzofuran	NS	NS	NS	**1,300**	<400	<370	<400	NR	<380	<350
Diethyl phthalate	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Dimethyl phthalate	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Di-n-butyl phthalate	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Di-n-octyl phthalate	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Fluoranthene	100,000	100,000	500,000	**27,000**	<400	**6,700**	<400	NR	<380	<350
Fluorene	30,000	100,000	500,000	**2,200**	<400	<370	<400	NR	<380	<350
Hexachlorobenzene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Hexachlorobutadiene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Hexachlorocyclopentadiene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Hexachloroethane	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Indeno(1,2,3-c,d)pyrene	500	500	5,600	**3,300**	<400	**1,300**	<400	NR	<380	<350
Isophorone	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Naphthalene	12,000	100,000	500,000	**1,400**	<400	<370	<400	NR	<380	<350
Nitrobenzene	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
N-Nitrosodi-n-propylamine	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
N-Nitrosodiphenylamine	NS	NS	NS	<390	<400	<370	<400	NR	<380	<350
Pentachlorophenol	800	6,700	6,700	<980	<1,000	<920	<1,000	NR	<960	<880
Phenanthrene	100,000	100,000	500,000	**22,000**	<400	**4,700**	<400	NR	<380	<350
Phenol	330	100,000	500,000	<390	<400	<370	<400	NR	<380	<350
Pyrene	100,000	100,000	500,000	**21,000**	<400	**6,000**	<400	NR	<380	<350

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory guidance
NR = No Recovery
NS = No Standard

Table 2 (Continued)

Semi Volatile Organic Compounds in Soil (ug/kg-dry)
EPA Method 8270
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID		Standard		SB-4 (5-7')	SB-5 (0-2')	SB-5 (5.5-7.5')	SB-6 (0-2')	SB-6 (5.5-7.5')	SB-7 (0-2')	SB-7 (5-7)
Sample Date	UUSCO [1]	RRSCO [2]	CSCO [3]	1/15/14	1/13/14	1/13/14	1/13/14	1/13/14	1/13/14	1/13/14
1,1´-Biphenyl	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2,2´-oxybis(1-chloropropane)	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2,4,5-Trichlorophenol	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
2,4,6-Trichlorophenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2,4-Dichlorophenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2,4-Dimethylphenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2,4-Dinitrophenol	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
2,4-Dinitrotoluene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2,6-Dinitrotoluene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2-Chloronaphthalene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2-Chlorophenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
2-Methylnaphthalene	NS	NS	NS	<400	<380	<380	**450**	<410	<380	<360
2-Methylphenol	330	100,000	500,000	<400	<380	<380	<390	<410	<380	<360
2-Nitroaniline	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
2-Nitrophenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
3,3´-Dichlorobenzidine	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
3-Nitroaniline	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
4,6-Dinitro-2-methylphenol	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
4-Bromophenyl-phenylether	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
4-Chloro-3-methylphenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
4-Chloroaniline	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
4-Chlorophenyl phenyl ether	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
4-Methylphenol	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
4-Nitroaniline	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
4-Nitrophenol	NS	NS	NS	<1,000	<940	<950	<970	<1,000	<960	<900
Acenaphthene	20,000	100,000	500,000	<400	<380	<380	2,500	<410	2,500	<360
Acenaphthylene	100,000	100,000	500,000	<400	<380	<380	**580**	<410	<380	<360
Acetophenone	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Anthracene	100,000	100,000	500,000	<400	<380	<380	**6,700**	<410	**900**	<360
Atrazine	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Benzaldehyde	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Benzo(a)anthracene	1,000	1,000	5,600	<400	<380	<380	**19,000**	<410	**3,900**	<360
Benzo(a)pyrene	1,000	1,000	1,000	<400	<380	<380	**15,000**	<410	**3,200**	<360
Benzo(b)fluoranthene	1,000	1,000	5,600	<400	<380	<380	**18,000**	<410	**4,500**	<360
Benzo(g,h,i)perylene	100,000	100,000	500,000	<400	<380	<380	**4,900**	<410	**1,400**	<360
Benzo(k)fluoranthene	800	3,900	56,000	<400	<380	<380	**5,300**	<410	**1,400**	<360
Bis(2-chloroethoxy)methane	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Bis(2-chloroethyl)ether	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Bis(2-ethylhexyl)phthalate	NS	NS	NS	<400	<380	<380	**590**	<410	<380	<360
Butyl benzyl phthalate	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Caprolactam	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Carbazole	NS	NS	NS	<400	<380	<380	**3,100**	<410	**480**	<360
Chrysene	1,000	3,900	56,000	<400	<380	<380	**19,000**	<410	**3,800**	<360
Dibenzo(a,h)anthracene	330	330	560	<400	<380	<380	**2,300**	<410	**590**	<360
Dibenzofuran	NS	NS	NS	<400	<380	<380	**1,500**	<410	<380	<360
Diethyl phthalate	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Dimethyl phthalate	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Di-n-butyl phthalate	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Di-n-octyl phthalate	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Fluoranthene	100,000	100,000	500,000	<400	<380	<380	**44,000**	<410	**8,300**	<360
Fluorene	30,000	100,000	500,000	<400	<380	<380	**2,600**	<410	<380	<360
Hexachlorobenzene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Hexachlorobutadiene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Hexachlorocyclopentadiene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Hexachloroethane	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Indeno(1,2,3-c,d)pyrene	500	500	5,600	<400	<380	<380	**5,600**	<410	**1,500**	<360
Isophorone	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Naphthalene	12,000	100,000	500,000	<400	<380	<380	**740**	<410	<380	<360
Nitrobenzene	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
N-Nitrosodi-n-propylamine	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
N-Nitrosodiphenylamine	NS	NS	NS	<400	<380	<380	<390	<410	<380	<360
Pentachlorophenol	800	6,700	6,700	<1,000	<940	<950	<970	<1,000	<960	<900
Phenanthrene	100,000	100,000	500,000	<400	<380	<380	**31,000**	<410	**4,700**	<360
Phenol	330	100,000	500,000	<400	<380	<380	<390	<410	<380	<360
Pyrene	100,000	100,000	500,000	<400	<380	<380	**35,000**	<410	**7,400**	<360

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory guidance
NS = No Standard

Table 3

Metals in Soil (mg/kg-dry)
EPA Method 6010
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	Standard UUSCO [1]	 RRSCO [2]	 CSCO [3]	SB-1 (0-2') 1/13/14	SB-1 (5-7') 1/13/14	SB-2 (0-2') 1/15/14	SB-2 (7-9') 1/15/14	SB-3 (0-2) 1/13/14	SB-3 (5-7') 1/13/14	SB-4 (2-4') 1/15/14
Aluminum	NS	NS	NS	**8,570**	**6,210**	**9,210**	**9,990**	NR	**7,310**	**5,250**
Antimony	NS	NS	NS	<7.05	<7.23	<6.58	<7.13	NR	<6.92	<6.38
Arsenic	13	16	16	**8.3**	**5.6**	**4.5**	<1.19	NR	<1.15	<1.06
Barium	350	400	400	**243**	**59**	**102**	**68.6**	NR	**62.9**	**29.6**
Beryllium	7.2	72	590	<0.59	<0.60	<0.55	<0.59	NR	<0.58	<0.53
Cadmium	2.5	4.3	9.3	**2.73**	**1.64**	**2.85**	**0.94**	NR	<0.58	**0.96**
Calcium	NS	NS	NS	**8,030**	**2,970**	**11,700**	**3,790**	NR	**1,910**	**4,850**
Chromium	30	180	1,500	**27**	**13.9**	**18.8**	**28**	NR	**20.9**	**11.9**
Cobalt	NS	NS	NS	**7.96**	<6.02	**8.55**	**10.4**	NR	<5.77	**5.39**
Copper	50	270	270	**141**	**84.9**	**86.5**	**22.7**	NR	**10.1**	**16.5**
Iron	NS	NS	NS	**19,800**	**8,050**	**17,200**	**16,300**	NR	**9,760**	**10,200**
Lead	63	400	1,000	**428**	**51.4**	**286**	**3.16**	NR	**1.72**	**2.41**
Magnesium	NS	NS	NS	**4,720**	**1,310**	**5,780**	**4,300**	NR	**2,110**	**4,100**
Manganese	1,600	2,000	10,000	**224**	**68.7**	**308**	**103**	NR	**62.0**	**265**
Mercury	0.18	0.81	2.8	**0.32**	<0.24	<0.21	<0.23	NR	<0.23	<0.21
Nickel	30	310	310	**30.7**	**8.4**	**37.4**	**21.0**	NR	**13.9**	**10.1**
Potassium	NS	NS	NS	**1,400**	**505**	**754**	**1,270**	NR	**629**	**832**
Selenium	3.9	180	1,500	**2.74**	**1.04**	**2.09**	**1.69**	NR	**0.94**	**1.24**
Silver	2	180	1,500	<1.17	<1.20	<1.10	<1.19	NR	<1.15	<1.06
Sodium	NS	NS	NS	**226**	**101**	**171**	**223**	NR	**137**	124
Thallium	NS	NS	NS	<1.17	<1.20	<1.10	<1.19	NR	<1.15	<1.06
Vanadium	NS	NS	NS	**31.2**	**17.8**	**34.5**	**37.3**	NR	**24.3**	**14.5**
Zinc	109	10,000	10,000	**697**	**463**	**236**	**72.5**	NR	**43.1**	**131**

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory standard
NR = No Recovery
NS = No Standard

Table 3 (Continued)

Metals in Soil (mg/kg-dry)
EPA Method 6010
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID / Sample Date	UUSCO [1]	Standard RRSCO [2]	CSCO [3]	SB-4 (5-7') 1/15/14	SB-5 (0-2') 1/13/14	SB-5 (5.5-7.5) 1/13/14	SB-6(0-2') 1/13/14	SB-6 (5.5-7.5') 1/13/14	SB-7 (0-2') 1/13/14	SB-7 (5-7) 1/13/14
Aluminum	NS	NS	NS	**5,080**	**10,700**	**5,950**	**7,960**	**6,890**	**6,920**	**4,970**
Antimony	NS	NS	NS	<7.16	<6.73	<6.83	<6.92	<7.35	<6.92	<6.47
Arsenic	13	16	16	**2.29**	**2.87**	**2.53**	**3.02**	**2.11**	**8.13**	<1.08
Barium	350	400	400	**43.9**	**61.0**	**47.1**	**83.2**	**89.0**	**488**	**29.1**
Beryllium	7.2	72	590	<0.60	<0.56	<0.57	<0.58	<0.61	<0.58	<0.54
Cadmium	2.5	4.3	9.3	<0.60	**0.93**	**0.64**	**1.90**	<0.61	**6.91**	<0.54
Calcium	NS	NS	NS	**2,690**	**1,680**	**1,890**	**4,630**	**3,840**	**5,270**	**950**
Chromium	30	180	1,500	**12.3**	**21.7**	**16.6**	**23.8**	**14.0**	**27.2**	**9.04**
Cobalt	NS	NS	NS	<5.97	**7.23**	**<5.69**	**7.06**	<6.13	<5.77	<5.39
Copper	50	270	270	**60.1**	**21.5**	**11.6**	**45.7**	**23.4**	**138**	**2.88**
Iron	NS	NS	NS	**6,580**	**15,800**	**11,000**	**16,800**	**8,780**	**25,200**	**7,810**
Lead	63	400	1,000	**32.3**	**27.5**	**17.1**	**215**	**56.2**	**1,420**	**5.15**
Magnesium	NS	NS	NS	**1,760**	**2,380**	**1,430**	**4,010**	**1,410**	**1,670**	**1,390**
Manganese	1,600	2,000	10,000	**89.0**	**341**	**85.6**	**321**	**85.9**	**406**	**60.3**
Mercury	0.18	0.81	2.8	<0.24	<0.22	<0.23	<0.22	<0.24	**0.91**	<0.21
Nickel	30	310	310	**8.11**	**12.4**	**7.08**	**13.1**	**6.9**	**12.8**	**5.85**
Potassium	NS	NS	NS	**530**	**1,100**	**326**	**1,260**	**341**	**691**	**364**
Selenium	3.9	180	1,500	**0.76**	**1.61**	**1.41**	**1.97**	**1.32**	**3.78**	**0.84**
Silver	2	180	1,500	<1.19	<1.12	<1.14	<1.15	<1.23	<1.15	<1.08
Sodium	NS	NS	NS	**116**	**127**	**127**	**132**	**125**	**100**	**73.3**
Thallium	NS	NS	NS	<1.19	<1.12	<1.14	<1.15	<1.23	<1.15	<1.08
Vanadium	NS	NS	NS	**13.5**	**27.0**	**19.7**	**24.6**	**18.5**	**28.4**	**8.51**
Zinc	109	10,000	10,000	**58.9**	**47.3**	**31.7**	**298**	**59.4**	**854**	**29.4**

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory standard
NS = No Standard

Table 4

PCBs and Pesticides in Soil (ug/kg-dry)
EPA Method 8081/8082
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	UUSCO [1]	Standard RRSCO [2]	CSCO [3]	SB-1 (0-2') 1/13/14	SB-1 (5-7') 1/13/14	SB-2 (0-2') 1/15/14	SB-2 (7-9') 1/15/14	SB-3 (0-2) 1/13/14	SB-3 (5-7') 1/13/14	SB-4 (2-4') 1/15/14
4,4´-DDD	3.3	2,600	92,000	<3.9	<4.0	<3.7	<4.0	NR	<3.8	<3.5
4,4´-DDE	3.3	1,800	62,000	<3.9	<4.0	<3.7	<4.0	NR	<3.8	<3.5
4,4´-DDT	3.3	1,700	47,000	**28**	<4.0	**9.6**	<4.0	NR	<3.8	<3.5
Aldrin	5	19	680	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
alpha-BHC	20	97	3,400	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
alpha-Chlordane	94	4,200	24,000	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
Aroclor 1016	100	1,000	1,000	<39	<40	<37	<40	NR	<38	<35
Aroclor 1221	100	1,000	1,000	<79	<81	<74	<80	NR	<78	<71
Aroclor 1232	100	1,000	1,000	<39	<40	<37	<40	NR	<38	<35
Aroclor 1242	100	1,000	1,000	<39	<40	<37	<40	NR	<38	<35
Aroclor 1248	100	1,000	1,000	<39	<40	<37	<40	NR	<38	<35
Aroclor 1254	100	1,000	1,000	<39	<40	<37	<40	NR	<38	<35
Aroclor 1260	100	1,000	1,000	**120**	<40	**48**	<40	NR	<38	<35
beta-BHC	36	72	3,000	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
delta-BHC	40	100,000	500,000	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
Dieldrin	5	39	1,400	<3.9	<4.0	<3.7	<4.0	NR	<3.8	<3.5
Endosulfan I	2,400	4,800	200,000	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
Endosulfan II	2,400	4,800	200,000	<3.9	<4.0	<3.7	<4.0	NR	<3.8	<3.5
Endosulfan sulfate	2,400	4,800	200,000	<3.9	<4.0	<3.7	<4.0	NR	<3.8	<3.5
Endrin	14	2,200	89,000	<3.9	<4.0	<3.7	<4.0	NR	<3.8	<3.5
Endrin aldehyde	NS	NS	NS	**10**	<4.0	<3.7	<4.0	NR	<3.8	<3.5
Endrin ketone	NS	NS	NS	**28**	<4.0	**3.9**	<4.0	NR	<3.8	<3.5
gamma-BHC	100	280	9,200	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
gamma-Chlordane	NS	NS	NS	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
Heptachlor	42	420	15,000	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
Heptachlor epoxide	NS	NS	NS	<2.0	<2.1	<1.9	<2.0	NR	<2.0	<1.8
Methoxychlor	NS	NS	NS	<20	<21	<19	<20	NR	<20	<18
Toxaphene	NS	NS	NS	<200	<210	<190	<200	NR	<200	<180

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory standard
NR = No Recovery
NS = No Standard

Table 4 (Continued)

PCBs and Pesticides in Soil (ug/kg-dry)
EPA Method 8081/8082
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	UUSCO [1]	Standard RRSCO [2]	CSCO [3]	SB-4 (5-7') 1/15/14	SB-5 (0-2') 1/13/14	SB-5 (5.5-7.5') 1/13/14	SB-6 (0-2') 1/13/14	SB-6 (5.5-7.5') 1/13/14	SB-7 (0-2') 1/13/14	SB-7 (5-7) 1/13/14
4,4´-DDD	3.3	2,600	92,000	<4.0	<3.8	<3.8	<3.8	<4.1	<3.8	<3.6
4,4´-DDE	3.3	1,800	62,000	<4.0	<3.8	<3.8	**4.7**	<4.1	**23**	<3.6
4,4´-DDT	3.3	1,700	47,000	<4.0	<3.8	<3.8	**58**	<4.1	**39**	<3.6
Aldrin	5	19	680	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
alpha-BHC	20	97	3,400	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
alpha-Chlordane	94	4,200	24,000	<2.0	<1.9	<2.0	<2.0	<2.1	**75**	<1.8
Aroclor 1016	100	1,000	1,000	<40	<38	<38	<38	<41	<38	<36
Aroclor 1221	100	1,000	1,000	<80	<76	<77	<78	<82	<78	<73
Aroclor 1232	100	1,000	1,000	<40	<38	<38	<38	<41	<38	<36
Aroclor 1242	100	1,000	1,000	<40	<38	<38	<38	<41	<38	<36
Aroclor 1248	100	1,000	1,000	<40	<38	<38	<38	<41	<38	<36
Aroclor 1254	100	1,000	1,000	<40	<38	<38	<38	<41	<38	<36
Aroclor 1260	100	1,000	1,000	<40	<38	<38	**96**	<41	**65**	<36
beta-BHC	36	72	3,000	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
delta-BHC	40	100,000	500,000	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
Dieldrin	5	39	1,400	<4.0	<3.8	<3.8	<3.8	<4.1	<3.8	<3.6
Endosulfan I	2,400	4,800	200,000	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
Endosulfan II	2,400	4,800	200,000	<4.0	<3.8	<3.8	<3.8	<4.1	<3.8	<3.6
Endosulfan sulfate	2,400	4,800	200,000	<4.0	<3.8	<3.8	<38	<4.1	<3.8	<3.6
Endrin	14	2,200	89,000	<4.0	<3.8	<3.8	<3.8	<4.1	<3.8	<3.6
Endrin aldehyde	NS	NS	NS	<4.0	<3.8	<3.8	**23**	<4.1	**16**	<3.6
Endrin ketone	NS	NS	NS	<4.0	<3.8	<3.8	**80**	<4.1	**22**	<3.6
gamma-BHC	100	280	9,200	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
gamma-Chlordane	NS	NS	NS	<2.0	<1.9	<2.0	<20	<2.1	**39**	<1.8
Heptachlor	42	420	15,000	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
Heptachlor epoxide	NS	NS	NS	<2.0	<1.9	<2.0	<2.0	<2.1	<2.0	<1.8
Methoxychlor	NS	NS	NS	<20	<19	<20	<20	<21	<20	<18
Toxaphene	NS	NS	NS	<200	<190	<200	<200	<210	<200	<180

[1] Unrestricted Use Soil Cleanup Objectives, Table 375-6.8(a), 6 NYCRR 375, NYSDEC 2006
[2] Restricted Residential Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
[3] Commercial Soil Cleanup Objectives, Table 375-6.8(b), 6 NYCRR 375, NYSDEC 2006
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory standard
NS = No Standard

Table 5

Volatile Organic Compounds in Groundwater (ug/l)
EPA Method 8260
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	Standard [1]	TW-1 1/16/14	TW-2 1/16/14	TW-3 1/16/14
1,1,1-Trichloroethane	5	<10	<10	<10
1,1,2,2-Tetrachloroethane	0.2	<10	<10	<10
1,1,2-Trichloro-1,2,2-trifluoroethane	NS	<10	<10	<10
1,1,2-Trichloroethane	1	<10	<10	<10
1,1-Dichloroethane	5	<10	<10	<10
1,1-Dichloroethene	0.7	<10	<10	<10
1,2,4-Trichlorobenzene	5	<10	<10	<10
1,2-Dibromo-3-chloropropane	0.04	<10	<10	<10
1,2-Dibromoethane	NS	<10	<10	<10
1,2-Dichlorobenzene	2	<10	<10	<10
1,2-Dichloroethane	0.6	<10	<10	<10
1,2-Dichloropropane	1	<10	<10	<10
1,3-Dichlorobenzene	3	<10	<10	<10
1,4-Dichlorobenzene	3	<10	<10	<10
2-Butanone	50	<10	<10	<10
2-Hexanone	50	<10	<10	<10
4-Methyl-2-pentanone	NS	<10	<10	<10
Acetone	50	**11**	**61**	<10
Benzene	0.7	<10	<10	<10
Bromodichloromethane	50	<10	<10	<10
Bromoform	50	<10	<10	<10
Bromomethane	5	<10	<10	<10
Carbon disulfide	NS	<10	<10	<10
Carbon tetrachloride	5	<10	<10	<10
Chlorobenzene	5	<10	<10	<10
Chloroethane	5	<10	<10	<10
Chloroform	7	<10	<10	<10
Chloromethane	NS	<10	<10	<10
cis-1,2-Dichloroethene	5	<10	<10	<10
cis-1,3-Dichloropropene	0.4	<10	<10	<10
Cyclohexane	NS	<10	<10	<10
Dibromochloromethane	50	<10	<10	<10
Dichlorodifluoromethane	5	<10	<10	<10
Ethylbenzene	5	<10	<10	<10
Isopropylbenzene	5	<10	<10	<10
Methyl Acetate	NS	<10	<10	<10
Methyl tert-butyl ether	10	<10	<10	<10
Methylcyclohexane	NS	<10	<10	<10
Methylene chloride	5	<10	<10	<10
Styrene	50	<10	<10	<10
Tetrachloroethene	5	<10	<10	<10
Toluene	5	<10	<10	<10
trans-1,2-Dichloroethene	5	<10	<10	<10
trans-1,3-Dichloropropene	NS	<10	<10	<10
Trichloroethene	5	<10	<10	<10
Trichlorofluoromethane	5	<10	<10	<10
Vinyl chloride	2	<10	<10	<10
Xylene (total)	15	<10	<10	<10

[1] NYS DEC TOGS 1.1.1, June, 1998
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory guidance
NS = No Standard

Table 6

Semi Volatile Organic Compounds in Groundwater (ug/l)
EPA Method 8270
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	Standard [1]	TW-1 1/16/14	TW-2 1/16/14	TW-3 1/16/14
1,1´-Biphenyl	5	<10	<10	<10
2,2´-oxybis(1-chloropropane)	NS	<10	<10	<10
2,4,5-Trichlorophenol	NS	<25	<25	<25
2,4,6-Trichlorophenol	NS	<10	<10	<10
2,4-Dichlorophenol	0.3	<10	<10	<10
2,4-Dimethylphenol	50	<10	<10	<10
2,4-Dinitrophenol	10	<25	<25	<25
2,4-Dinitrotoluene	5	<10	<10	<10
2,6-Dinitrotoluene	0.07	<10	<10	<10
2-Chloronaphthalene	10	<10	<10	<10
2-Chlorophenol	NS	<10	<10	<10
2-Methylnaphthalene	42	<10	<10	<10
2-Methylphenol	NS	<10	<10	<10
2-Nitroaniline	5	<25	<25	<25
2-Nitrophenol	NS	<10	<10	<10
3,3´-Dichlorobenzidine	5	<10	<10	<10
3-Nitroaniline	5	<25	<25	<25
4,6-Dinitro-2-methylphenol	NS	<25	<25	<25
4-Bromophenyl-phenylether	NS	<10	<10	<10
4-Chloro-3-methylphenol	NS	<10	<10	<10
4-Chloroaniline	5	<10	<10	<10
4-Chlorophenyl phenyl ether	NS	<10	<10	<10
4-Methylphenol	NS	<10	<10	<10
4-Nitroaniline	5	<25	<25	<25
4-Nitrophenol	NS	<25	<25	<25
Acenaphthene	20	<10	<10	<10
Acenaphthylene	NS	<10	<10	<10
Acetophenone	NS	<10	<10	<10
Anthracene	50	<10	<10	<10
Atrazine	7.5	<10	<10	<10
Benzaldehyde	NS	<10	<10	<10
Benzo(a)anthracene	NS	<10	<10	<10
Benzo(a)pyrene	NS	<10	<10	<10
Benzo(b)fluoranthene	0.002	<10	<10	<10
Benzo(g,h,i)perylene	NS	<10	<10	<10
Benzo(k)fluoranthene	0.002	<10	<10	<10
Bis(2-chloroethoxy)methane	5	<10	<10	<10
Bis(2-chloroethyl)ether	1	<10	<10	<10
Bis(2-ethylhexyl)phthalate	5	<10	<10	<10
Butyl benzyl phthalate	NS	<10	<10	<10
Caprolactam	NS	<10	<10	<10
Carbazole	NS	<10	<10	<10
Chrysene	0.002	<10	<10	<10
Dibenzo(a,h)anthracene	NS	<10	<10	<10
Dibenzofuran	NS	<10	<10	<10
Diethyl phthalate	50	<10	<10	<10
Dimethyl phthalate	50	<10	<10	<10
Di-n-butyl phthalate	50	<10	<10	<10
Di-n-octyl phthalate	50	<10	<10	<10
Fluoranthene	50	<10	<10	<10
Fluorene	50	<10	<10	<10
Hexachlorobenzene	0.04	<10	<10	<10
Hexachlorobutadiene	0.5	<10	<10	<10
Hexachlorocyclopentadiene	5	<10	<10	<10
Hexachloroethane	5	<10	<10	<10
Indeno(1,2,3-c,d)pyrene	0.002	<10	<10	<10
Isophorone	50	<10	<10	<10
Naphthalene	10	<10	<10	<10
Nitrobenzene	0.4	<10	<10	<10
N-Nitrosodi-n-propylamine	NS	<10	<10	<10
N-Nitrosodiphenylamine	50	<10	<10	<10
Pentachlorophenol	NS	<25	<25	<25
Phenanthrene	50	<10	<10	<10
Phenol	NS	<10	<10	<10
Pyrene	50	<10	<10	<10

[1] NYS DEC TOGS 1.1.1, June, 1998
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory guidance
NS = No Standard

Table 7

Total and Dissolved Metals in Groundwater (ug/l)
EPA Method 6010 and 7471
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	Standard [1]	TW-1 1/16/14	TW-2 1/16/14	TW-3 1/16/14
Total				
Aluminum	100	**78.2**	**8.95**	**9.71**
Antimony	3	<60.0	<60.0	<60.0
Arsenic	50	**16.1**	<10.0	**15.2**
Barium	1,000	**0.88**	**0.21**	<0.20
Beryllium	3	<5.00	<5.00	<5.00
Cadmium	5	<5.00	<5.00	<5.00
Calcium	NS	**140**	**124**	**147**
Chromium	50	**0.31**	**0.03**	**0.03**
Cobalt	5	**0.07**	<0.05	<0.05
Copper	200	**0.25**	**0.03**	**0.04**
Iron	300	**141**	**18.6**	**21.6**
Lead	50	**295**	**43.1**	**37.2**
Magnesium	35,000	**51.7**	**31.2**	**44.6**
Manganese	300	**1.22**	**1.03**	**0.48**
Mercury	0.7	**0.5**	<0.2	<0.2
Nickel	100	**0.13**	<0.04	<0.04
Potassium	NS	**25.9**	**5.6**	**6.1**
Selenium	10	**25.7**	<10.0	**12.7**
Silver	NS	<0.01	<0.01	<0.01
Sodium	20,000	**17.4**	**51.2**	**51.4**
Thallium	8	<10.0	<10.0	<10.0
Vanadium	14	**0.30**	<0.05	<0.05
Zinc	66	**0.85**	**0.14**	**0.21**
Dissolved				
Aluminum	100	<0.20	<0.20	<0.20
Antimony	3	<60.0	<60.0	<60.0
Arsenic	50	<10.0	<10.0	<10.0
Barium	1,000	<0.20	<0.20	<0.20
Beryllium	3	<5.00	<5.00	<5.00
Cadmium	5	<5.00	<5.00	<5.00
Calcium	NS	**113**	**125**	**139**
Chromium	50	<0.01	<0.01	<0.01
Cobalt	5	<0.05	<0.05	<0.05
Copper	200	<0.02	<0.02	<0.02
Iron	300	<0.10	<0.10	<0.10
Lead	50	**8.91**	**7.97**	**6.38**
Magnesium	35,000	**24.6**	**26.0**	**36.6**
Manganese	300	**0.19**	**0.87**	**0.19**
Mercury	0.7	<0.20	<0.20	<0.20
Nickel	100	<0.04	<0.04	<0.04
Potassium	NS	**15.1**	<5.00	<5.00
Selenium	10	**7.84**	**7.34**	**10.2**
Silver	NS	<0.01	<0.01	<0.01
Sodium	20,000	**21.1**	**54.0**	**63.9**
Thallium	8	<10.0	<10.0	<10.0
Vanadium	14	<0.05	<0.05	<0.05
Zinc	66	**0.030**	**0.03**	**0.04**

[1] NYS DEC TOGS 1.1.1, June, 1998
Bolded values signify detection above method detection limit
Highlighted values signify exceedance of regulatory guidance in dissolved samples
NS = No Standard

Table 8

Volatile Organic Compounds in Sub-Slab Vapor (ug/m3)
EPA Method TO-15
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Sample ID Sample Date	NYSDOH Guideline [1]	SV-1 1/16/14	SV-2 1/16/14	SV-3 1/16/14	SV-4 1/16/14
1,1,1-Trichloroethane	NS	<1.09	<5.46	<1.09	<1.09
1,1,2,2-Tetrachloroethane	NS	<1.37	<6.87	<1.37	<1.37
1,1,2-Trichloro-1,2,2-trifluoroethane	NS	<0.77	<3.83	<0.77	<0.77
1,1,2-Trichloroethane	NS	<1.09	<5.46	<1.09	<1.09
1,1-Dichloroethane	NS	<0.81	<4.05	<0.81	<0.81
1,1-Dichloroethene	NS	<0.79	<3.96	<0.79	<0.79
1,2,4-Trichlorobenzene	NS	<1.48	<7.42	<1.48	<1.48
1,2,4-Trimethylbenzene	NS	**1.62**	**22.90**	**2.61**	**14.0**
1,2-Dibromoethane	NS	<1.54	<7.69	<1.54	<1.54
1,2-Dichlorobenzene	NS	<1.20	<6.01	<1.20	<1.20
1,2-Dichloroethane	NS	<0.81	<4.05	<0.81	<0.81
1,2-Dichloroethene (cis)	NS	<0.79	<3.96	<0.79	<0.79
1,2-Dichloroethene (trans)	NS	<0.79	<3.96	**1.19**	<0.79
1,2-Dichloropropane	NS	<0.92	<4.62	<0.92	<0.92
1,2-Dichlorotetrafluoroethane	NS	<1.40	<6.99	<1.40	<1.40
1,3,5-Trimethylbenzene	NS	<0.98	**23.1**	**1.43**	**12.7**
1,3-Butadiene	NS	<0.44	<2.21	<0.44	<0.44
1,3-Dichlorobenzene	NS	<1.20	<6.01	<1.20	<1.20
1,3-Dichloropropene (cis)	NS	<0.91	<4.54	<0.91	<0.91
1,3-Dichloropropene (trans)	NS	<0.91	<4.54	<0.91	<0.91
1,3-Hexachlorobutadiene	NS	<2.13	<10.7	<2.13	<2.13
1,4-Dichlorobenzene	NS	<1.20	<6.01	<1.20	<1.20
1,4-Dioxane	NS	<0.72	<3.60	<0.72	<0.72
2,2,4-Trimethylpentane	NS	**5.75**	**116**	**8.92**	**45.2**
4-Ethyltoluene	NS	<0.98	<4.92	<0.98	**3.88**
Acetone	NS	**68.7**	**173**	**722**	**634**
Benzene	NS	**1.57**	<3.19	**4.57**	**12.7**
Bromodichloromethane	NS	<1.34	<6.70	<1.34	<1.34
Bromoform	NS	<2.07	<10.3	<2.07	<2.07
Bromomethane	NS	<0.78	<3.89	<0.78	<0.78
Carbon disulfide	NS	<0.62	<3.11	**2.18**	**1.28**
Carbon tetrachloride	NS	<1.26	<6.29	**2.14**	**3.96**
Chlorobenzene	NS	<0.92	<4.60	<0.92	<0.92
Chloroethane	NS	<0.53	<2.64	<0.53	<0.53
Chloroform	NS	<0.98	<4.88	<0.98	**1.71**
Chloromethane	NS	**1.26**	<2.07	**1.40**	<0.41
Cyclohexane	NS	**1.31**	**20.5**	**3.24**	**25.6**
Dibromochloromethane	NS	<1.70	<8.52	<1.70	<1.70
Dichlorodifluoromethane	NS	**2.57**	<4.94	<0.99	<0.99
Ethanol	NS	**28.4**	**32.3**	**101**	**290**
Ethyl acetate	NS	<0.72	<3.60	<0.72	<0.72
Ethylbenzene	NS	<0.87	<4.34	**2.17**	**21.5**
Isopropanol	NS	**4.64**	**53.5**	**5.53**	**14.3**
Methyl butyl ketone	NS	<0.82	<4.10	<0.82	**31.4**
Methyl ethyl ketone	NS	**1.62**	**6.19**	**64.0**	**828**
Methyl isobutyl ketone	NS	<0.82	<4.10	**3.61**	**108**
Methyl tert-butyl ether	NS	<0.72	<3.61	**1.08**	**10.9**
Methylene chloride	60	**3.53**	**5.63**	**11.1**	**3.07**
n-Heptane	NS	**2.17**	**39.3**	**6.84**	**50.5**
n-Hexane	NS	**3.67**	**62.0**	**13.3**	**23.7**
Propylene	NS	**2.81**	**5.9**	**28.5**	**6.90**
Styrene	NS	<0.85	<4.26	<0.85	**0.89**
tert-Butyl Alcohol	NS	**3.61**	**6.67**	**25.2**	**12.3**
Tetrachloroethene	100	<1.36	<6.78	**1.63**	**47.7**
Tetrahydrofuran	NS	<0.59	<2.95	**8.76**	**129**
Toluene	NS	**5.01**	**17.7**	**14.3**	**113**
Trichloroethene	5	<1.07	<5.37	<1.07	<1.07
Trichlorofluoromethane	NS	**1.35**	<5.62	**1.6**	<1.12
Vinyl acetate	NS	**7.32**	**102**	**14.8**	<0.70
Vinyl bromide	NS	<0.87	<4.37	<0.87	<0.87
Vinyl chloride	NS	<0.51	<2.56	<0.51	<0.51
Xylenes (m&p)	NS	**3.47**	**34.7**	**8.38**	**53.6**
Xylenes (o)	NS	**1.39**	**21.1**	**3.39**	**20.6**

[1] Table 3.1, NYSDOH "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York", October 2006.
Bolded values signify detection above method detection limit
Highlighted values signify exceedances of guidance values
NS = No Standard

Table 9

Calculated Groundwater Elevation (ft.)

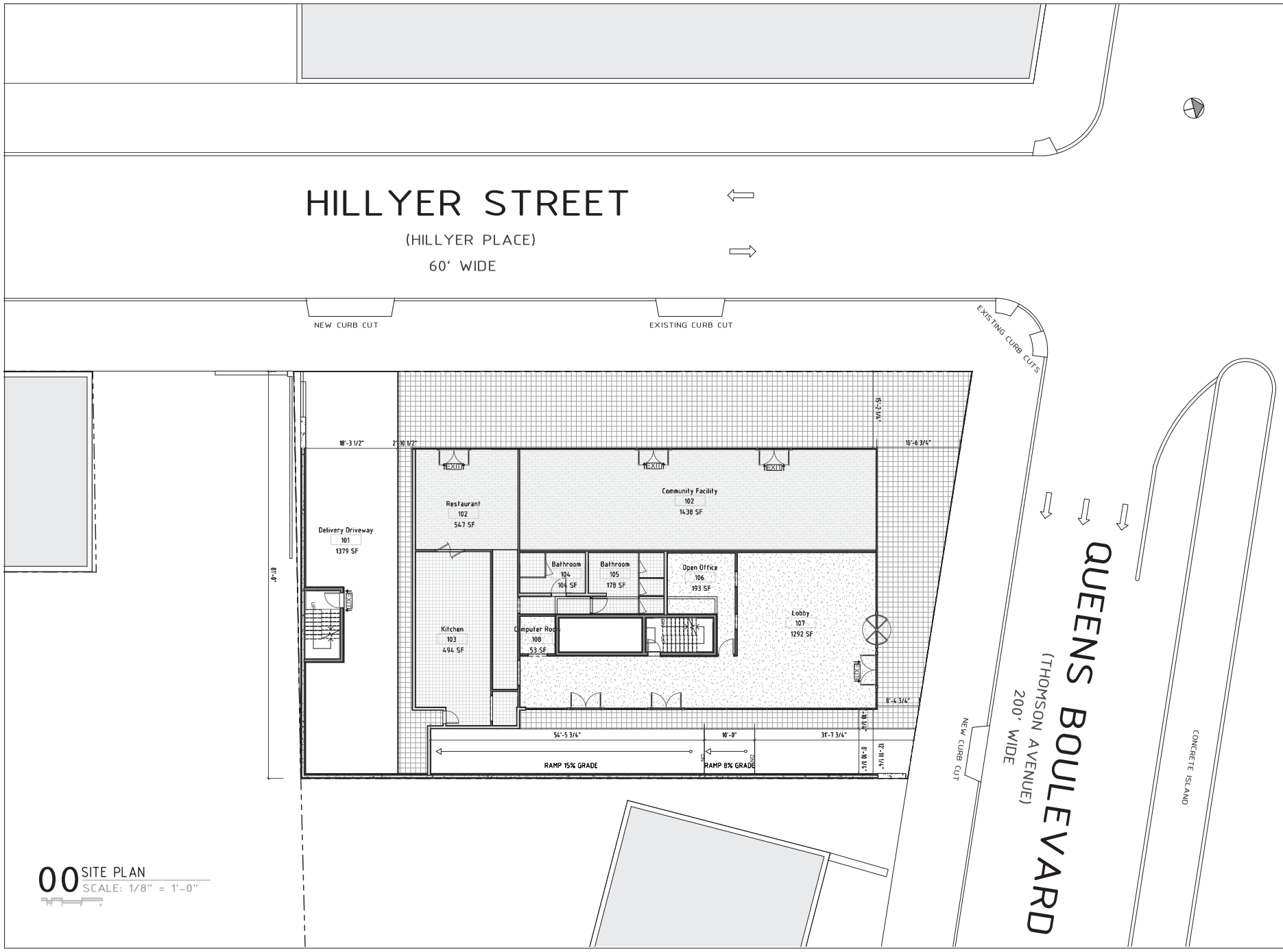
78-02/06 Queens Boulevard
Elmhurst, NY

ACT Project No.: 7581-ELNY

Date Sampled	Monitoring Well ID	Casing Elevation	Depth to water	Groundwater Elevation
1/16/14	TW-1	21.79	7.66	14.13
1/16/14	TW-2	21.16	7.24	13.92
1/16/14	TW-3	20.86	7.18	13.68

Top of casing elevations were surveyed to an arbitrary elevation of 20 feet.

APPENDIX 1
PROPOSED DEVELOPMENT PLANS



00 SITE PLAN
SCALE: 1/8" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
30-76 STEINWAY STREET, SUITE 301
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
SITE PLAN

SEAL & SIGNATURE

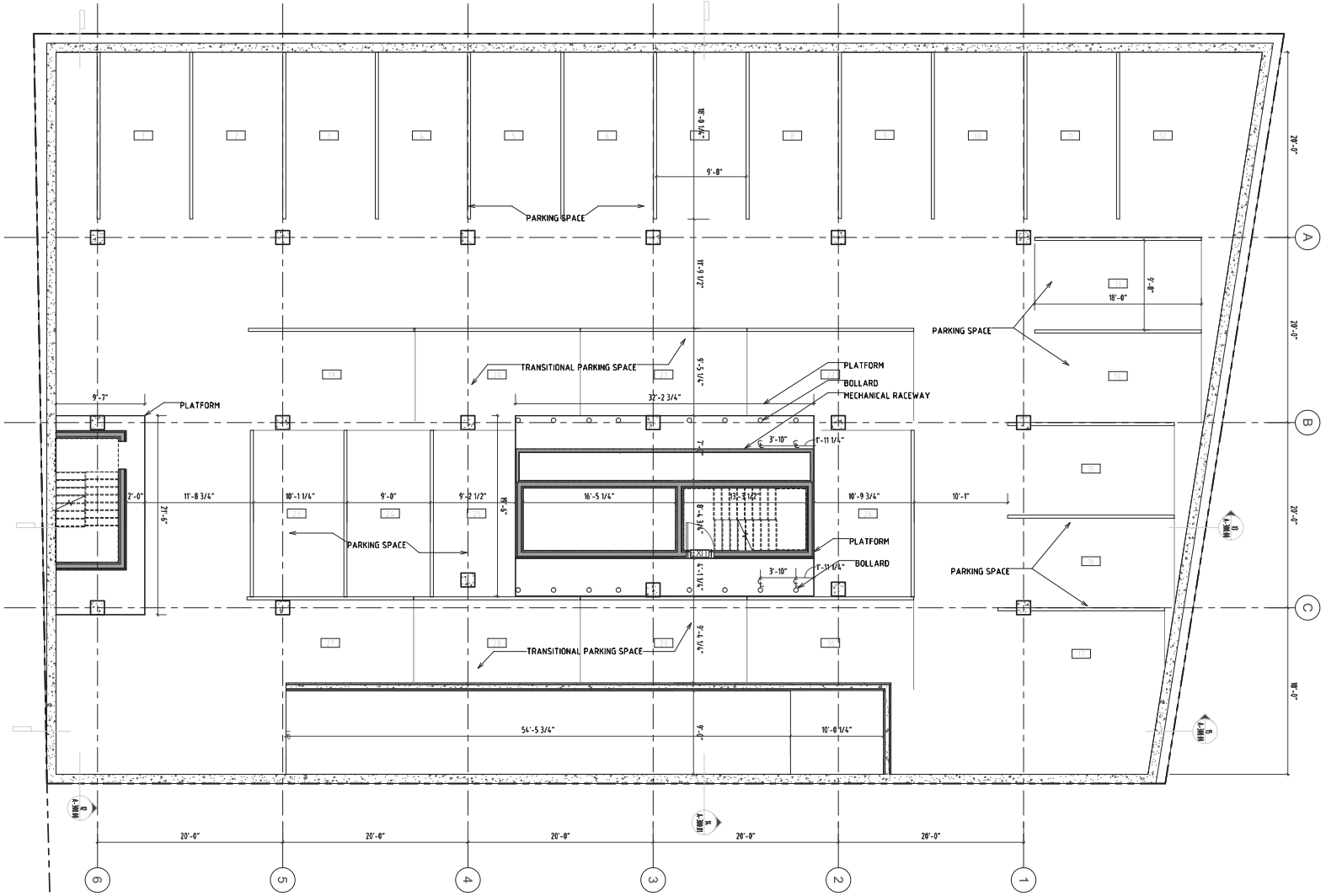
DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

DWG NO:
A-100.00

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP



01 CELLAR FLOOR PLAN
SCALE: 3/16" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
31-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
CELLAR PLAN

SEAL & SIGNATURE

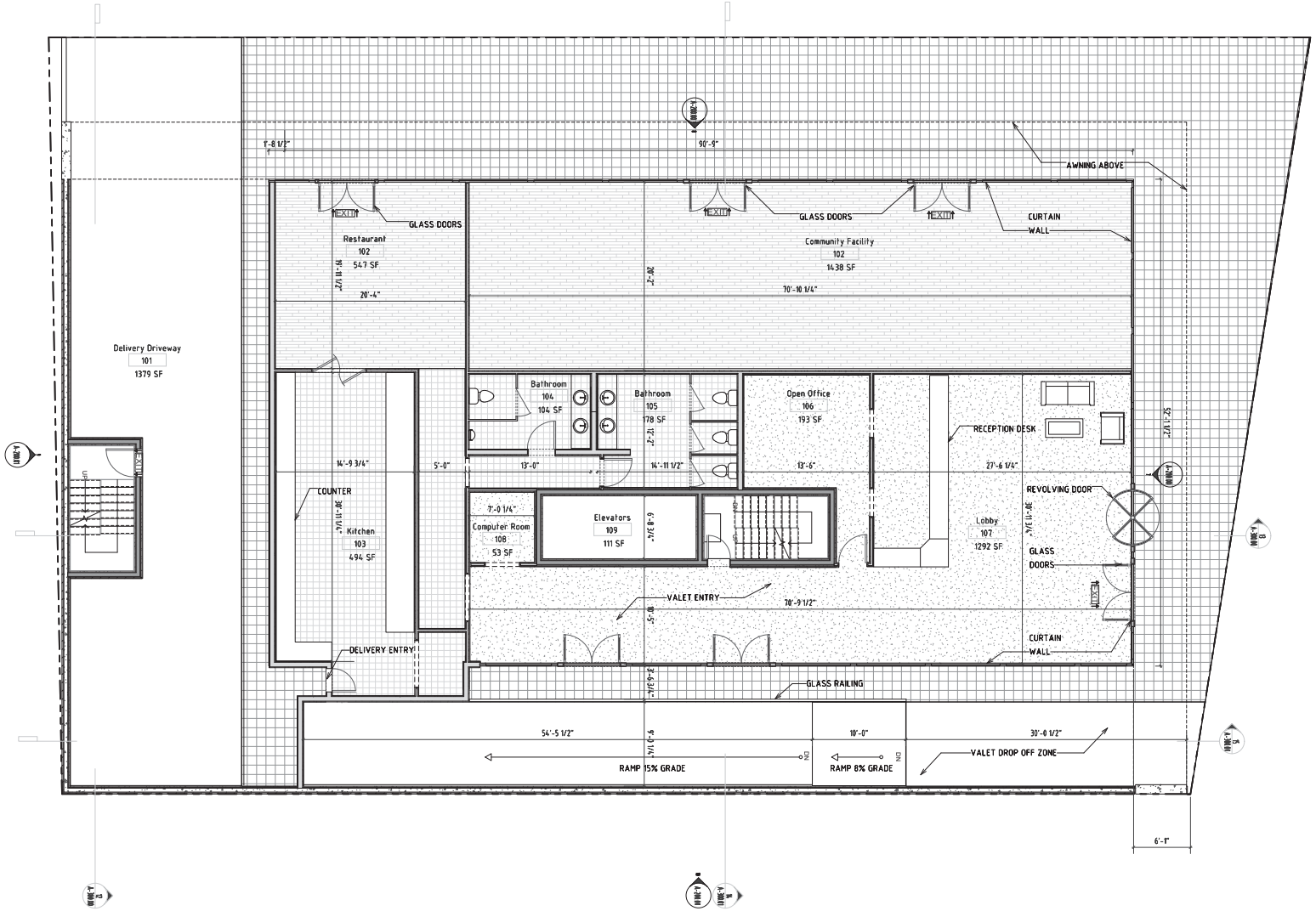
DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

DWG NO:
A-100.01

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP



02 1ST FLOOR PLAN
SCALE: 3/16" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
31-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
1ST FLOOR PLAN

SEAL & SIGNATURE

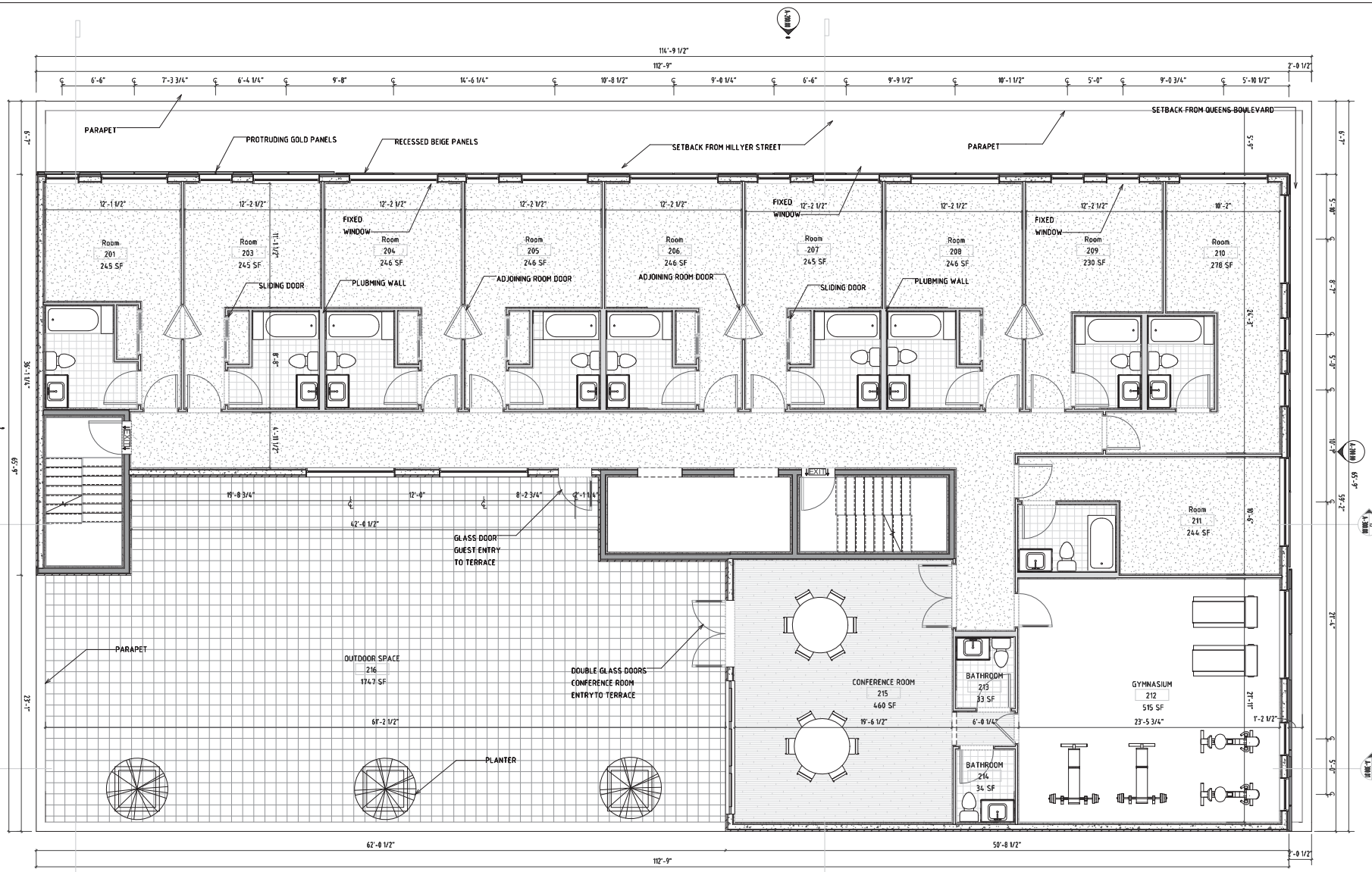
DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

DWG NO:
A-100.02

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP



03 2ND FLOOR PLAN
SCALE: 1/4" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
32-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
2ND FLOOR PLAN

SEAL & SIGNATURE

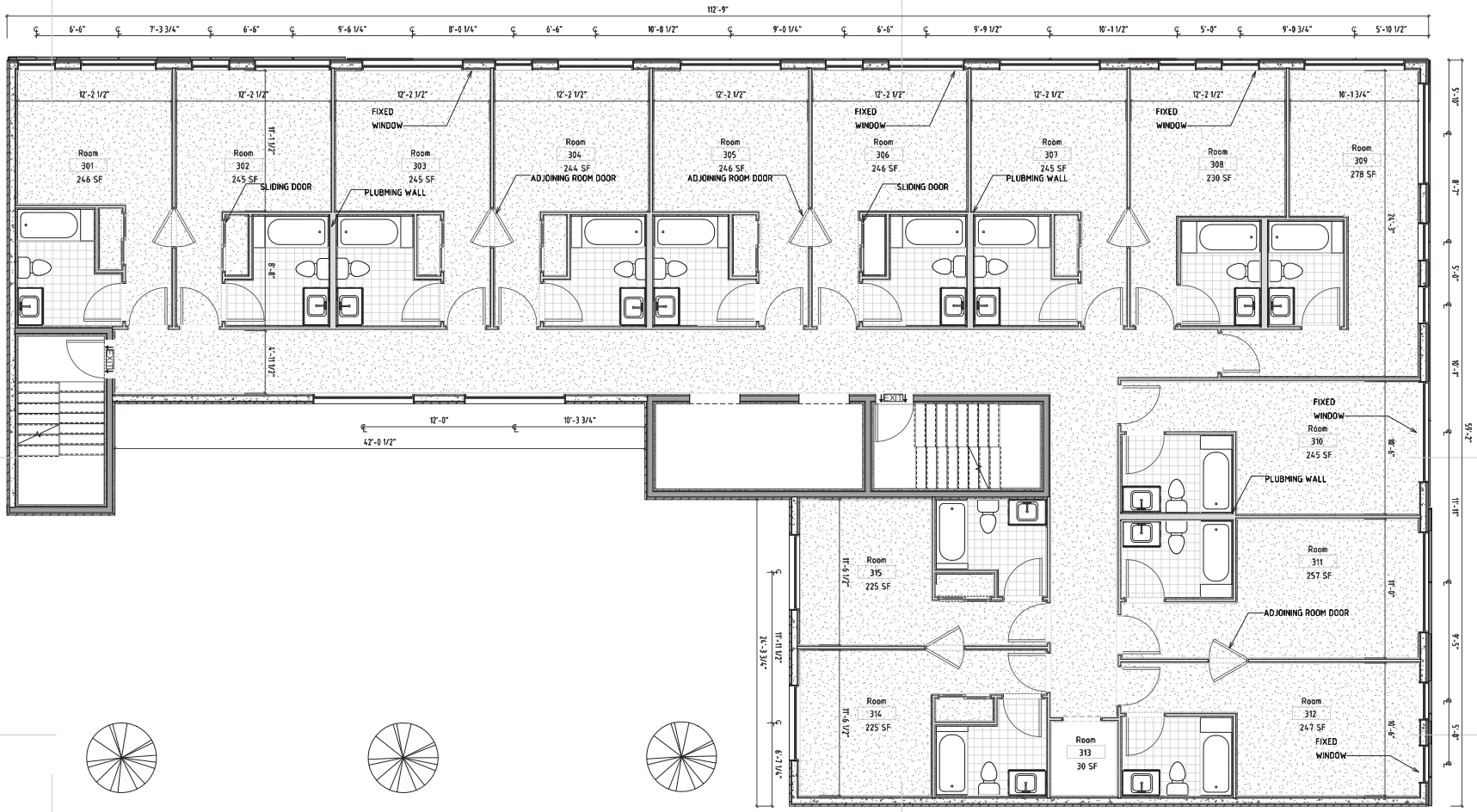
DATE: 12/17/14 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

DWG NO:
A-100.03

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP



04 3RD-8TH FLOOR PLAN
SCALE: 1/4" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
30-76 STEINWAY STREET, SUITE 301
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
3RD-8TH FLOORS PLAN

SEAL & SIGNATURE

DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

DWG NO:
A-100.04

SHEET NO: OF

BSAN STICKER

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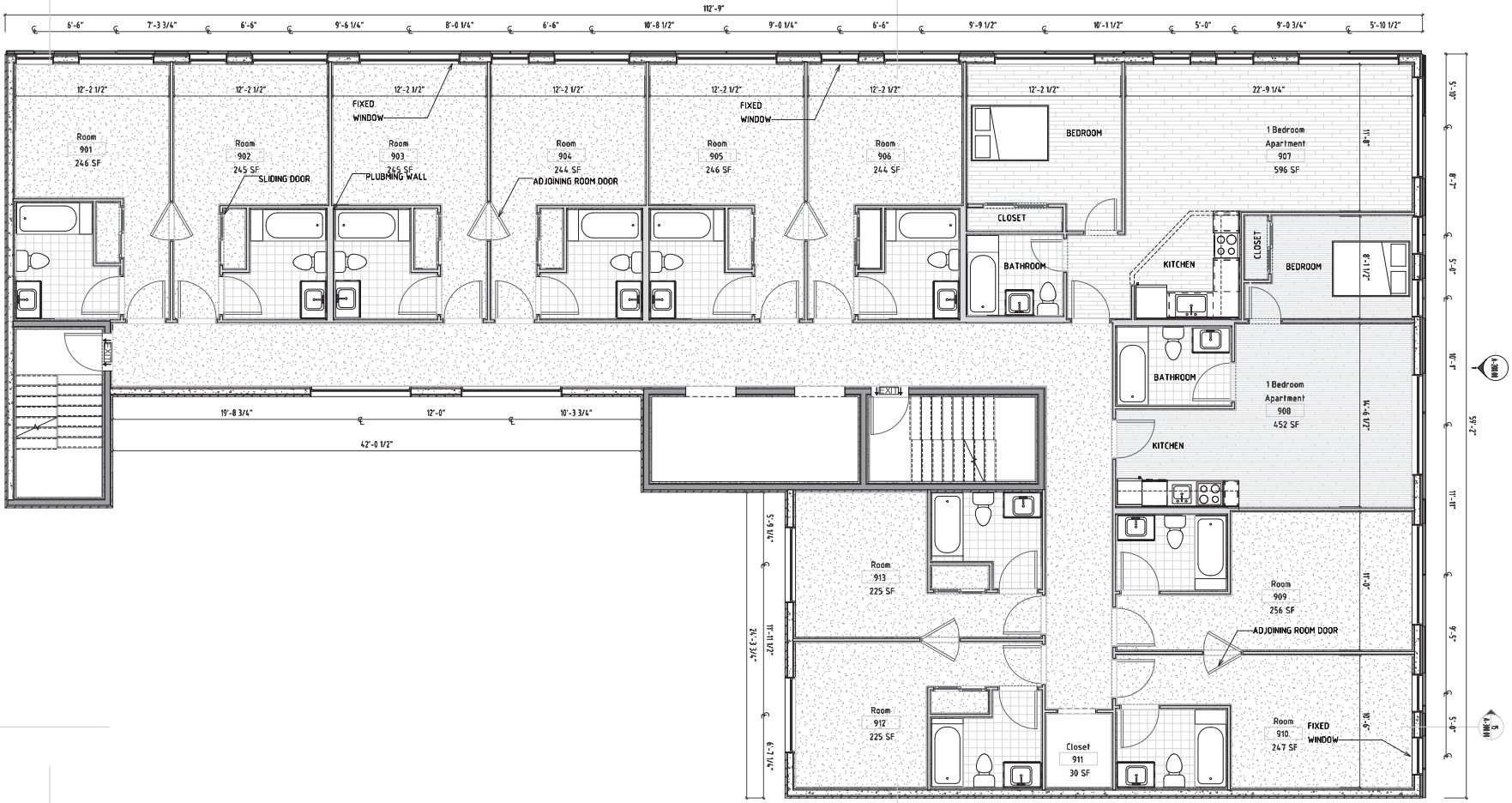

05 9TH-11TH FLOOR PLAN
SCALE: 1/4" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
31-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
9TH-11TH FLOOR PLAN

SEAL & SIGNATURE

DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

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A-100.05

SHEET NO: OF

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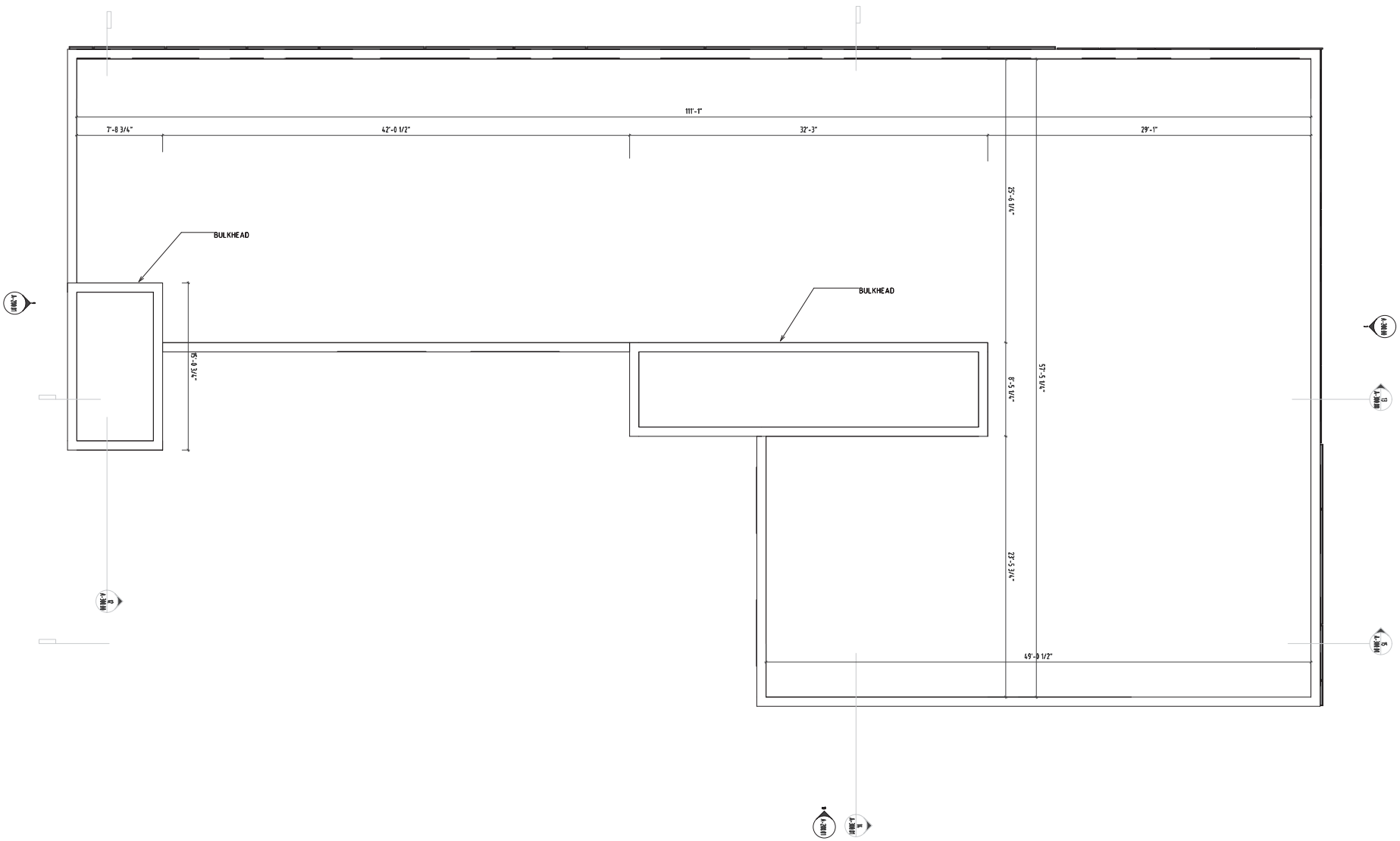

06 ROOF PLAN
SCALE: 1/4" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
30-76 STEINWAY STREET, SUITE 301
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
ROOF PLAN

SEAL & SIGNATURE

DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K.

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A-100.06

SHEET NO: OF

BSAN STICKER

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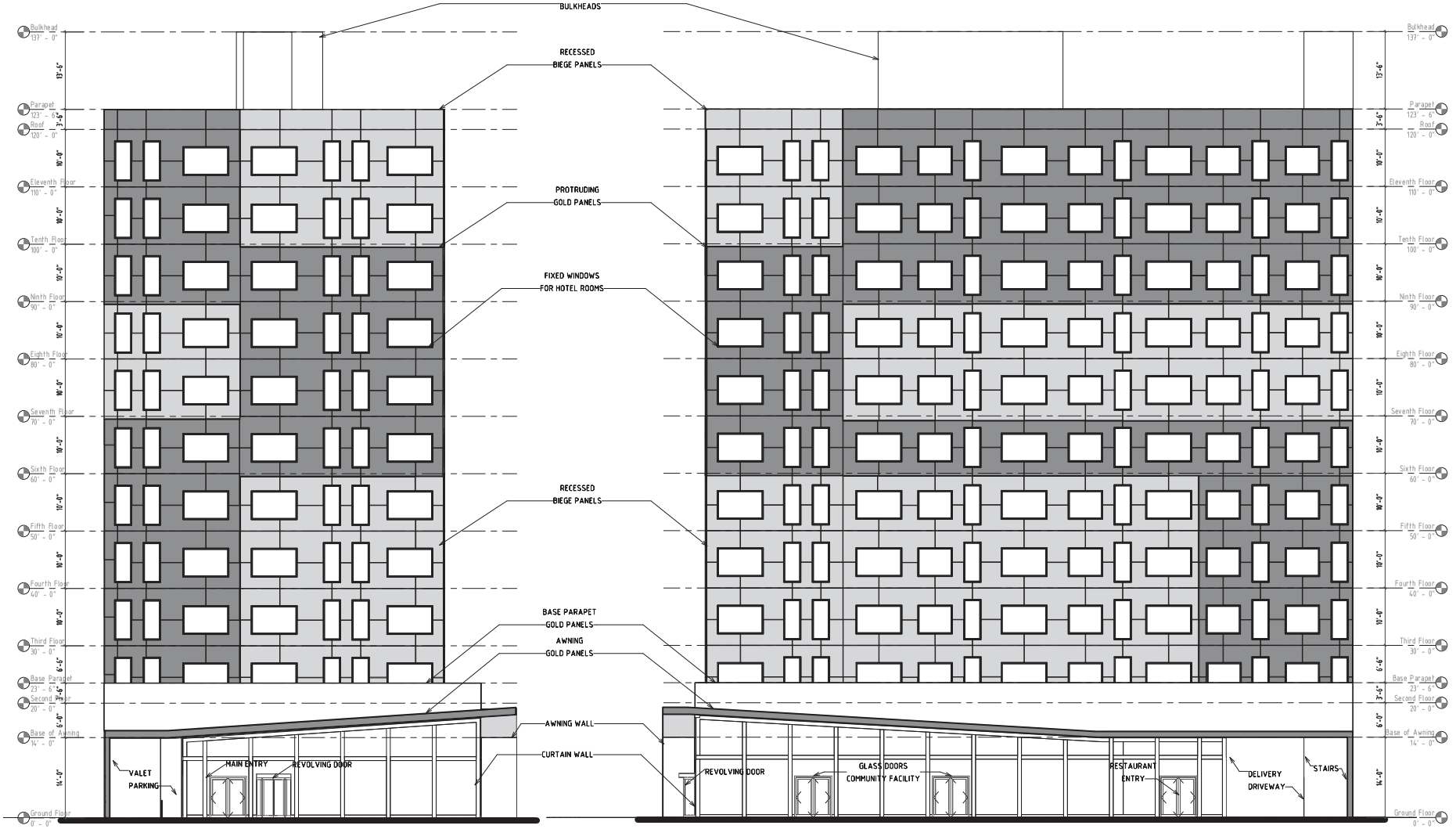

07 NORTH ELEVATION
SCALE: 1/8" = 1'-0"

08 WEST ELEVATION
SCALE: 1/8" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
30-76 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
ELEVATIONS

SEAL & SIGNATURE

DATE: 01/08/15 | DRAWING BY: K. I
SCALE: AS NOTED | CHECKED BY: E. K.

DWG NO:
A-200.00

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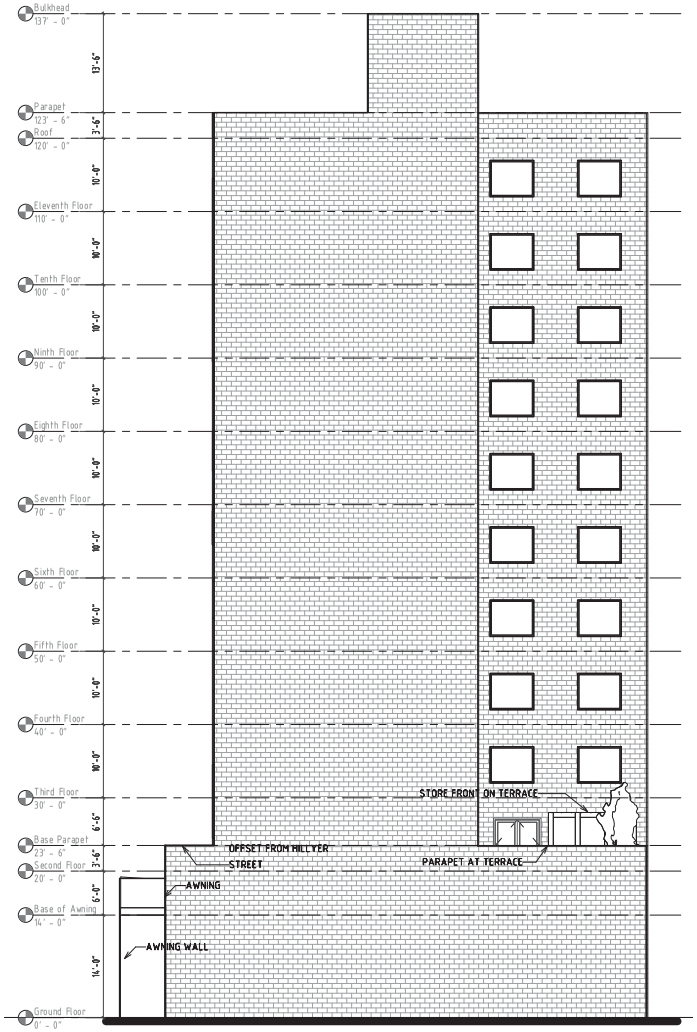
BSAN STICKER

DOB APPROVAL STAMP



09 SOUTH ELEVATION
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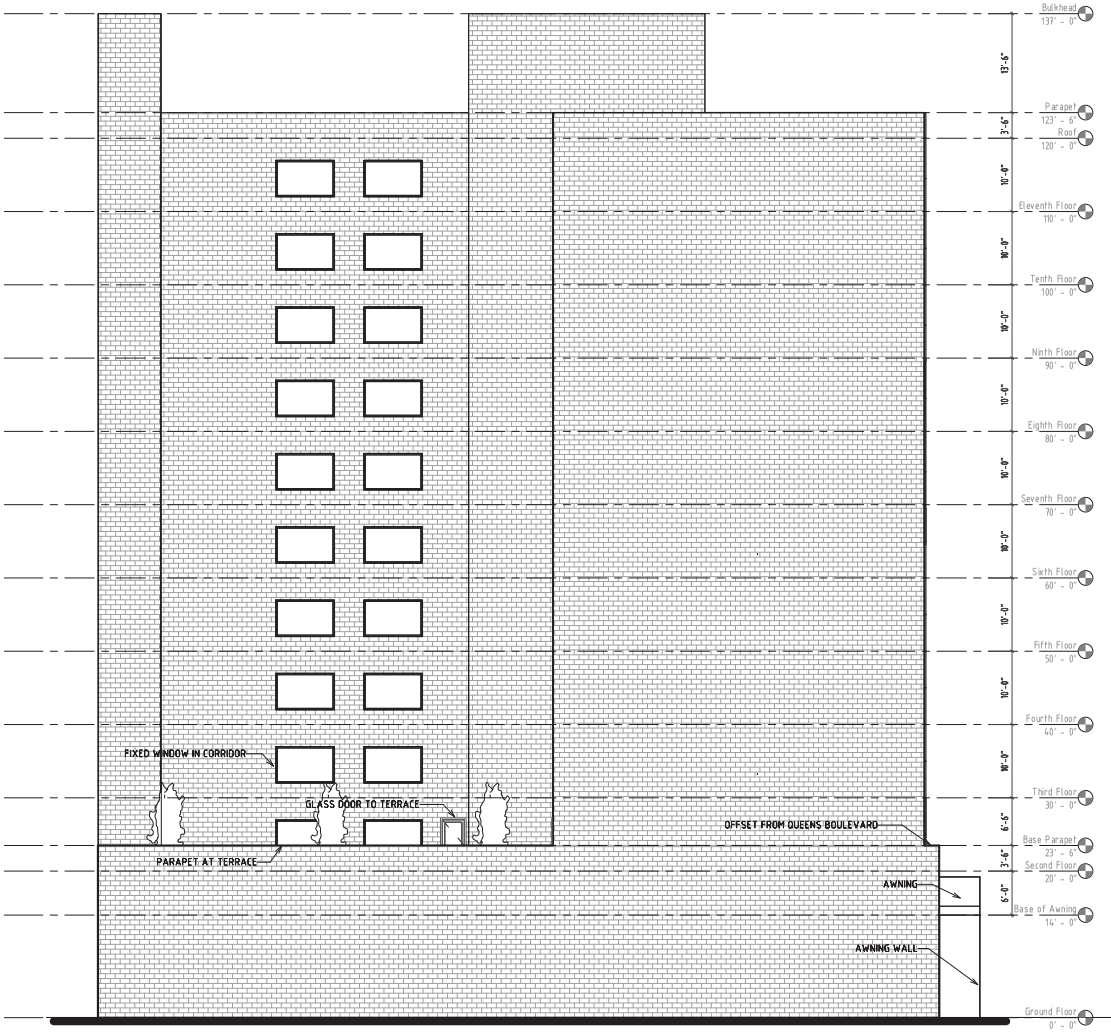

10 EAST ELEVATION
SCALE: 1/8" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
30-76 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
ELEVATIONS

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DATE: 07/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K

DWG NO:
A-200.01

SHEET NO: OF

BSAN STICKER

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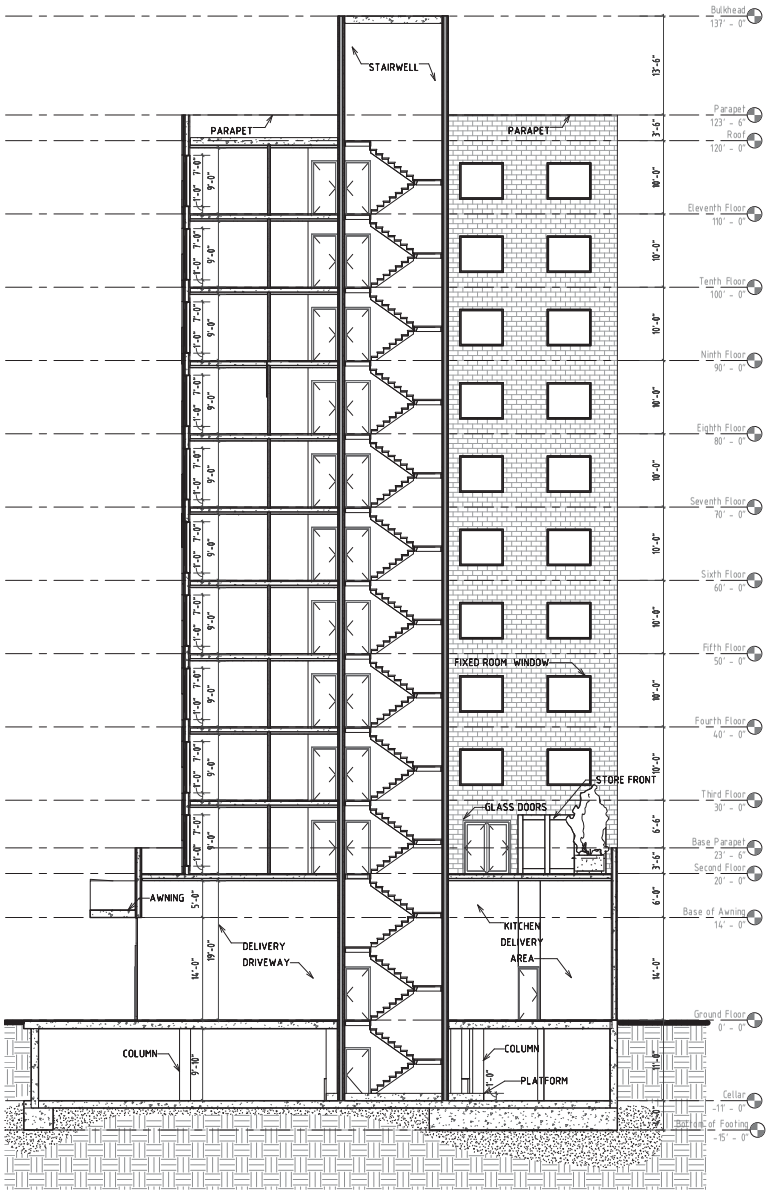

12 CROSS SECTION
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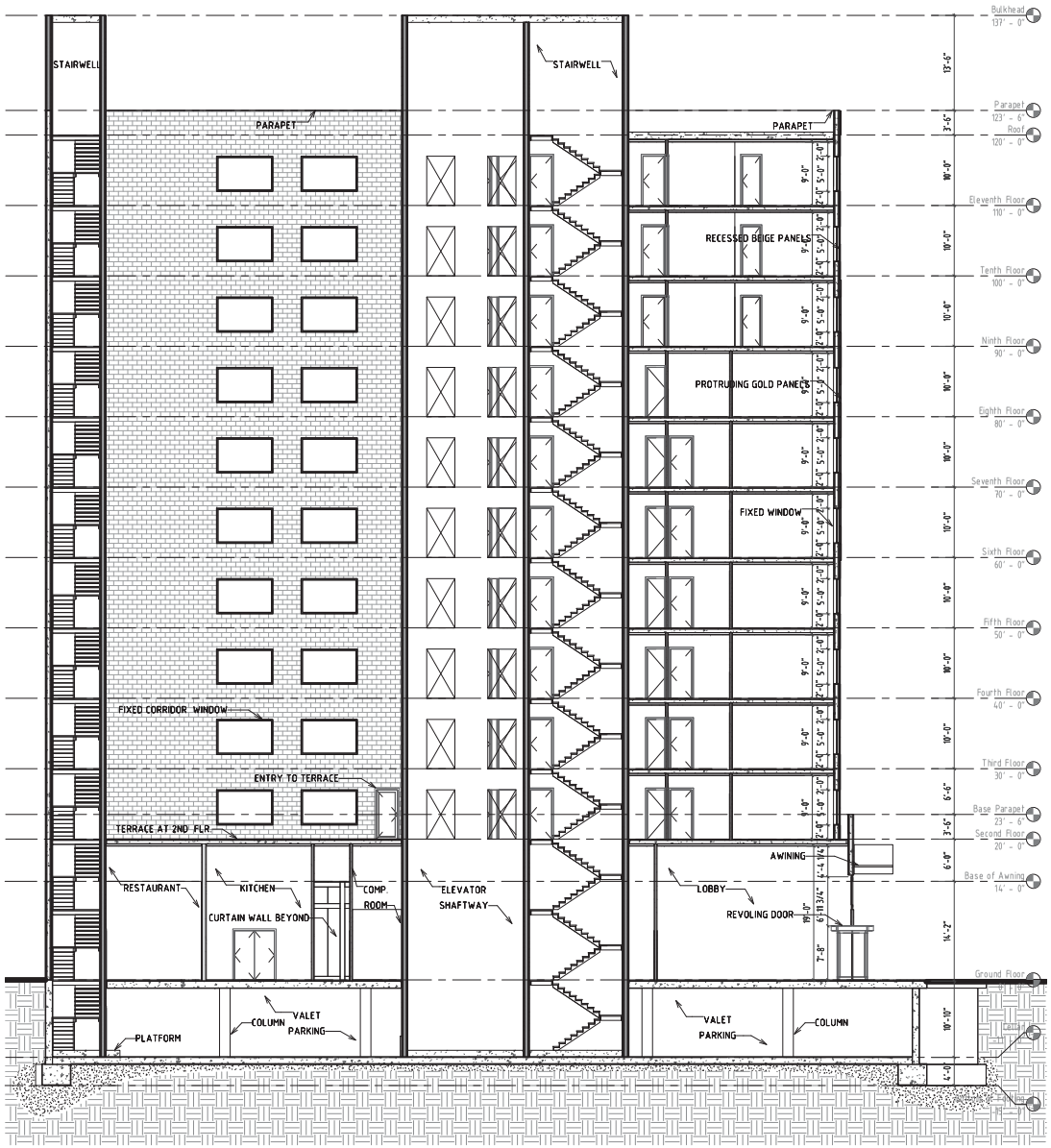

13 LONGITUDINAL SECTION
SCALE: 1/8" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
33-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

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REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

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SECTIONS

SEAL & SIGNATURE

DATE: 12/17/14 | DRAWING BY: Author
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A-300.00

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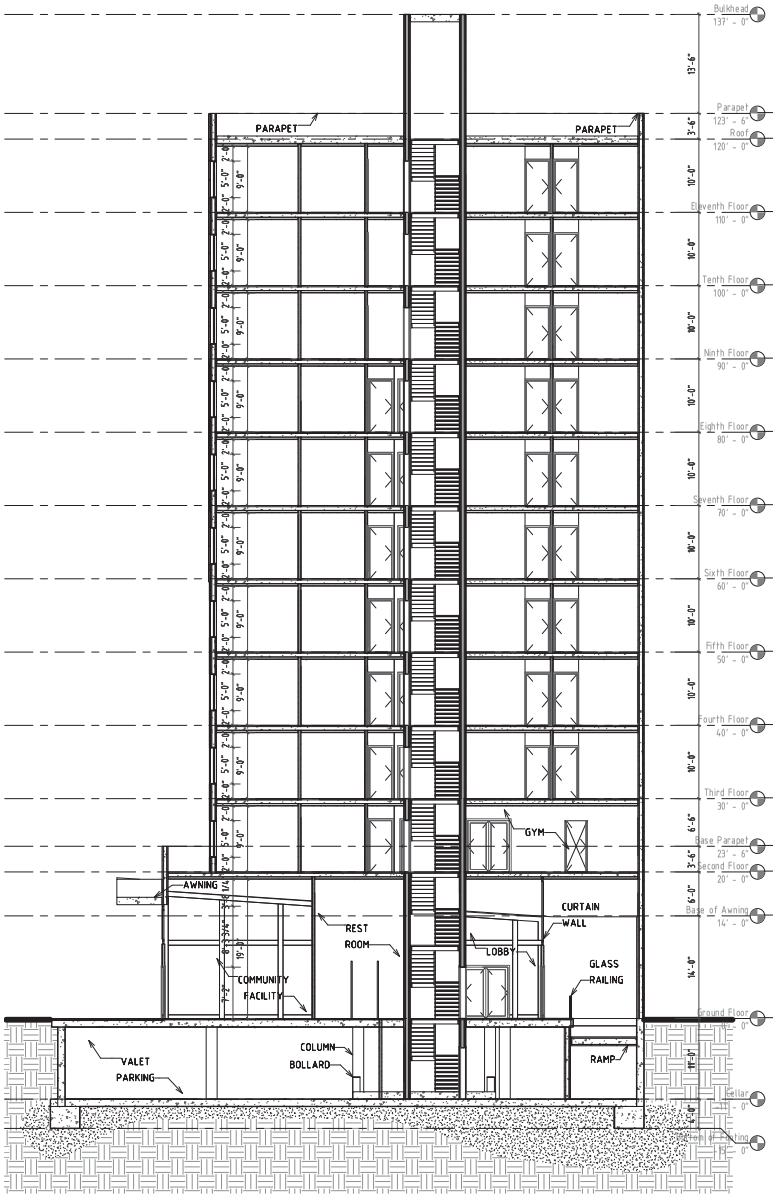
BSAN STICKER

DOB APPROVAL STAMP



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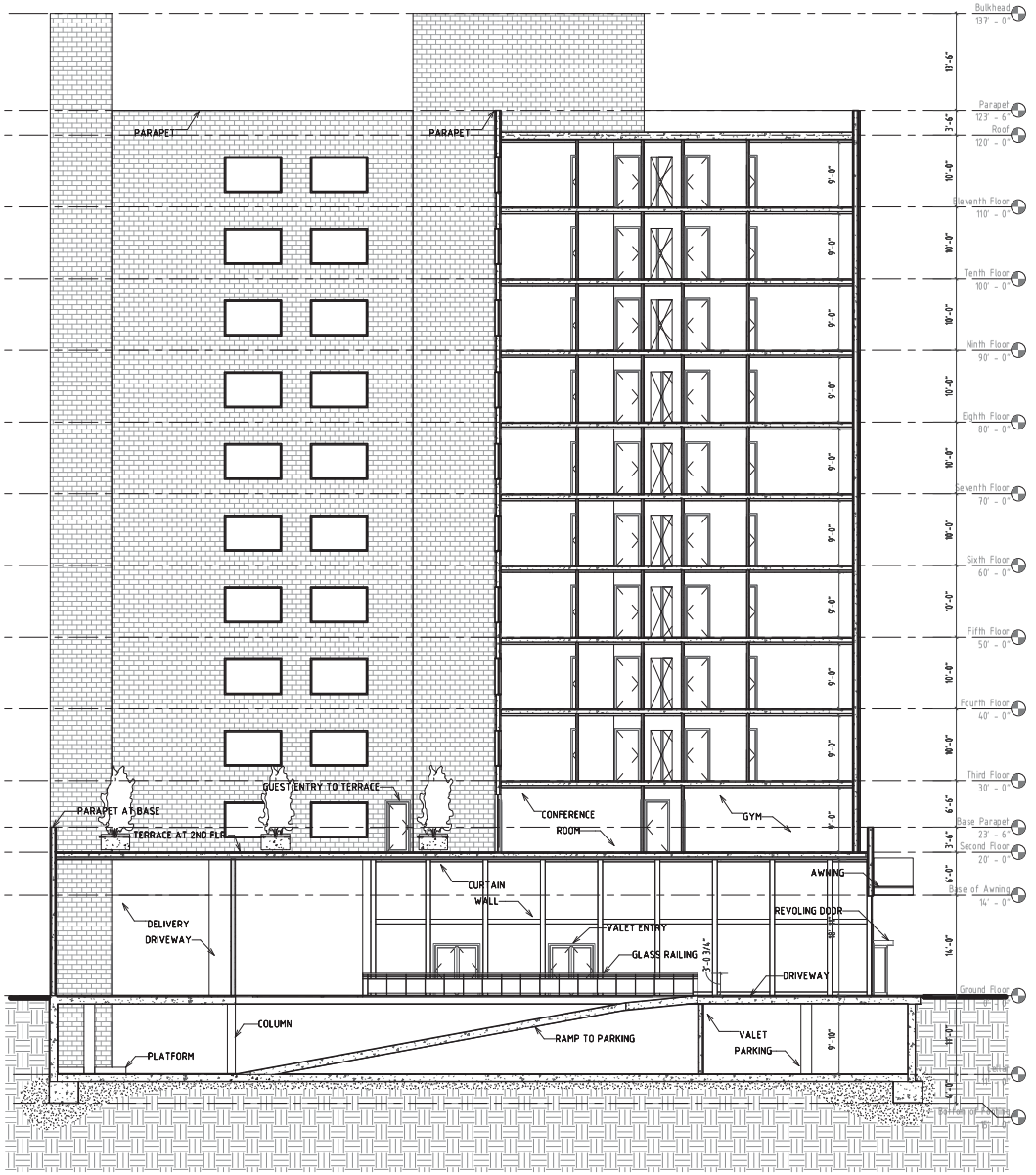

15 LONGITUDINAL SECTION
SCALE: 1/8" = 1'-0"

KAMBANIS ARCHITECT P.L.L.C
31-75 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
SECTIONS

SEAL & SIGNATURE

DATE: 01/08/15 | DRAWING BY: K.I
SCALE: AS NOTED | CHECKED BY: E.K

DWG NO: A-300.01

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP

KAMBANIS ARCHITECT P.L.L.C
30-76 STEINWAY STREET, SUITE 201
ASTORIA, NY 11103
TEL: 718.606.9903
FAX: 718.606.9933

CLIENT:

CONSULTANTS:

REVISIONS

NO	DATE	DESCRIPTION

KEY PLAN

PROJECT
78-06 QUEENS BOULEVARD

DRAWING TITLE
RISERS

SEAL & SIGNATURE

DATE: 12/17/14 | DRAWING BY: Author
SCALE: AS NOTED | CHECKED BY: Checker

DWG NO:
PL-100.00

SHEET NO: OF

BSAN STICKER

DOB APPROVAL STAMP

APPENDIX 2
CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Times Development Inc. have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, Times Development Inc. will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Amanda Duchesne, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

Project Contact List OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project

manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories A document repository is maintained online. Internet access to view OER's document repositories is available at public libraries. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. The library nearest the Site is:

Queens Library at Lefrak City

98-30 57th Avenue, Corona, NY 11368

718-592-7677

Hours

Monday: 9:00-8:00
Tuesday: 1:00-6:00
Wednesday: 10:00-6:00
Thursday: 12:00-8:00
Friday: 10:00-6:00

Saturday and Sunday: Closed

Digital Documentation NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Identify Issues of Public Concern Times Development Inc. is required to identify whether there are specific issues of concern to stakeholders proximate to the project site. Such issues include but are not limited to interests of Environmental Justice communities. This section should list any site-specific issues of public concern and the method that they will be used resolved them. If needed, contact OER for additional guidance on how to identify issues of public concern.

Public Notice and Public Comment Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by Times Development Inc., reviewed and approved by OER prior to distribution and mailed by Times Development Inc. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- **Public Notice announcing the approval of the RAWP and the start of remediation**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

APPENDIX 3
SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

Reduce Consumption of Virgin and Non-Renewable Resources Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels Use of clean fuel improves NYC's air quality by reducing harmful emissions.

Recontamination Control Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

Stormwater Retention Stormwater retention improves water quality by lowering the rate of combined stormwater and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

Linkage with Green Building Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

Paperless Brownfield Cleanup Program Times Development Inc. is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program Times Development Inc. is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

APPENDIX 4
SOIL/MATERIALS MANAGEMENT PLAN

1.1 SOIL SCREENING METHODS

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 STOCKPILE METHODS

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 CHARACTERIZATION OF EXCAVATED MATERIALS

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 MATERIALS EXCAVATION, LOAD-OUT, AND DEPARTURE

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 OFF-SITE MATERIALS TRANSPORT

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will

be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are shown in Figure 10. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 MATERIALS DISPOSAL OFF-SITE

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Queens, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 MATERIALS REUSE ON-SITE

Soil and fill that is derived from the property that meets the Soil Cleanup Objectives (SCOs) established in this plan may be reused on-Site. The SCOs for on-Site reuse are Track 1 Unrestricted Use SCOs **or** Track 2 Restricted/Restricted Residential/Commercial/Industrial as modified by the Track 4 Site-Specific SCOs listed Section 4.2. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed. No reused materials are anticipated as part of the property development.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 DEMARCATION

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials

beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. The backfill and cover soil quality objectives are listed in Section 4.2.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence

that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department

of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 STORMWATER POLLUTION PREVENTION

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 CONTINGENCY PLAN

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found

during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 ODOR, DUST, AND NUISANCE CONTROL

Odor Control

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

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

APPENDIX 5
CONSTRUCTION HEALTH AND SAFETY PLAN

CONSTRUCTION
HEALTH AND SAFETY PLAN

78-02/06 Queens Boulevard
Elmhurst, NY 11373
Block 2453, Lots 42 and 44

ACT Project No. 7581-ELNY

February 23rd, 2015

Prepared for:

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Prepared by:

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1.0 INTRODUCTION

The construction of an 11-story mixed use building is being proposed at the property located at 78-02/06 Queens Boulevard, Elmhurst, New York ("the Site"). This Construction Health and Safety Plan (CHASP) has been prepared to identify site-specific health and safety procedures to be followed by on-site contractors during remedial activities at the site. All activities performed under this CHASP are targeted to comply with Occupational Safety and Health Administration (OSHA) Regulations 29 CFR Part 1910, *et seq.*

1.1 Purpose

The purpose of this CHASP is to provide the contractors' field personnel, and other visitors with an understanding of the potential chemical and physical hazards that exist or may arise while portions of this project are being performed. The primary objective is to ensure the well being of all field personnel and the community surrounding this site. A copy of this CHASP will be available to anyone that requests it. Visiting personnel (e.g. government officials, administrators, bank inspectors, assessors, etc.) that will have limited exposure to the site native soil/fill material during construction activities will be instructed on how to reduce the probability of exposure to site contaminants, but will not be required read the CHASP.

All on-site personnel shall familiarize themselves with the contents of this CHASP and the remedial activities planned for the site. Personnel choosing not to comply with this CHASP will be removed from the worksite.

1.2 Site Description

The Site is located at 78-02/06 Queens Boulevard, Elmhurst in the western section in Queens, New York and is identified as Block 2453 and Lots 42 and 44 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,325-square feet and is bounded by Hillyer Street, with one-story commercial buildings to the west, a one-story automotive repair shop to the south, a vacant seven-story hotel to the east, and Queens Boulevard with commerical buildings to the

north. A map of the site boundary is shown in Figure 2. Currently, the Site is a vacant dirt and gravel lot.

1.3 Environmental Concerns

Advanced Cleanup Technologies (ACT) completed a Phase I Environmental Site Assessment On January 2nd, 2014. The Phase I identified the following recognized environmental conditions:

- Historical industrial use of the subject property;
- Historical industrial use of the adjacent property to the south:
- An open petroleum spill at the adjacent property to the south.

A Remedial Investigation Report was prepared by Advanced Cleanup Technologies and was dated January 2015. Soil/fill samples collected during the RI were compared to NYSDEC Part 375-6.8 Unrestricted Use (Track 1) and Restricted Residential Use (Track 2) Soil Cleanup Objectives (SCOs). Soil sampling showed that no VOCs except for acetone (max 150 µg/kg) was detected above Track 1 SCOs. Two pesticides including 4,4'-DDT (max of 58 µg/kg), and 4,4'-DDE (max of 4.7 µg/kg) and one PCB, Aroclor 1260 (max of 120 µg/kg) were detected above their respective Track 1 SCOs. A total of 7 SVOCs were detected above their respective Restricted Residential SCOs in the shallow soil samples. Benzo(a)pyrene (max of 15,000 µg/kg), indeno(1,2,3-c,d)pyrene (max of 5,600 µg/kg) benzo(a)anthracence (max of 19,000 µg/kg), benzo(b)fluoranthene (max of 18,000 µg/kg), dibenzo(a,h)anthracene (max of 2,300 µg/kg), chrysene (max of 19,000 µg/kg), benzo(k)fluoranthene (max of 5,300 µg/kg). Metals including barium (max of 488 ug/kg), cadmium (max of 2.85 µg/kg), copper (max of 141 µg/kg), mercury (max of 0.32 µg/kg), nickel (max of 37.4 µg/kg), zinc (max of 854 µg/kg) and lead (max of 1,420 ug/kg) exceeded their respective Unrestricted Use SCOs. And of these metals, barium, cadmium, mercury and lead also exceeded Restricted Residential Use SCOs. The majority of soil contamination is restricted to shallow soils and is indicative of historic fill materials.

Groundwater samples collected during the RI were compared to NYSDEC 6NYCRR Part 703.5 Groundwater Quality Standards (GQS). Groundwater sampling showed that no SVOCs were detected above laboratory method detection limits. One VOC, acetone was detected above

it's GQS with a concentration of 61 µg/L. Several metals were identified in the groundwater samples and only selenium (max of 10.2 µg/L) exceeded its GQS in the filtered groundwater.

Soil vapor samples collected during the RI were compared to the compounds listed in Table 3.1 Air Guideline Values Derived by the NYSDOH located in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion. All of the detected compounds were below their respective guidance values. Soil vapor samples collected during the subsurface investigation showed all four samples contained low levels of petroleum and chlorinated VOCs. Several low level concentrations were detected for petroleum related and chlorinated VOCs. Petroleum related compounds (BTEX were detected at a maximum concentrations of 221 µg/m^3. Most compounds were detected at less than 20 µg/m^3. Highest levels were detected for acetone (maximum of 722 µg/m^3) and ethanol (maximum of 290 µg/m^3). The chlorinated VOC, Tetrachloroethylene (PCE) was identified in two of the four soil vapor samples at a maximum concentration of 47.7 µg/m^3. Carbon Tetrachloride was detected in the same two soil vapor samples at a maximum concentration of 3.96 µg/m^3. 1,1,1-Trchloroethane (TCA) and Trichloroethylene (TCE) were not detected in any soil vapor samples. PCE concentrations were below the monitoring and mitigation levels detected by NYSDOH matrix.

2.0 SITE PERSONNEL

All on-site personnel shall have training in accordance with the regulations codified at 29 CFR 1910.20. Proof that the qualifications of the on-site personnel comply with these regulations will be maintained by the Site Supervisor prior to their being allowed to be included in the on-Site workforce.

All on-site personnel shall familiarize themselves with the contents of the CHASP, the scope of the Remedial Action Work Plan (RAWP) for the Site and attend a daily site specific health and safety briefing prior to the commencement of work activities. Personnel choosing not to comply with this CHASP will be removed from the worksite.

ACT's Site Supervisor will have oversight responsibility over the project to ensure that this

CHASP is properly implemented and that ACT and its subcontractors adhere to all OSHA regulations and other established industry health and safety practices.

Each contractor will designate an on-site individual responsible for health and safety issues relating to excavation and construction activities. Each contractor will communicate to the Site Supervisor the name of this individual and what specific actions are to be taken by each contractor during that work day that will be required to comply with the CHASP.

The Site Supervisor will coordinate the activities of all other contractors on-site so as not to jeopardize the health and safety of any personnel on-site. In addition, the Site Supervisor will continually monitor and inspect personnel and equipment for compliance with established safe work practices.

A list of the pertinent personnel authorized to supervise site health and safety operations is presented below:

Title	Name	Telephone Number
Site Supervisor ACT	Tim Young	516-640-2947 (Mobile)
Project Manager ACT	Theresa Burkard	516-417-7660 (Mobile)
Health and Safety Officer ACT	Yisong Yang	718-508-2970 (Mobile)

3.0 PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE) is divided into the following four categories based on the degree of protection afforded:

Level A: This PPE level will be selected when the greatest level of skin, respiratory, and eye protection is required. It includes positive pressure, full face-piece self-contained breathing apparatus (SCBA), or NIOSH-approved positive pressure

supplied air respirator with escape SCBA and a totally-encapsulating chemical-protective suit.

Level B: This PPE level will be selected when the highest level of respiratory protection is necessary but a lesser level of skin protection is needed. It includes positive pressure, full face-piece SCBA, or NIOSH-approved positive pressure supplied air respirator with escape SCBA and hooded chemical-resistant clothing such as overalls and long-sleeved jacket, coveralls, one or two-piece chemical-splash suit or disposable chemical-resistant overalls.

Level C: This PPE level will be selected when the concentration(s) and type(s) of airborne substance(s) present in the work area is known and the criteria for using air purifying respirators are met. It includes full-face or half-mask, NIOSH-approved air purifying respirators and hooded chemical-resistant clothing such as overalls and long-sleeved jacket, coveralls, one or two-piece chemical-splash suit or disposable chemical-resistant overalls.

Level D: This PPE level will be selected for nuisance contamination only. It includes coveralls, gloves, chemical-resistant steel toe and shank boots, safety glasses or chemical splash goggles, hard hat, escape mask and face shield.

PPE shall be selected in accordance with the site air monitoring program (Section 5.3), OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH-approved and respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection.

Before site personnel are required to use any respirator with a negative or positive pressure tight-fitting face-piece, the personnel will be fit tested with the same make, model, style, and size of respirator that will be used. The fit test shall be administered using only an OSHA-accepted fit test protocol. The OSHA-accepted fit test protocols and procedures provided for in 29 CFR 1910.120 are contained in Appendix B of this CHASP.

All Site workers will be required to participate in a comprehensive PPE program. The PPE program will consist of daily "Tailgate" Health and Safety meetings, proper inspection, donning, use, maintenance, storage and decontamination of protective clothing and equipment, use of protective equipment in temperature extremes and monitoring of co-workers and the work environment.

The Site Supervisor will determine the level of protection required for all field activities and whether the level of protection should be upgraded. It is anticipated that all on-site activities will be conducted in Level D PPE, unless otherwise upgraded by the Site Supervisor. Changes in the level of protection will be recorded in the dedicated site logbook along with the rationale for the changes.

4.0 HAZARD EVALUATION

4.1 Chemical Exposure

A list of chemicals including VOCs, SVOCs, metals, pesticides and PCBs that are present in subsurface soil at the Site is provided in Table 1. These types of contaminants at the detected concentrations represent a low to moderate potential for exposure. The standards listed in the table represent Immediate Danger to Life and Health (IDLH), Time-Weighted Average (TWA) and Short-Term Exposure Limit (STEL).

The primary routes of exposure for these chemicals are inhalation, ingestion and absorption through the skin and mucous membranes. The health risks associated with the exposure to these substances during construction activities will be minimized through a combination of education, personal protection equipment (PPE) and dust control measures.

4.2 Temperature Hazards

4.2.1 Heat Exposure Hazards

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

Heat Rash

Heat rash results from continuous exposure to heat, humid air, and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

Heat Cramps

Cramps result from the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

Heat Exhaustion

Exhaustion results from increased stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

Heat Stroke

Heat stroke results from an overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red, hot, dry skin, absence of perspiration, nausea, dizziness and confusion, strong, rapid pulse, coma, and death.

The following procedures should be followed to prevent or control heat stroke:

A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as "Gatorade". Employees must be encouraged to drink more than the amount required in order to satisfy thirst.

B. Use cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek suits).

C. Provide shelter against heat and direct sunlight to protect personnel. Take breaks in shaded areas.

D. Rotate workers utilizing protective clothing during hot weather.

E. Establish a work regime that will provide adequate rest periods, with personnel working in shifts.

4.2.2 Cold Exposure Hazards

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also, thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7 °C (20 °F), including wind chill factor, heated warming shelters (company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation.

A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect (adapted from TLV's and Biological Exposure Indices 1988-1989, ACGIH).

4.3 Fire Prevention

One portable fire extinguisher with a rating (ratio) of 20 pound A/B/C will be conspicuously and centrally located at the site. Portable extinguishers will be properly tagged with inspection dates and maintained in accordance with standard maintenance procedures for portable fire extinguishers. The following fire prevention guidelines are to be followed:

- Only approved safety cans will be used to transport and store flammable liquids.

- All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool prior to filling.
- Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved, or vapor forms, or other flammable liquids may be present.
- No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

4.4 Operation of Heavy Equipment

When operating or working around heavy equipment, the Site Supervisor will ensure that site personnel conform to this CHASP to include the wearing of proper clothing such as hard hats and safety glasses. Any specific health and safety issues relating to the equipment to be used on-site that work day will be covered in the daily health and safety briefing.

5.0 MANAGEMENT AND PLANNING

5.1 General Site Control

The Site Supervisor will establish a command post within the Site. A perimeter site fence, as required by the New York City Department of Buildings, will be erected to define the limits of the Site. All work must be performed within the site fence. Flagmen and traffic control will be provided as required at all times.

The Site will be left hazard-free at the end of each work day. In addition, all fence gates will be operable and locked in a closed position, all site fencing will be properly standing or braced and site lighting will be operational. The property owner will provide site security during off-work hours.

During site excavation, worker exposure to potential hazardous substances will be minimized through Health and Safety Communication (Section 5.2), Decontamination Procedures (Section 5.3)

and Dust Control Methods (Section 5.3).

5.2 Health and Safety Communication

The relatively small size of the work area makes normal verbal communication the primary mode of communication for the project. In the event that verbal communication is impossible the following hand signals will be used.

Gripping a partners wrist = "Leave area immediately"
Hands on top of head = " I need assistance"
Thumbs up = "OK; I'm alright; I understand"
Thumbs down = "No; Negative"

Daily Health and Safety Meetings will address a list of tasks to be performed that day, the equipment and machinery involved, and any hazards identified with this type of activity. Workers will be given the opportunity to list out additional perceived hazards, and discuss safe work practices while in these operations. The daily safety meeting will also be an opportunity to review the work performed the previous day, any hazards encountered, mitigating actions taken, and suggestions for future improvement.

5.3 Air Monitoring

This section of the CHASP discusses air monitoring that will be performed to address community and site personnel concerns of possible exposures due to airborne migration of suspected contaminants that may be encountered during on-site field activities.

Periodic air monitoring will be performed for VOCs at the perimeter of the work area once every two hours during field activities. Continuous air monitoring will be performed for VOCs during all ground intrusive activities such as soil excavation, loading and offsite transport. All ambient air readings will be recorded and provided as an appendix in the P.E.-certified Remedial Closure Report.

5.3.1 Community Air Monitoring

Periodic air monitoring for VOCs at the perimeter of the work area will be accomplished as follows:

- VOCs will be monitored at the upwind perimeter of the work area at the start of each work day and periodically thereafter to establish background conditions. The monitoring will be performed utilizing a Photovac 2020 portable Photoionization Detector (PID) equipped with a 10.6 eV lamp capable of detecting the types of contaminants known or suspected to be present.
- VOCs will be monitored at the downwind perimeter of the work area daily at 2 hour intervals. If ambient air concentrations of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background, work activities will be halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15 minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

5.3.2 Activity-Specific Air Monitoring

Continuous air monitoring will be conducted inside the work area for VOC levels during all ground-intrusive activities, such as soil excavation, loading and offsite transport in accordance with 29 CFR 1910.120(h). Continuous air monitoring will also be performed utilizing a Photovac

2020 PID. Continuous air monitoring will be performed in the following manner:

- Volatile organic compounds will be monitored inside the work area of construction and health and safety personnel on a continuous basis. The PID will be programmed to calculate 15-minute running average concentrations. If ambient air concentrations of total organic vapors inside the work area exceed 5 ppm above background, work activities will be halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels inside the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level inside the work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15 minute average.

5.4 Dust Control

Each contractor shall control any dust generated on-site that may be produced during work activities. Dust control measures will be employed to ensure that there is no off-site migration of dust into the community by use of a stream of water applied through a fine spray nozzle. The NYC hydrant used for a water source will be fitted with a RPZ control device to prevent inadvertent contamination of the public water supply. In addition, a solid barrier fence will be installed around the perimeter of the property to control any fugitive migration of dust.

5.5 Spill Control and Prevention

Spills associated with site activities may be attributed to project specific heavy equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy

dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material.

Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.

5.6 Decontamination Procedures

Contaminants will be removed from personnel and equipment through a decontamination regiment. Workers will be required to remove any contaminated PPE before leaving the Site. Work boots, safety glasses, hard hats and work gloves will be washed in a two percent Alconox Solution, followed by three consecutive clean water rinses. All wash and rinse water will be containerized into a DOT drum. Gross contaminants will be brushed from worker's clothing before leaving the Site. A station for hand washing will also be set up.

Decontamination of heavy equipment will also be required before leaving the Site. Excavator buckets and vehicle wheels or tracks will be brushed clean with a broom, before being moved off-site. Reusable hand tools will be washed in a two percent Alconox solution, followed by a series of clean water rinses. All wash and rinse water will be containerized in appropriate steel drums for proper disposal.

5.7 Soil Disposal

Any contaminated soil (organic or inorganic constituents) encountered during the remedial activities will be segregated, stockpiled on-site onto polyethylene sheeting, and covered with polyethylene sheeting to prevent exposure to workers and the community until proper transportation and disposal in accordance with all NYSDEC Regulations is arranged.

6.0 EMERGENCY MEDICAL CARE AND PROCEDURES

If a personnel accident occurs on-site requiring emergency care, immediate care will be

administered appropriate to the injury in accordance with established Red Cross procedures and practices. In the event of serious injury to on-site personnel, the Emergency Medical Service of the City of New York (EMS) will be summoned to remove the injured individual to the nearest medical facility for treatment as follows.

Ambulance:	**911**
Emergency Medical:	**911**
Fire Department:	**911**
Elmhurst Hospital Center:	**(718) 334-4000**
Police Department:	**911**
Poison Control Center:	**(516) 542-2323**

The nearest emergency medical facility is the Elmhurst Hospital Center, 79-01 Broadway, Elmhurst, New York, which is located 1.2 miles from the Site. A map of the route to this hospital is attached. The directions to this medical facility from the Site are as follows:

- **Head east on Queens Boulevard toward 51st Avenue;**
- **Slight left to stay on Queens Boulevard;**
- **Turn left onto Broadway;**
- **Elmhurst Hospital Center is located on the Right.**

OSHA approved First Aid Kits will be maintained on-Site along with a First Aid blanket for treating shock, and will be readily accessible to all workers if an emergency occurs. The emergency signal for evacuation of personnel from the Site will be three (3) long blasts of a vehicle horn with the off-site rallying point designated as the corner of 35th Street and 8th Avenue. If in the event of a fire, explosion or other life-threatening incident on-site, the emergency signal above will be sounded and all personnel will evacuate the Site. The appropriate New York City emergency personnel (fire, police, etc.) will be immediately notified.

All injuries, no matter how slight, will be reported to the site safety supervisor immediately.

The Site Supervisor will complete an accident report for all incidents. Some injuries, such as severe lacerations or burns, may require immediate treatment. Unless required due to immediate danger, seriously injured persons should not be moved without direction from attending medical personnel. The Site Supervisor will record occupational injuries and illnesses within 48 hours of occurrence, as required by statute.

Table 1

NIOSH Exposure Limits

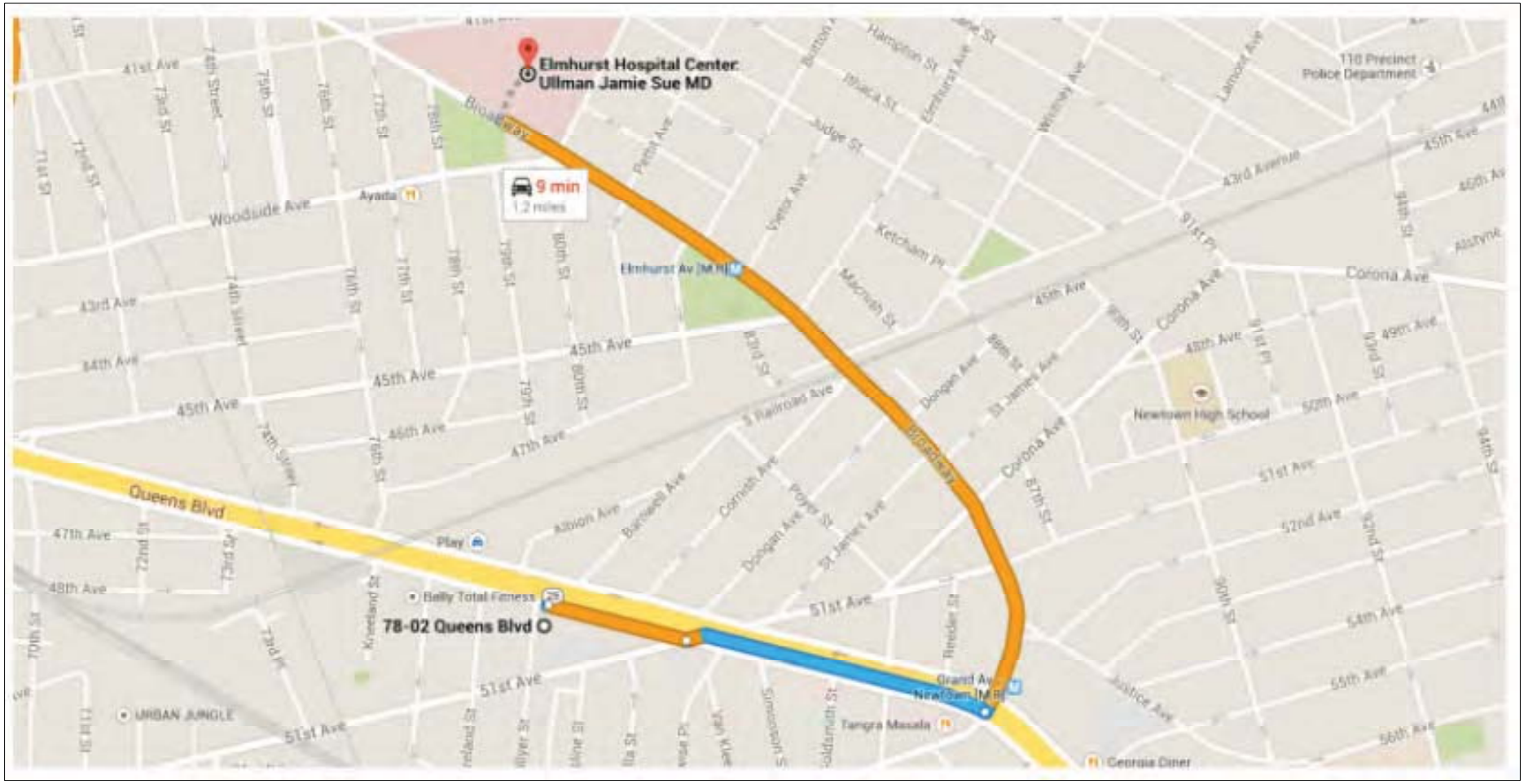
TABLE 1
NIOSH Exposure Limits (mg/m^3)[1]

Chemical	IDLH	TWA	STEL
Benzene	1625	1.63	8.13
Toluene	1900	375	560
Ethylbenzene	3530	435	545
Xylenes	3970	435	655
Naphthalene	1250	50	75
Acenaphthene	N.L.	N.L.	N.L.
Anthracene	N.L.	N.L.	N.L.
Pyrene	N.L.	N.L.	N.L.
Chrysene	N.L.	N.L.	N.L.
Benzo(b)Fluoranthene	N.L.	N.L.	N.L.
Benzo(a)Pyrene	N.L.	N.L.	N.L.
Benzo(ghi)Perylene	N.L.	N.L.	N.L.
Polychlorinated Biphenyl	5.0	0.5	N.L.
Aldrin	25	0.25	N.L.
Endrin	2	0.1	N.L.
Chlordane	100	0.5	N.L.
Toxaphene	200	0.5	N.L.
DDT	500	1	N.L.
Silver	10	0.01	N.L.
Barium	1100	0.5	N.L.
Cadmium	9	0.05	N.L.
Selenium	1	0.2	N.L.
Lead	100	0.05	N.L.
Mercury	10	0.05	N.L.
Arsenic	5	0.01	N.L.
Chromium	250	0.5	N.L.

[1] *All values taken from NIOSH International Chemical Safety Cards (Http://www.cdc.gov/niosh/ipcsneng/nengname.html)*
N.L..... None Listed

Figure 1

Hospital Route



Source: Google Maps

N

Hospital Route

Advanced Cleanup Technologies, Inc.
ENVIRONMENTAL CONSULTANTS
110 Main Street, Suite 103, Port Washington, New York 11050
Tel: 516-441-5800 Fax: 516-441-5511

Project No.: 7581-ELNY	Figure No.: 1
Date: 02/23/2015	Scale: Not To Scale

Appendix A

Chemical Safety Cards

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8
June 05, 2003 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES	Redness. Pain.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Fireproof. Separated from food and feedstuffs oxidants halogens	Do not transport with food and feedstuffs. Note: E F symbol T symbol R: 45-46-11-36/38-48/23/24/25-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0015

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZENE

ICSC: 0015

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.5 ppm as TWA 2.5 ppm as STEL (skin) A1 BEI (ACGIH 2004). MAK: H Carcinogen category: 1 Germ cell mutagen group: 3A (DFG 2004). OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A NIOSH IDLH: Ca 500 ppm See: 71432	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation through the skin and by ingestion **INHALATION RISK:** A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness Exposure far above the occupational exposure limit value may result in unconsciousness death **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the bone marrow immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 80°C Melting point: 6°C Relative density (water = 1): 0.88 Solubility in water, g/100 ml at 25°C: 0.18 Vapour pressure, kPa at 20°C: 10 Relative vapour density (air = 1): 2.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -11°C c.c. Auto-ignition temperature: 498°C Explosive limits, vol% in air: 1.2-8.0 Octanol/water partition coefficient as log Pow:

	2.13
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. 

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

International Chemical Safety Cards

TOLUENE

ICSC: 0078

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1

ICSC # 0078
CAS # 108-88-3
RTECS # XS5250000
UN # 1294
EC # 601-021-00-3
October 10, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•**INHALATION**	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•**EYES**	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-38-48/20-63-65-67 S: 2-36/37-46-62 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0078

International Chemical Safety Cards

TOLUENE

ICSC: 0078

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 50 ppm as TWA (skin) A4 BEI issued (ACGIH 2004).
MAK:
Pregnancy risk group: C
(DFG 2004).
EU OEL: 192 mg/m³ 50 ppm as TWA 384 mg/m³ 100 ppm as STEL (skin) (EU 2006).
OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)
NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)
NIOSH IDLH: 500 ppm See: 108883

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmia and unconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.
Auto-ignition temperature: 480°C

	Vapour pressure, kPa at 25°C: 3.8 Relative vapour density (air = 1): 3.1	Explosive limits, vol% in air: 1.1-7.1 Octanol/water partition coefficient as log Pow: 2.69
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 	

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Use of alcoholic beverages enhances the harmful effect. Card has been partly updated in October 2004: see sections Occupational Exposure Limits, EU classification, Emergency Response. Card has been partly updated in October 2006: see section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-30S1294
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0078 **TOLUENE**

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

Ethylbenzol
Phenylethane
EB
$C_8H_{10}/C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
November 23, 2007 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Dry powder. Foam. Carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Cough. Sore throat. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain. crimation; deleted at update Nov 07 - only at very high levels.	Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation in the throat and chest. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Collect leaking	Fireproof. Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	F symbol Xn symbol R: 11-20

liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer Do NOT let this chemical enter the environment.		S: 2-16-24/25-29 UN Hazard Class: 3 UN Packing Group: II Signal: Danger Flame-Excl mark-Health haz Highly flammable liquid and vapour May be harmful if swallowed Harmful if inhaled vapour Causes mild skin irritation Causes eye irritation Suspected of causing cancer May cause respiratory irritation May cause drowsiness or dizziness May be harmful if swallowed and enters airways Toxic to aquatic life

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ICSC: 0268

ETHYLBENZENE

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH AROMATIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are easily formed. **CHEMICAL DANGERS:** Reacts with strong oxidants. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 125 ppm as STEL A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2007). EU OEL: 442 mg/m³ 100 ppm as TWA 884 mg/m³ 200 ppm as STEL (skin) (EU 2006). OSHA PEL†: TWA 100 ppm (435 mg/m³) NIOSH REL: TWA 100 ppm (435 mg/m³) ST 125 ppm (545 mg/m³) NIOSH IDLH: 800 ppm 10%LEL See: 100414	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans. The substance may have effects on the kidneys and liver , resulting in impaired functions Repeated contact with skin may cause dryness and cracking.
PHYSICAL PROPERTIES	Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c.

	Solubility in water, g/100 ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7	Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.1 Viscosity, mm²/s at 25 °C: 0.6
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment.	

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-305 1135 or 30GF1- I+II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0268 **ETHYLBENZENE**

International Chemical Safety Cards

ICSC: 0086

p-XYLENE

UNEP

National Institute for Occupational Safety and Health NIOSH

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as	Fireproof. Separated from strong oxidants and strong acids	Note: C Xn symbol

possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)		R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0086

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids strong oxidants **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001). EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 138°C Melting point: 13°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.9	Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 528°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.15
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III
NFPA Code: H 2; F 3; R 0;

Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0086 **p-XYLENE**

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

ICSC # 0667
CAS # 91-20-3
RTECS # QJ0525000
UN # 1334 (solid); 2304 (molten)
EC # 601-052-00-2
April 21, 2005 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, food and feedstuffs Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61

	UN Hazard Class: 4.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0667	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** On combustion, forms irritating and toxic gases. Reacts with strong oxidants **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 10 ppm as TWA 15 ppm as STEL (skin) A4 (not classifiable as a human carcinogen); (ACGIH 2005). MAK: skin absorption (H); Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004). OSHA PEL†: TWA 10 ppm (50 mg/m^3) NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3) NIOSH IDLH: 250 ppm See: 91203	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 218°C Sublimation slowly at room temperature Melting point: 80°C Density: 1.16 g/cm³ Solubility in water, g/100 ml at 25°C: none	Vapour pressure, Pa at 25°C: 11 Relative vapour density (air = 1): 4.42 Flash point: 80°C c.c. Auto-ignition temperature: 540°C Explosive limits, vol% in air: 0.9-5.9 Octanol/water partition coefficient as log Pow: 3.3
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.	

NOTES

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF 1 -II+III (solid); 4 1 S2304 (molten)
NFPA Code: H2; F2; R0;

ADDITIONAL INFORMATION	

ICSC: 0667 **NAPHTHALENE**

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International Chemical Safety Cards

ACENAPHTHENE

ICSC: 1674

1,2-Dihydroacenaphthylene
1,8-Ethylenenaphthalene
$C_{12}H_{10}$
Molecular mass: 154.2

ICSC # 1674
CAS # 83-32-9
RTECS # AB1000000
UN # 3077
October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See NOTES.	PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P2 filter respirator for harmful particles. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers: if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	UN Hazard Class: 9 UN Packing Group: III Signal: Warning Enviro Very toxic to aquatic life with long lasting effects

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1674	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994 No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values

International Chemical Safety Cards

ACENAPHTHENE

ICSC: 1674

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
WHITE TO BEIGE CRYSTALS

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On combustion, forms toxic gases including carbon monoxide. Reacts with strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV not established.
MAK not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
See Notes.

PHYSICAL PROPERTIES

Boiling point: 279°C
Melting point: 95°C
Density: 1.2 g/cm³
Solubility in water, g/100 ml at 25°C: 0.0004

Vapour pressure, Pa at 25°C: 0.3
Relative vapour density (air = 1): 5.3
Flash point: 135°C o.c.
Auto-ignition temperature: >450 °C
Octanol/water partition coefficient as log Pow: 3.9 - 4.5

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised that this substance does not enter the environment.

NOTES

Acenaphthene occurs as a pure substance and also as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Transport Emergency Card: TEC (R)-90GM7-III

ADDITIONAL INFORMATION

ICSC: 1674	ACENAPHTHENE

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ANTHRACENE

ICSC: 0825

UNEP

National Institute for Occupational Safety and Health NIOSH

Anthracin
Paranaphthalene
$C_{14}H_{10}$ / $(C_6H_4CH)_2$
Molecular mass: 178.2

ICSC # 0825
CAS # 120-12-7
RTECS # CA9350000
March 24. 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT DISPERSION OF DUST!	
•**INHALATION**	Cough. Sore throat.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**	Redness. Pain.	Safety spectacles, face shield, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles).	Separated from strong oxidants. Well closed.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0825

International Chemical Safety Cards

ANTHRACENE

ICSC: 0825

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** WHITE CRYSTALS OR FLAKES. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** The substance decomposes on heating, under influence of strong oxidants producing acrid, toxic fume , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance slightly irritates the skin and the respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light.
PHYSICAL PROPERTIES	Boiling point: 342°C Melting point: 218°C Density: 1.25-1.28 g/cm³ Solubility in water, g/100 ml at 20 °C: 0.00013 Vapour pressure, Pa at 25°C: 0.08 Relative vapour density (air = 1): 6.15 Flash point: 121°C Auto-ignition temperature: 538°C Explosive limits, vol% in air: 0.6-? Octanol/water partition coefficient as log Pow: 4.5 (calculated)
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. 

NOTES

Green oil, Tetra-olive N2G are trade names.

NFPA Code: H0; F1; R;

ADDITIONAL INFORMATION

ICSC: 0825 **ANTHRACENE**

	relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

PYRENE

ICSC: 1474

Benzo (d,e,f) phenanthrene
beta-Pyrene
$C_{16}H_{10}$
Molecular mass: 202.26

ICSC # 1474
CAS # 129-00-0
RTECS # UR2450000
November 27, 2003 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking.	Water spray, carbon dioxide, dry powder, alcohol-resistant foam, foam.
EXPLOSION			
EXPOSURE			
•INHALATION		Avoid inhalation of dust	Fresh air, rest.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder Do NOT let this chemical enter the environment. (Extra personal protection: P2 filter respirator for harmful particles.)	Separated from strong oxidants. Keep in a well-ventilated room.	Do not transport with food and feedstuffs.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1474

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994 No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

PYRENE

ICSC: 1474

IMPORTANT	**PHYSICAL STATE; APPEARANCE:** YELLOW COLOURLESS SOLID IN VARIOUS FORMS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on heating producing irritating fumes **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation through the skin and by ingestion **INHALATION RISK:** Evaporation at 20°C is negligible: a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Exposure to sun may provoke an irritating effect of pyrene on skin and lead to chronic skin discoloration. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 404°C Melting point: 151°C Density: 1.27 g/cm³	Solubility in water: 0.135 mg/l at 25°C Vapour pressure, Pa at °C: 0.08 Octanol/water partition coefficient as log Pow: 4.88
ENVIRONMENTAL DATA	Bioaccumulation of this chemical may occur in crustacea,in fish,in milk,in algae andin molluscs. It is strongly advised that this substance does not enter the environment.	

NOTES

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, pyrene may be encountered as a laboratory chemical in its pure form. Health effects of exposure to the substance have not been investigated adequately. See ICSC 1415 Coal-tar pitch.

ADDITIONAL INFORMATION

	relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHRYSENE

ICSC: 1672

Benzoaphenanthrene
1,2-Benzophenanthrene
1,2,5,6-Dibenzonaphthalene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 1672
CAS # 218-01-9
RTECS # GC0700000
UN # 3077
EC # 601-048-00-0
October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P3 filter respirator for toxic particles. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	T symbol N symbol R: 45-68-50/53 S: 53-45-60-61 UN Hazard Class: 9 UN Packing Group: III

		Signal: Warning Health haz-Enviro Suspected of causing cancer Very toxic to aquatic life Toxic to aquatic life with long lasting effects

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1672

International Chemical Safety Cards

ICSC: 1672

CHRYSENE

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO BEIGE CRYSTALS OR POWDER **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** The substance decomposes on burning producing toxic fumes Reacts violently with strong oxidants. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2006). MAK: skin absorption (H); Carcinogen category: 2 (DFG 2007).
	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** A harmful concentration of airborne particles can be reached quickly when dispersed **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES	Boiling point: 448°C Melting point: 254 - 256°C Density: 1.3 g/cm³ Solubility in water: very poor Octanol/water partition coefficient as log Pow: 5.9
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

Transport Emergency Card: TEC (R)-90GM7-III
Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 1672 **CHRYSENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ICSC: 0720

BENZO(b)FLUORANTHENE

UNEP

National Institute for Occupational Safety and Health NIOSH

Benz(e)acephenanthrylene
2,3-Benzofluoroanthene
Benzo(e)fluoranthene
3,4-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0720
CAS # 205-99-2
RTECS # CU1400000
EC # 601-034-00-4
March 25, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers: if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(b)FLUORANTHENE

ICSC: 0720

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS CRYSTALS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: A2 (suspected human carcinogen); (ACGIH 2004). MAK: Carcinogen category: 2; (DFG 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans. May cause genetic damage in humans.
PHYSICAL PROPERTIES	Boiling point: 481°C Melting point: 168°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.12
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality.	

NOTES

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

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International Chemical Safety Cards

BENZO(a)PYRENE

ICSC: 0104

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0104
CAS # 50-32-8
RTECS # DJ3675000
EC # 601-032-00-3
October 17, 2005 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
EXPLOSION			
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder,	Separated from strong oxidants.	T symbol N symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

then remove to safe place.		

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0104	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994 No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values

International Chemical Safety Cards

BENZO(a)PYRENE

ICSC: 0104

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** PALE-YELLOW CRYSTALS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Reacts with strong oxidants causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005). MAK: Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 496°C Melting point: 178.1°C Density: 1.4 g/cm³	Solubility in water: none (<0.1 g/100 ml) Vapour pressure: negligible Octanol/water partition coefficient as log Pow: 6.04
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.	

NOTES

Do NOT take working clothes home. Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

ICSC: 0104	BENZO(a)PYRENE

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(ghi)PERYLENE

ICSC: 0739

1,12-Benzoperylene
1,12-Benzperylene
$C_{22}H_{12}$
Molecular mass: 276.3

ICSC # 0739
CAS # 191-24-2
RTECS # DI6200500
October 18, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	NO open flames.	In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Well closed.	

SEE IMPORTANT INFORMATION ON BACK

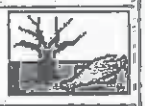
ICSC: 0739

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(ghi)PERYLENE

ICSC: 0739

IMPORTANT	**PHYSICAL STATE; APPEARANCE:** PALE YELLOW-GREEN CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 550°C Melting point: 278°C Density: 1.3 g/cm³	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air and water.	

NOTES

Benzo(ghi)perylene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

ICSC # 0939
CAS # 11097-69-1
RTECS # TQ1360000
UN # 2315
EC # 602-039-00-4
October 20, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
•INHALATION		Ventilation.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Headache. Numbness.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Separated from food and feedstuffs. Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Severe marine pollutant. Note: C Xn symbol N symbol R: 33-50/53 S: 2-35-60-61 UN Hazard Class: 9 UN Packing Group: II

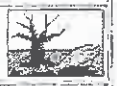
SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

I M	PHYSICAL STATE; APPEARANCE: LIGHT YELLOW VISCOUS LIQUID.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

P O R T A N T D A T A	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes in a fire producing irritating and toxic gases **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.5 mg/m³ as TWA (skin) A3 (ACGIH 2004). MAK: 0.05 ppm 0.70 mg/m³ H Peak limitation category: II(8) Carcinogen category: 3B Pregnancy risk group: B (DFG 2004). OSHA PEL: TWA 0.5 mg/m³ skin NIOSH REL*: Ca TWA 0.001 mg/m³ See Appendix A *Note: The REL also applies to other PCBs. NIOSH IDLH: Ca 5 mg/m³ See: IDLH INDEX	**INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Relative density (water = 1): 1.5 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.01 Octanol/water partition coefficient as log Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.	

NOTES

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C.

Transport Emergency Card: TEC (R)-90GM2-II-L

ADDITIONAL INFORMATION

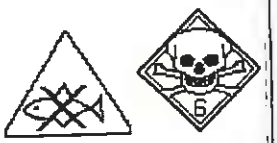
ICSC: 0939 **POLYCHLORINATED BIPHENYL (AROCLOR 1254)**

International Chemical Safety Cards

ALDRIN

ICSC: 0774

1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-exo-1,4-endo-5,8-dimethanonaphthalene
1,45,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1alpha,4alpha,4aß,5alpha,8alpha,8aß)
HHDN
$C_{12}H_8Cl_6$
Molecular mass: 364.9



ICSC # 0774
CAS # 309-00-2
RTECS # IO2100000
UN # 2761
EC # 602-048-00-3
March 26, 1998 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	
•INHALATION	(See Ingestion).	Ventilation (not if powder).	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Convulsions. Dizziness. Headache. Nausea. Vomiting. Muscle twitching.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. (Extra personal protection: chemical protection suit including self-contained breathing apparatus).	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials: See Chemical Dangers. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Severe marine pollutant. T symbol N symbol R: 24/25-40-48/24/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0774

International Chemical Safety Cards

ALDRIN

ICSC: 0774

IMPORTANT

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALS

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes on heating producing toxic and corrosive fumes including hydrogen chloride. Reacts with acids and oxidants. Attacks many metals in presence of water.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.25 mg/m³ (as TWA), A3 (skin) (ACGIH 1997).
MAK: (Inhalable fraction) 0.25 mg/m³ skin absorption (H);
Peak limitation category: II(8)
(DFG 2006).
OSHA PEL: TWA 0.25 mg/m^3 skin
NIOSH REL: Ca TWA 0.25 mg/m^3 skin See Appendix A
NIOSH IDLH: Ca 25 mg/m^3 See: 309002

ROUTES OF EXPOSURE:
The substance can be absorbed into the body through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the central nervous system , resulting in convulsions. The effects may be delayed. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance accumulates in the human body. Cumulative effects are possible: see Acute Hazards/Symptoms.

PHYSICAL PROPERTIES

Boiling point at 0.27kPa: 145°C
Melting point: 104-105°C
Density: 1.6 g/cm³
Solubility in water: none
Vapour pressure, Pa at 20°C: 0.009
Octanol/water partition coefficient as log Pow: 7.4

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to birds, honey bees. In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it persists

	in the environment. The substance may cause long-term effects in the aquatic environment. Avoid release to the environment in circumstances different to normal use.

NOTES

Other melting points: 49-60°C (technical grade). Depending on the degree of exposure, periodic medical examination is indicated. If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s). Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. The recommendations on this Card also apply to ICSC 0787 (dieldrin). Aldrec, Aldrex, Aldrite, Aldron, Aldrosol, Algran, Altox, Drinox, Octalene, Seedrin, and Toxadrin are trade names.

Transport Emergency Card: TEC (R)-61G41b.
NFPA Code: H2; F0; R0;

Card has been partially updated in August 2007: see Storage, Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0774 **ALDRIN**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ENDRIN

ICSC: 1023

$C_{12}H_8Cl_6O$
Molecular mass: 380.9

ICSC # 1023
CAS # 72-20-8
RTECS # IO1575000
UN # 2761
EC # 602-051-00-X
March 10, 2000 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	(See Ingestion).	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Dizziness. Weakness. Headache. Nausea. Vomiting. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection:	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs Well closed. Keep in a well-ventilated room.	Do not transport with food and feedstuffs. Severe marine pollutant. T+ symbol N symbol R: 24-28-50/53

chemical protection suit including self-contained breathing apparatus).		S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: I

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1023

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values

International Chemical Safety Cards

ENDRIN

ICSC: 1023

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** WHITE CRYSTALS **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on heating above 245°C, producing hydrogen chloride phosgene **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.1 mg/m³ (skin) (ACGIH 2000). OSHA PEL: TWA 0.1 mg/m^3 skin NIOSH REL: TWA 0.1 mg/m^3 skin NIOSH IDLH: 2 mg/m^3 See: 72208	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying or when dispersed, especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance may cause effects on the central nervous system , resulting in convulsions and death. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Decomposes below boiling point at 245°C Melting point: 200°C Density: 1.7 g/cm³	Solubility in water, g/100 ml at 25°C: none Vapour pressure, Pa at 25°C: negligible Octanol/water partition coefficient as log Pow: 5.34
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to honey bees birds mammals It is strongly advised not to let the chemical enter into the environment because it persists in the environment. In the food chain important to humans, bioaccumulation takes place, specifically in fish seafood Avoid release to the environment in circumstances different to normal use.	

NOTES

If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s). Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-61G41a

NFPA Code: H3; F0; R; 0

ADDITIONAL INFORMATION

ICSC: 1023 **ENDRIN**

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

CHLORDANE (TECHNICAL PRODUCT)

ICSC: 0740

1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene
$C_{10}H_6Cl_8$
Molecular mass: 409.8

ICSC # 0740
CAS # 57-74-9
UN # 2996
EC # 602-047-00-8
March 26, 1998 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Alcohol-resistant foam, powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	(See Ingestion).	Breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Confusion. Convulsions. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: chemical protection suit	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs bases and incompatible materials See Chemical Dangers. Well closed. Keep in a well-ventilated room.	Do not transport with food and feedstuffs. Severe marine pollutant. Xn symbol N symbol

including self-contained breathing apparatus.		R: 21/22-40-50/53 S: 2-36/37-60-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0740

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHLORDANE (TECHNICAL PRODUCT)

ICSC: 0740

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** TECHNICAL: LIGHT YELLOW TO AMBER VISCOUS LIQUID **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on burning, on contact with bases producing toxic fumes including phosgene hydrogen chloride Attacks iron, zinc, plastic, rubber and coatings. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.5 mg/m³ as TWA (skin) A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2004). MAK: (Inhalable fraction) 0.5 mg/m³ Peak limitation category: II(8); skin absorption (H); Carcinogen category: 3B; (DFG 2004). OSHA PEL: TWA 0.5 mg/m^3 skin NIOSH REL: Ca TWA 0.5 mg/m^3 skin See Appendix A NIOSH IDLH: Ca 100 mg/m^3 See: 57749	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying. **EFFECTS OF SHORT-TERM EXPOSURE:** Exposure at high levels may result in disorientation, tremors, convulsions, respiratory failure and death. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the liver immune system , resulting in tissue lesions and liver impairment. This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point at 0.27kPa: 175°C Relative density (water = 1): 1.59-1.63 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.0013 Octanol/water partition coefficient as log Pow: 2.78
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to soil organisms, honey bees. It is strongly advised that this substance does not enter the environment. The substance may cause long-term effects in the aquatic environment.	

NOTES

If the substance is formulated with solvents also consult the ICSCs of these materials. Carrier solvents used in commercial formulations may change physical and toxicological properties. Belt, Chlor Kil, Chlortox, Corodan, Gold Crest, Intox,

Kypchlor, Niran, Octachlor, Sydane, Synklor, Termi-Ded, Topiclor, and Toxichlor are trade names. Also consult ICSC 0743 Heptachlor.

Transport Emergency Card: TEC (R)-61GT6-III

ADDITIONAL INFORMATION

ICSC: 0740 **CHLORDANE (TECHNICAL PRODUCT)**

September 2005

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

Chlorinated camphene

CAS 8001-35-2

$C_{10}H_{10}Cl_8$

RTECS XW5250000

Synonyms & Trade Names
Chlorocamphene, Octachlorocamphene, Polychlorocamphene, Toxaphene

DOT ID & Guide
2761 151

Exposure Limits
NIOSH REL: Ca [skin] See Appendix A
OSHA PEL†: TWA 0.5 mg/m^3 [skin]

IDLH Ca [200 mg/m^3] See: 8001352

Conversion

Physical Description
Amber, waxy solid with a mild, piney, chlorine- and camphor-like odor. [insecticide]

MW: 413.8	BP: Decomposes	MLT: 149-194°F	Sol: 0.0003%
VP(77°F): 0.4 mmHg	IP: ?		Sp.Gr: 1.65
Fl.P: NA	UEL: NA	LEL: NA	

Noncombustible Solid, but may be dissolved in flammable liquids.

Incompatibilities & Reactivities
Strong oxidizers [Note: Slightly corrosive to metals under moist conditions.]

Measurement Methods
NIOSH 5039
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated/Daily
Remove: When wet or contaminated
Change: Daily
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure- demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Nausea, confusion, agitation, tremor, convulsions, unconsciousness; dry, red skin; [potential occupational carcinogen]

Target Organs central nervous system, skin

Cancer Site [in animals: liver cancer]

See also: INTRODUCTION See ICSC CARD: 0843

NIOSH Home | NIOSH Search | Site Index | Topic List | Contact Us

International Chemical Safety Cards

DDT

ICSC: 0034

UNEP

National Institute for Occupational Safety and Health NIOSH

Dichlorodiphenyltrichloroethane
1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane
2,2-bis(p-Chlorophenyl)-1,1,1-trichloroethane
1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene)
p,p'-DDT
$C_{14}H_9Cl_5$
Molecular mass: 354.5

ICSC # 0034
CAS # 50-29-3
RTECS # KJ3325000
UN # 2761
EC # 602-045-00-7
April 20, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Tremors. Diarrhoea. Dizziness. Headache. Vomiting. Numbness. Paresthesias. Hyperexcitability. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Provision to contain effluent from fire extinguishing. Separated from iron, aluminum and its salts, food and feedstuffs See Chemical Dangers.	Do not transport with food and feedstuffs. Severe marine pollutant. T symbol N symbol R: 25-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0034

International Chemical Safety Cards

DDT

ICSC: 0034

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS CRYSTALS WHITE POWDER. TECHNICAL PRODUCT IS WAXY SOLID. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** On combustion, forms toxic and corrosive fumesincludinghydrogen chloride. Reacts with aluminium and iron. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 1 mg/m³ as TWA A3 (ACGIH 2004). MAK: 1 mg/m³ H Peak limitation category: II(8) (DFG 2003). OSHA PEL: TWA 1 mg/m^3 skin NIOSH REL: Ca TWA 0.5 mg/m^3 See Appendix A NIOSH IDLH: Ca 500 mg/m^3 See: 50293	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation. The substance may cause effects on the central nervous system , resulting in convulsions and respiratory depression Exposure at high levels may result in death. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 260°C Melting point: 109°C Density: 1.6 g/cm³	Solubility in water: poor Octanol/water partition coefficient as log Pow: 6.36
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to birds. Bioaccumulation of this chemical may occur along the food chain, for example in milk and aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be given to avoid any additional release, e.g. through inappropriate disposal. 	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Consult national legislation. Agritan, Azotox, Anofex, Ixodex, Gesapon, Gesarex, Gesarol, Guesapon, Clofenotane, Zeidane, Dicophane, Neocid are trade names.

Transport Emergency Card: TEC (R)-61GT7-III

ADDITIONAL INFORMATION

ICSC: 0034 **DDT**

International Chemical Safety Cards

SILVER

ICSC: 0810

Argentium
C.I. 77820
Ag

ICSC # 0810
CAS # 7440-22-4
RTECS # VW3500000
September 10, 1997 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible, except as powder.		
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Separated from ammonia, strong hydrogen peroxide solutions, strong acids.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0810

International Chemical Safety Cards

SILVER

ICSC: 0810

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** WHITE METAL, TURNS DARK ON EXPOSURE TO OZONE, HYDROGEN SULFIDE OR SULFUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Shock-sensitive compounds are formed with acetylene. Reacts with acids causing fire hazard. Contact with strong hydrogen peroxide solution will cause violent decomposition to oxygen gas. Contact with ammonia may cause formation of compounds that are explosive when dry. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (metal): 0.1 mg/m³ (ACGIH 1997). EU OEL: 0.1 mg/m³ as TWA (EU 2000). OSHA PEL: TWA 0.01 mg/m^3 NIOSH REL: TWA 0.01 mg/m^3 NIOSH IDLH: 10 mg/m^3 (as Ag) See: IDLH INDEX	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of high amounts of metallic silver vapours may cause lung damage with pulmonary oedema. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may cause a grey-blue discoloration of the eyes, nose, throat and skin (argyria/argyrosis).
PHYSICAL PROPERTIES	Boiling point: 2212°C Melting point: 962°C	Relative density (water = 1): 10.5 Solubility in water: none
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to aquatic organisms.	

NOTES

Card has been partially updated in March 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0810 SILVER

International Chemical Safety Cards

BARIUM

ICSC: 1052

Ba
Atomic mass: 137.3

ICSC # 1052
CAS # 7440-39-3
RTECS # CQ8370000
UN # 1400
October 20, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable. Many reactions may cause fire or explosion.	NO open flames, NO sparks, and NO smoking. NO contact with water.	Special powder, dry sand, NO hydrous agents, NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•INHALATION	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT wash away into sewer.	Separated from halogenated solvents, strong oxidants, acids. Dry. Keep under inert gas, oil or oxygen-free liquid.	UN Hazard Class: 4.3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1052	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BARIUM

ICSC: 1052

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** YELLOWISH TO WHITE LUSTROUS SOLID IN VARIOUS FORMS. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** The substance may spontaneously ignite on contact with air (if in powder form). The substance is a strong reducing agent and reacts violently with oxidants and acids. Reacts violently with halogenated solvents. Reacts with water, forming flammable/explosive gas (hydrogen - see ICSC0001), causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.5 mg/m³ (as TWA) (ACGIH 1999).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by ingestion. **INHALATION RISK:** **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes, the skin and the respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 1640°C Melting point: 725°C Density: 3.6 g/cm³	Solubility in water: reaction
ENVIRONMENTAL DATA		

NOTES

Reacts violently with fire extinguishing agents such as water, bicarbonate, powder, foam, and carbon dioxide. Rinse contaminated clothes (fire hazard) with plenty of water.

Transport Emergency Card: TEC (R)-43G12

ADDITIONAL INFORMATION

NOTICE:	of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ICSC: 0020

CADMIUM

UNEP

National Institute for Occupational Safety and Health NIOSH

Cd
Atomic mass: 112.4

ICSC # 0020
CAS # 7440-43-9
RTECS # EU9800000
UN # 2570
EC # 048-002-00-0
April 22, 2005 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable in powder form and spontaneously combustible in pyrophoric form. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with heat or acid(s).	Dry sand. Special powder. NO other agents.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system. dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place.	Fireproof. Dry. Keep under inert gas. Separated from igntion sources, oxidants acids, food and feedstuffs	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Note: E T- symbol N symbol

		R: 45-26-48/23/25-62-63-68-50/53 S: 53-45-60-61 UN Hazard Class: 6.1

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0020	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CADMIUM

ICSC: 0020

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C AND TARNISHES ON EXPOSURE TO MOIST AIR. **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Reacts with acids forming flammable/explosive gas (hydrogen - see ICSC0001). Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (Total dust) 0.01 mg/m³ (Respirable fraction) 0.002 mg/m³ as TWA A2 (suspected human carcinogen); BEI issued (ACGIH 2005). MAK: skin absorption (H); Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004). OSHA PEL*: 1910.1027 TWA 0.005 mg/m^3 *Note: The PEL applies to all Cadmium compounds (as Cd). NIOSH REL*: Ca See Appendix A *Note: The REL applies to all Cadmium compounds (as Cd). NIOSH IDLH: Ca 9 mg/m^3 (as Cd) See: IDLH INDEX	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and by ingestion. **INHALATION RISK:** A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered. **EFFECTS OF SHORT-TERM EXPOSURE:** The fume is irritating to the respiratory tract Inhalation of fume may cause lung oedema (see Notes). Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Lungs may be affected by repeated or prolonged exposure to dust particles. The substance may have effects on the kidneys , resulting in kidney impairment This substance is carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 765°C Melting point: 321°C Density: 8.6 g/cm³	Solubility in water: none Auto-ignition temperature: (cadmium metal dust) 250°C
ENVIRONMENTAL DATA		
NOTES		

Reacts violently with fire extinguishing agents such as water,foam.carbon dioxideand halons. Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Do NOT take working clothes home. Cadmium also exists in a pyrophoric form (EC No. 048-011-00-X), which bears the additional EU labelling symbol F, R phrase 17, and S phrases 7/8 and 43. UN numbers and packing group will vary according to the physical form of the substance.

ADDITIONAL INFORMATION

ICSC: 0020 **CADMIUM**

International Chemical Safety Cards

SELENIUM

ICSC: 0072

Se
(powder)

ICSC # 0072
CAS # 7782-49-2
RTECS # VS7700000
EC # 034-001-00-2
April 26, 1993 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide. NO water
EXPLOSION	Risk of fire and explosion on contact with oxidants.		
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•**INHALATION**	Irritation of nose. Cough. Dizziness. Headache. Laboured breathing. Nausea. Sore throat. Vomiting. Weakness. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Redness. Skin burns. Pain. Discolouration.	Protective gloves. Protective clothing.	Rinse skin with plenty of water or shower. Refer for medical attention. Remove and isolate contaminated clothes.
•**EYES**	Redness. Pain. Blurred vision.	Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Metallic taste. Diarrhoea. Chills. Fever. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Fireproof. Separated from strong oxidants, strong acids, food and feedstuffs Dry.	Airtight. Do not transport with food and feedstuffs. T symbol R: 23/25-33-53 S: 1/2-20/21-28-45-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0072

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

SELENIUM

ICSC: 0072

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
ODOURLESS SOLID IN VARIOUS FORMS. DARK RED-BROWN TO BLUISH-BLACK AMORPHOUS SOLID OR RED TRANSPARENT CRYSTALS OR METALLIC GREY TO BLACK CRYSTALS.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed. Reacts violently with oxidants strong acids Reacts withwater at 50°C forming flammable/explosive gas (hydrogen - see ICSC0001) and selenious acids. Reacts with incandescence on gentle heating with phosphorous and metals such as nickel, zinc, sodium, potassium, platinum.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.2 mg/m³ as TWA (ACGIH 2004).
MAK: (Inhalable fraction) 0.05 mg/m³
Peak limitation category: II(4); Carcinogen category: 3B; Pregnancy risk group: C; (DFG 2004).
OSHA PEL*: TWA 0.2 mg/m^3 *Note: The PEL also applies to other selenium compounds (as Se) except Selenium hexafluoride.
NIOSH REL*: TWA 0.2 mg/m^3 *Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride.
NIOSH IDLH: 1 mg/m^3 (as Se) See: 7782492

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract Inhalation of dust may cause lung oedema (see Notes). Inhalation of fume may cause symptoms of asphyxiation, chills and fever and bronchitis. The effects may be delayed.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the respiratory tract, gastrointestinal tract, and skin, resulting in nausea, vomiting, cough, yellowish skin discolouration, loss of nails, garlic breath and bad teeth.

PHYSICAL PROPERTIES

Boiling point: 685°C
Melting point: 170-217°C
Relative density (water = 1): 4.8

Solubility in water:
none
Vapour pressure, Pa at 20°C: 0.1

ENVIRONMENTAL DATA

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0072	**SELENIUM**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

LEAD

ICSC: 0052

Lead metal
Plumbum
Pb
(powder)

ICSC # 0052
CAS # 7439-92-1
RTECS # OF7525000
August 10, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•**INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
•**SKIN**		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	Separated from food and feedstuffs incompatible materials See Chemical Dangers.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0052

International Chemical Safety Cards

LEAD

ICSC: 0052

IMPORTANT

PHYSICAL STATE; APPEARANCE:
BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.05 mg/m³ as TWA A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 2; Germ cell mutagen group: 3A;
(DFG 2006).
EU OEL: as TWA 0.15 mg/m³ (EU 2002).
OSHA PEL*: 1910.1025 TWA 0.050 mg/m^3 See Appendix C *Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH REL*: TWA 0.050 mg/m^3 See Appendix C *Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.
NIOSH IDLH: 100 mg/m^3 (as Pb) See: 7439921

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood bone marrow central nervous system peripheral nervous system kidneys , resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development. This substance is probably carcinogenic to humans. fast track change Oct 06 - IARC 2A.

PHYSICAL PROPERTIES		
	Boiling point: 1740°C	Density: 11.34 g/cm³
	Melting point: 327.5°C	Solubility in water: none

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Card has been partly updated in April 2005. See section Occupational Exposure Limits. Card has been partly updated in October 2006: see section Occupational Exposure Limits, Effects Long Tem Exposure.

ADDITIONAL INFORMATION	
ICSC: 0052	**LEAD**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

MERCURY

ICSC: 0056

UNEP

National Institute for Occupational Safety and Health NIOSH

Quicksilver
Liquid silver
Hg

ICSC # 0056
CAS # 7439-97-6
RTECS # OV4550000
UN # 2809
EC # 080-001-00-0
April 22, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Risk of fire and explosion.		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs Well closed.	Special material. Do not transport with food and feedstuffs. T symbol

sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.		N symbol R: 23-33-50/53 S: 1/2-7-45-60-61 UN Hazard Class: 8 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0056

International Chemical Safety Cards

MERCURY

ICSC: 0056

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 0.025 mg/m³ as TWA (skin) A4 BEI issued (ACGIH 2004). MAK: 0.1 mg/m³ Sh Peak limitation category: II(8) Carcinogen category: 3B (DFG 2003). OSHA PEL†: C 0.1 mg/m^3 NIOSH REL: Hg Vapor: TWA 0.05 mg/m^3 skin Other: C 0.1 mg/m^3 skin NIOSH IDLH: 10 mg/m^3 (as Hg) See: 7439976
	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its vapour and through the skin, also as a vapour! **INHALATION RISK:** A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed. Medical observation is indicated. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the central nervous system kidneys, resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none
	Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009
ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-80GC9-II+III

ADDITIONAL INFORMATION

ICSC: 0056 **MERCURY**

International Chemical Safety Cards

ICSC: 0013

ARSENIC

UNEP

National Institute for Occupational Safety and Health NIOSH

Grey arsenic
As
Atomic mass: 74.9

ICSC # 0013
CAS # 7440-38-2
RTECS # CG0525000
UN # 1558
EC # 033-001-00-X
October 18, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat. Shortness of breath. Weakness. See Ingestion.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and chest. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed.	Do not transport with food and feedstuffs. Marine pollutant. T symbol N symbol R: 23/25-50/53 S: 1/2-20/21-28-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0013

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ARSENIC

ICSC: 0013

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with acids to produce

OCCUPATIONAL EXPOSURE LIMITS:
OSHA PEL: 1910.1018 TWA 0.010 mg/m^3
NIOSH REL: Ca C 0.002 mg/m^3 15-minute See Appendix A
NIOSH IDLH: Ca 5 mg/m^3 (as As) See: 7440382
TLV: 0.01 mg/m^3 as TWA A1 (confirmed human carcinogen); BEI issued (ACGIH 2004).
MAK:
Carcinogen category: 1; Germ cell mutagen group: 3A;
(DFG 2004).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly, when dispersed.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract. The substance may cause effects on the gastrointestinal tract cardiovascular system central nervous system kidneys , resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders shock convulsions and kidney impairment Exposure above the OEL may result in death. The effects may be delayed. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the mucous membranes, skin, peripheral nervous system liver bone marrow , resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment anaemia This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Sublimation point: 613°C
Density: 5.7 g/cm^3

Solubility in water:
none

ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment. 

NOTES

The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC 0377), Arsenic trichloride (ICSC 0221), Arsenic trioxide (ICSC 0378), Arsine (ICSC 0222).

Transport Emergency Card: TEC (R)-61GT5-II

ADDITIONAL INFORMATION

ICSC: 0013 **ARSENIC**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

Chrome
Cr
Atomic mass: 52.0
(powder)

ICSC # 0029
CAS # 7440-47-3
RTECS # GB4200000
October 27, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	No open flames if in powder form.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION		Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles.		

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

ICSC: 0029

CHROMIUM

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** GREY POWDER **PHYSICAL DANGERS:** Dust explosion possible if in powder or granular form, mixed with air. **CHEMICAL DANGERS:** Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances , causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (as Cr metal, Cr(III) compounds) 0.5 mg/m³ as TWA A4 (ACGIH 2004). MAK not established. OSHA PEL*: TWA 1 mg/m^3 See Appendix C *Note: The PEL also applies to insoluble chromium salts. NIOSH REL: TWA 0.5 mg/m^3 See Appendix C NIOSH IDLH: 250 mg/m^3 (as Cr) See: 7440473	**ROUTES OF EXPOSURE:** **INHALATION RISK:** A harmful concentration of airborne particles can be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** May cause mechanical irritation tothe eyesandthe respiratory tract. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Boiling point: 2642°C Melting point: 1900°C Density: 7.15 g/cm³	Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

The surface of the chromium particles is oxidized to chromium(III)oxide in air. See ICSC 1531 Chromium(III) oxide.

ADDITIONAL INFORMATION

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