WILLOUGHBY SQUARE

BROOKLYN, NEW YORK 11201

Remedial Action Work Plan

NYC VCP Number: 15CVCP092K
E-Designation Site Number: 15ENOS289K

Prepared for:
Willoughby Operating Company, LLC
411 Hempstead Turnpike, Suite 200
West Hempstead, NY 11552

Prepared by:
Tenen Environmental, LLC
121 W 27th Street, Suite 1004 New York, NY 10001
mahmed@tenen-env.com
646-606-2332

MARCH 2015

REMEDIAL ACTION WORK PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS ii
FIGURES v
TABLES v
APPENDICES v
LIST OF ACRONYMS vi
CERTIFICATION 1
EXECUTIVE SUMMARY 2
Community Protection Statement 8
REMEDIAL ACTION WORK PLAN 13
1.0 SITE BACKGROUND 13
1.1 Site Location and Current usage 13
1.2 proposed Redevelopment Plan 13
1.3 Description of Surrounding Property 14
1.4 Environmental investigation Reports 14
2.0 REMEDIAL ACTION OBJECTIVES 19
Groundwater 19
Soil 19
3.0 REMEDIAL Alternatives analysis 20
3.1 THRESHOLD CRITERIA 22
3.2. BALANCING CRITERIA 23
4.0 REMEDIAL ACTION 30
4.1 Summary of Preferred Remedial Action 30
4.2 Soil Cleanup Objectives and soil/Fill management 32
Estimated Soil/Fill Removal Quantities 33
End-Point Sampling 33
Quality Assurance/Quality Control 35
Import and Reuse of Soils 36

4.3 engineering Controls 37
Composite Cover System 37
Vapor Barrier 37
4.4 Institutional Controls 38
4.5 Site Management plan 39
4.6 qualitative human health exposure assessment 40
5.0 REMEDIAL ACTION MANAGEMENT 45
5.1 Project Organization and oversight 45
5.2 Site Security 45
5.3 Work Hours 45
5.4 Construction Health and Safety Plan 45
5.5 Community Air Monitoring Plan 46
VOC Monitoring, Response Levels, and Actions 47
Particulate Monitoring, Response Levels, and Actions 48
5.6 Agency Approvals 48
5.7 Site Preparation 49
Pre-Construction Meeting 49
Mobilization 49
Utility Marker Layouts, Easement Layouts 49
Dewatering 50
Equipment and Material Staging 50
Stabilized Construction Entrance 50
Truck Inspection Station 50
Extreme Storm Preparedness and Response Contingency Plan 50
5.8 Traffic Control 52
5.9 Demobilization 53
5.10 Reporting and Record Keeping 53
Daily Reports 53
Record Keeping and Photo-Documentation 54
5.11 Complaint Management 54
5.12 Deviations from the Remedial Action Work Plan 54
6.0 REMEDIAL ACTION REPORT 56

7.0 SCHEDULE 58
Appendix 1 Citizen Participation Plan 59
Appendix 2 Sustainability statement 63
Appendix 3 65
SOIL/MATERIALS MANAGEMENT PLAN 65
1.1 Soil Screening Methods 65
1.2 Stockpile Methods 65
1.3 Characterization of Excavated Materials 65
1.4 Materials Excavation, Load-Out and Departure 66
1.5 Off-Site Materials Transport 66
1.6 Materials Disposal Off-Site 67
1.7 Materials Reuse On-Site 68
1.8 Demarcation 68
1.9 import of Backfill Soil from Off-Site Sources 69
Source Screening and Testing 70
1.10 Fluids Management 70
1.11 Storm-water Pollution Prevention 71
1.12 Contingency Plan 71
1.13 Odor, Dust and Nuisance Control 72
Appendix 4 74
CONSTRUCTION Health and Safety Plan 74
Appendix 5 75
proposed development plans 75
Appendix 6 76
krystol internal membrane (kim) waterproofing specifications 76

FIGURES

Figure 1: Site Location Map
Figure 2: Site Plan
Figure 3: Proposed Endpoint Sampling Locations
Figure 4: Site Excavation Plan

TABLES

Tables 1-5: Analytical Results for Soil
Tables 6-11: Analytical Results for Groundwater
Table 12: Soil Cleanup Objectives

APPENDICES

List of Appendices

Appendix 1: Citizen Participation Plan

Appendix 2: Sustainability Statement

Appendix 3: Soil/Materials Management Plan

Appendix 4: Construction Health and Safety Plan

Appendix 5: Proposed Development Plans

Appendix 6: Krystol Internal Membrane (KIM) Waterproofing Specifications

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/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
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
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
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

CERTIFICATION

I, Matthew Carroll, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the Willoughby Square Site (NYC VCP Site No. 15CVCP092K and OER Project No. 15ENOS289K).

I, Mohamed Ahmed, am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the Willoughby Square Site (NYC VCP Site No. 15CVCP092K and OER Project No. 15ENOS289K).

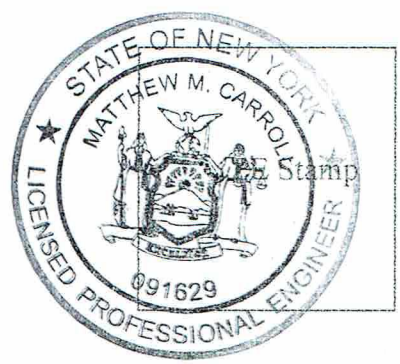
I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site 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.

Matthew M. Carroll
Name

091629
NYS PE License Number

Signature

4/7/15
Date



Place Stamp

Mohamed Ahmed
QEP Name

mohamed ahmed
QEP Signature

4-7-15
Date

EXECUTIVE SUMMARY

Willoughby Operating Company LLC has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP # 15CVCP092K) to investigate and remediate a 50,125-square foot site located at Willoughby Square in Brooklyn, 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, identified as Willoughby Square, is an irregular-shaped parcel of 50,180 square feet. The Site is located in the Downtown section of Brooklyn, New York on the northern portion of the block bounded by a 24-story commercial/office building across Willoughby Street to the north, commercial buildings across Duffield Street to the west, an active construction site across Albee Square (aka "Gold Street") to the East and Fulton Street to the south (Figure 1). The legal description of the Site is Block 146; Lots 16, 17, 18, 23, 29, 34, 35, 36, 37 and a portion of (P/O) 41 as defined by the New York City Department of Finance (NYCDOF). The property is currently vacant with several developed buildings and parking space.

In June 2013, Tenen prepared and submitted a remedial investigation work plan (RIWP) to the New York City Department of Environmental Protection (NYCDEP) Office of Environmental Planning and Assessment to perform a subsurface investigation to evaluate the potential impacts, if any, to the subsurface environment due to the historical usage of the Site and neighboring properties. The RIWP was approved on July 2, 2013 with comments and recommendations. The RIWP was implemented in September 2014.

The objective of the remedial investigation was to evaluate the potential impacts, if any, to the subsurface environment due to the historical usage of the Site and neighboring properties. The Site is owned by the City of New York and does not have an E-designation for Underground Storage Tanks Testing Protocol (aka "hazardous materials"). However, the soil sampling and

testing followed the underground storage tanks testing protocol, as indicated in the Downtown Brooklyn Development Plan, Chapter 10 adopted by New York City on June 28, 2004.

Summary of Proposed Redevelopment Plan

The proposed redevelopment for the Site includes demolition of the existing structures, and construction of an at-grade park and a below-ground parking garage covering the entire Site. Plans for the parking garage indicate the construction of four sub-grade parking levels, with a foundation that would extend to approximately 44 feet 8 inches below grade surface (bgs). The entire garage structure would contain a total of approximately 100,000 gross square feet (gsf). Therefore, an estimated 122,100 tons of soil will require excavation. The water table is expected at approximately 48 feet below grade surface (bgs), and will therefore not be encountered during excavation. The proposed development plans are presented in Appendix 5.

Summary of Environmental Findings

1. The elevation of the Site is approximately 40-45 feet.
2. Depth to groundwater is estimated to be approximately 48 feet below sidewalk grade.
3. Groundwater flow is generally southwest.
4. Depth to bedrock at the Site is greater than 100 feet.
5. The stratigraphy of the Site from the surface down consists of historic fill material to depths as great as 21 feet, underlain by native fine to medium-grained sand and glacial till.
6. Soil/fill samples results were compared to New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives and Restricted Commercial Use Soil Cleanup Objectives (SCOs) as presented in 6NYCRR Part 375-6.8 and CP51. Soil/fill samples collected during the RI showed trace concentrations of several VOCs, but only acetone (max. of 62 µg/kg) exceeded Unrestricted Use SCOs. Several SVOCs consisting of Polycyclic Aromatic Hydrocarbons (PAHs) were detected with benz(a)anthracene (max. of 35,000 µg/kg), benzo(a)pyrene (max. of 35,000 µg/kg), benzo(b)fluoranthene (max. of 44,000 µg/kg), benzo(k)fluoranthene (max. of 15,000 µg/kg), chrysene (max. of 33,000 µg/kg), dibenz(a,h)anthracene (max. of 4,600 µg/kg),

and indeno(1,2,3-cd)pyrene (max. of 24,000 µg/kg) exceeding Restricted Commercial Use SCOs within three shallow soil samples. Five pesticides including, 4,4'-DDD (max. of 340 µg/kg), 4,4'-DDE (max. of 210 µg/kg), 4,4'-DDT (max. of 860 µg/kg), dieldrin (max. of 5.81 µg/kg), and endrin (4.4 µg/kg) were detected above Unrestricted Use SCOs in the shallow samples. Two PCBs were detected but none exceeded Unrestricted Use SCOs. Several metals including barium (max. of 607 mg/kg), cadmium (max. of 8.6 mg/kg), copper (max. of 76 mg/kg), lead (max. of 2,650 mg/kg), mercury (max. of 1.54 mg/kg), nickel (max. of 150 mg/kg), silver (max. of 9.6 mg/kg), and zinc (max. of 3,000 mg/kg) exceeded Unrestricted Use SCOs. Of these metals, barium and lead exceeded Restricted Commercial Use SCOs. Overall, the soil results were consistent with data identified at sites with urban fill material in NYC.

7. Groundwater sample results were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). The groundwater sample collected during the investigations showed no SVOCs, PCBs, or pesticides. Trace concentration of one VOC, chloroform, was detected not exceeding its GQS. Several metals were identified in groundwater, but only sodium (87.8 mg/L) exceeded its GQS.
8. Soil vapor samples collected during the 2008 Phase II 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 dated October 2006. Soil vapor samples collected during the Phase II did not detect chlorinated VOCs in any of the four samples. The total concentration of petroleum-related VOCs (BTEX) was at a max of 21 $\mu g/m^3$.

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 implementation 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 specified by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results and disposal facility(s) approval letters will be submitted to NYCOER prior to the start of the remedial action;
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. For development purposes, the entire property will be excavated to a depth of 44 feet and 8 inches below grade for construction of the new subgrade parking garage. Approximately 122,096 tons of soil will be excavated and removed from this 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 (if encountered) and closure of petroleum spills (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;

11. Collection and analysis of eight end-point samples to determine the performance of the remedy with respect to attainment of 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;

13. Implementation of storm-water pollution prevention measures in compliance 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. 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;

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

16. As part of new development, installation of a vapor barrier below the proposed subgrade parking. The vapor barrier will include the application of Krystol Internal Membrane (KIM) waterproofing to the bottom and sidewall concrete slab cover;

17. As part of new development, construction and maintenance of an engineered composite cover consisting of a 2-feet thick bottom concrete slab to prevent human exposure to residual soil/fill remaining under the Site;

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

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

20. If Track 1 SCOs are not achieved, recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and Institutional Controls 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) use of groundwater without treatment rendering it safe for the intended use; (2) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (3) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation (OER) created the New York City Voluntary Cleanup Program (NYC VCP) to provide 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. This cleanup plan 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 NYC VCP, 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.

Construction 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 Health and Safety Plan. The Site safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Mohamed Ahmed and can be reached at (646) 606-2332.

Worker Training. Workers participating in cleanup involving hazardous waste as determined by 40 CFR 262.11 and ECL 27-0903 or a "source area" as determined by DER-10 1.3(b)70 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, 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 Matthew Carroll/Tenen Environmental at (646) 606 - 2332 or NYC Office of Environmental Remediation Project Manager Sarah Pong at (212) 442-8342.

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.

Storm-Water Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water 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 are 7:00 a.m. to 6:00 p.m., Monday to Friday.

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 Winston Wilson at (516) 779-7922, the NYC Office of Environmental Remediation Project Manager Sarah Pong at (212) 442-8342, 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 you to review in the public document repositories located at Brooklyn Heights Library.

Long-Term Site Management. If long-term protection is required after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan 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 defined in the property's deed or 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

Willoughby Operating Company LLC has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at Willoughby Square in the Downtown Brooklyn section of Brooklyn, New York (the "Site"), Figure 1. 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, identified as Willoughby Square, is an irregular-shaped parcel of 50,125 square feet. The Site is located in the Downtown section of Brooklyn, New York on the northern portion of the block bounded by a 24-story commercial/office building across Willoughby Street to the north, commercial buildings across Duffield Street to the west, an active construction site across Albee Square (aka "Gold Street") to the East and Fulton Street to the south (Figure 1). The legal description of the Site is Block 146; Lots 16, 17, 18, 23, 29, 34, 35, 36, 37 and a portion of (P/O) 41 as defined by the New York City Department of Finance (NYCDOF). The property is currently vacant with several developed buildings and parking space.

1.2 PROPOSED REDEVELOPMENT PLAN

The proposed redevelopment for the Site includes demolition of the existing structures, and construction of an at-grade park and a below-ground parking garage covering the entire Site. Plans for the parking garage indicate the construction of four sub-grade parking levels, with a foundation that would extend to approximately 44 feet 8 inches below grade surface (bgs). The

entire garage structure would contain a total of approximately 100,000 gross square feet (gsf). Therefore, an estimated 122,100 tons of soil will require excavation. The water table is expected at approximately 48 feet below grade surface (bgs), and will therefore not be encountered during excavation. The proposed development plans are presented in Appendix 5.

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

1.3 DESCRIPTION OF SURROUNDING PROPERTY

All Site lots are zoned C6-4.5, a designation denoting commercial spaces with residential overlays. The land use for this Site consists of commercial, multi-family residences, and vacant land. The surrounding area is predominantly commercial with some residential spaces. Additionally, within a 500-ft radius are a few public facilities and one industrial space. There are two day-care centers and several schools including St. Joseph High School and Berkeley College within a 500-ft radius of the Site. However, no other schools, daycares facilities or medical centers exist within these bounds.

Figure 1 shows the surrounding land usage.

1.4 ENVIRONMENTAL INVESTIGATION REPORTS

The following environmental work plans and reports were developed for the Site:

- *Phase I Environmental Site Assessment-TRC in September 2007 and May 2013*
- *Phase II Environmental Site Investigation- H2M Group (August 2008)*
- *Phase II Environmental Site Investigation-The Louis Berger Group (June 2009)*
- Remedial Investigation Report, Willoughby Square- Tenen Environmental (November, 2014)

A summary of prior investigation methodology and results is provided below.

Phase I Environmental Site Assessment-TRC in September 2007 and May 2013

A Phase I Environmental Site Assessment was completed for the Site by TRC Engineers,

Inc. of New York, NY, in September 2007 and updated in May 2013 and identified the following Recognized Environmental Conditions (RECs) and environmental concerns in connection with the Site:

- Historic records revealed that portions of the Site, Block 146, Lots 16, 17, and 29, were historically occupied by a dental laboratory, a printing shop, and a laboratory, respectively. Potential releases from the historic operations at these on-site facilities may have adversely impacted the subsurface conditions at the Site and, therefore, represents a REC;
- Evidence of staining was observed during Site reconnaissance at various locations in the asphalt parking lots, specifically; Block 146, Lots 29 and P/O 41. Staining was also observed in neighboring parking lots; Block 146, Lots 23 and 37. Evidence of staining may be an indication of historic releases potentially causing an adverse impact to the subsurface conditions at the Site and, therefore, represents a REC; and
- Regulatory agency databases revealed that there is one active 15,000-gallon fuel oil UST, one 2,500-gallon fuel oil UST that was closed-in-place in March 1998, and one 20,000-gallon fuel oil UST that was administratively closed in February 1993 at 213 Duffield Street (Block 146, Lot 18). Additionally the regulatory agency database report revealed that one 2,500-gallon fuel oil tank was removed from 213 Duffield Street in December 2006. The prior/current use and presence of the active and closed fuel oil USTs represent an environmental concern.

Phase II Environmental Site Investigation- H2M Group (August 2008)

Holzmacher, McLendon and Murrell, P.C. (H2M) of Melville, NY, performed a Phase II Subsurface Investigation in September 2008. The investigation was performed on Lots 23 and 37 located at 106-108 Willoughby Street and 408-414 Albee Square, respectively.

H2M investigation included installation of three shallow and four deep soil borings and collection of soil samples. Three shallow soil samples were collected from the depth of two to four feet bgs and four deep soil samples were collected from depths between four and 20 feet bgs.

Conclusions of the H2M Phase II investigation are summarized below:

- The predominant geologic material encountered at the site was fine to medium-grained sand and glacial till overlain by fill material and/or demolition debris including brick fragments and crushed rocks likely related to the former building foundations.
- Two of seven shallow and deep soil samples contained parameters at concentrations above the NYSDEC RSCOs, including lead, mercury, and arsenic. H2M attributed these elevated levels to the presence of demolition debris associated with the former buildings.
- Several compounds were detected in the soil vapor samples at concentrations that exceeded those detected in the ambient air samples.

Phase II Environmental Site Investigation-The Louis Berger Group (June 2009)

Louis Berger Group, Inc. (Berger) of New York, NY, performed a Phase II Subsurface Investigation in April 2009 in order to evaluate potential subsurface impacts due to the historical usage of the Site and neighboring properties. The investigation was performed on Lots 16, 29, and 41 on Block 146.

Groundwater and soil vapor samples were not collected during this investigation. An attempt was made to sample groundwater at the deepest boring (SB04 - 47 feet bgs), via the advancement of a Screen Point 16 (SP16) groundwater sampling tool; however, groundwater was not encountered at this depth.

Based on the Phase II subsurface investigation, Berger made the following conclusions:

- The Site is underlain by at least ten to 21 feet of non-native fill material. The fill material consists of light to dark yellowish brown gravelly sand with construction debris in the form of concrete and brick pieces. Native soil, encountered below the shallow fill material, consisted of moderate brown medium to fine sand with some medium to fine gravel.
- SVOCs, metals, pesticides and PCBs were detected above the NYSDEC Unrestricted Use Soil Cleanup Objectives (SCOs) in the shallow fill layer (above 21 feet bgs). SVOCs were also detected above Commercial Use SCOs in the fill layer.
- Soil encountered below the fill layer (from 21 to 38 feet bgs) exhibited significantly fewer exceedances than the shallow fill layer.

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, Willoughby Square*", dated November, 2014 (RIR).

Summary of the Work Performed under the Remedial Investigation

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed twenty-five (25) soil borings across the Site, and collected forty-eight (48) soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed one groundwater monitoring well throughout the Site and collected one groundwater sample and one duplicate groundwater sample for chemical analysis to evaluate groundwater quality;
4. Installed four soil gas implants and collected four soil gas samples for chemical analysis.

Summary of Environmental Findings

1. The elevation of the Site is approximately 40-45 feet.
2. Depth to groundwater is estimated to be approximately 48 feet below sidewalk grade.
3. Groundwater flow is generally southwest.
4. Depth to bedrock at the Site is greater than 100 feet.
5. The stratigraphy of the Site from the surface down consists of historic fill material to depths as great as 21 feet, underlain by native fine to medium-grained sand and glacial till.
6. Soil/fill samples results were compared to New York State Department of Environmental Conservation (NYSDEC) Unrestricted Use Soil Cleanup Objectives and Restricted Commercial Use Soil Cleanup Objectives (SCOs) as presented in 6NYCRR Part 375-6.8 and CP51. Soil/fill samples collected during the RI showed trace concentrations of several VOCs but only acetone (max. of 62 µg/kg) exceeded Unrestricted Use SCOs. Several SVOCs consisting of Polycyclic Aromatic Hydrocarbons (PAHs) were detected with benz(a)anthracene (max. of 35,000 µg/kg), benzo(a)pyrene (max. of 35,000 µg/kg), benzo(b)fluoranthene (max. of 44,000 µg/kg), benzo(k)fluoranthene (max. of 15,000

µg/kg), chrysene (max. of 33,000 µg/kg), dibenz(a,h)anthracene (max. of 4,600 µg/kg), and indeno(1,2,3-cd)pyrene (max. of 24,000 µg/kg) exceeding Restricted Commercial Use SCOs within three shallow soil samples. Five pesticides including, 4,4'-DDD (max. of 340 µg/kg), 4,4'-DDE (max. of 210 µg/kg), 4,4'-DDT (max. of 860 µg/kg), dieldrin (max. of 5.81 µg/kg), and endrin (4.4 µg/kg) were detected above Unrestricted Use SCOs in the shallow samples. Two PCBs were detected but none exceeded Unrestricted Use SCOs. Several metals including barium (max. of 607 mg/kg), cadmium (max. of 8.6 mg/kg), copper (max. of 76 mg/kg), lead (max. of 2,650 mg/kg), mercury (max. of 1.54 mg/kg), nickel (max. of 150 mg/kg), silver (max. of 9.6 mg/kg), and zinc (max. of 3,000 mg/kg) exceeded Unrestricted Use SCOs. Of these metals, barium and lead exceeded Restricted Commercial Use SCOs. Overall, the soil results were consistent with data identified at sites with urban fill material in NYC.

7. Groundwater sample results were compared to New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). The groundwater sample collected during the investigations showed no SVOCs, PCBs, or pesticides. Trace concentration of one VOC, chloroform, was detected not exceeding its GQS. Several metals were identified in groundwater, but only sodium (87.8 mg/L) exceeded its GQS.
8. Soil vapor samples collected during the 2008 Phase II 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 dated October 2006. Soil vapor samples collected during the Phase II did not detect chlorinated VOCs in any of the four samples. The total concentration of petroleum-related VOCs (BTEX) was at a max of 21 $\mu g/m^3$.

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 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 Remedial Action Objectives (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 Unrestricted Use SCOs throughout the Site and confirmation that 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 parking garage 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 would be installed beneath the slab of the ventilated garage to prevent any potential future exposures from off-Site soil vapor.
- As part of development, placement of a final cover over the entire Site.

Alternative 2 involves:

- Establishment of Site-Specific (Track 4) SCOs
- Removal of all soil/fill exceeding Track 4 Site-Specific SCOs and confirmation that Track 4 has been achieved with post-excavation endpoint sampling. Excavation for the parking garage would take place to a depth of approximately 44 feet 8 inches below grade which would effectively remove all historic fill at the Site. However, if soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the new parking garage is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs.
- Placement of a final cover over the entire Site to prevent exposure to remaining soil/fill.
- Installation of a soil vapor barrier beneath the parking garage to prevent any potential future exposures from off-Site soil vapor.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of sensitive Site uses 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 the property owner's successors and assigns must comply with the approved SMP.

- Establishment of a deed restriction to ensure long term management of residual materials on the property

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. The vapor barrier would mitigate any vapor issues. Implementing Institutional Controls including a Site Management Plan 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 the contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan (CHASP), an approved Soil/Materials Management Plan, and Community Air Monitoring Plan (CAMP). Potential use of groundwater for potable supply would be prevented as its use is prohibited by city laws and regulations and groundwater is present, at a minimum, 45 feet below grade and will not be encountered during development. Potential future migration of off-Site soil vapors would be prevented by installing a vapor barrier below the new ventilated parking garage

located throughout Site. The subgrade parking garage will be built and ventilated per requirements of NYC Building Department codes.

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 Groundwater Protection Standards. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier below the new ventilated parking area per requirements of the NYC Building Department's codes. As part of development, a 3-feet thick bottom concrete slab will prevent human exposure to residual soil/fill remaining under the Site.

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 vapor barrier below the new ventilated parking area per requirements of the NYC Building Department's codes. A Site Management Plan would ensure that these controls remained protective for the long term.

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 implementation, as each requires removal and 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 parking garage. 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 4,884 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 will 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) will 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 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 Engineering Controls.

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. Additionally, the proposed development plan includes the installation of a cover system and vapor barrier which would prevent potential future migration of soil vapors into the garage.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs, by establishing Engineering Controls including a composite cover system across the Site; placing a vapor barrier and a composite cover system across the Site, establishing use restrictions , establishing an SMP to ensure long-term management Institutional Controls (ICs) Engineering Controls (ECs), and implementing a deed restriction to memorialize these controls for the long term. Groundwater use restrictions will eliminate potential exposure to groundwater and establishment of an SMP will ensure this protection remains effective 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 the 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 would 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 would permanently eliminate the toxicity; mobility and volume of contaminants from on-Site soil by excavating and removing all soils in excess of Track 1 Unrestricted Use SCOs.

Alternative 2 would likely remove all of the historic fill at the Site, thus permanently eliminating the toxicity, mobility, and volume of contaminants, and any remaining on-Site soil beneath the new parking garage would meet Track 4 - Site-Specific SCOs.

The removal of 44 feet 8 inches of the fill material and native material 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 alternatives are readily available, feasible, implementable, and have been proven effective in remediating the contaminants associated with the Site. They use standard materials and services and well-established technology. The reliability of each remedy is 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 extend to a depth of 14-21 feet and the new development calls for the excavation and removal of soil to the depth of 44 feet 8 inches below grade within the proposed parking garage footprint, the costs associated with both Alternative 1 and Alternative 2 will likely be comparable. If additional soil/fill with analytes above Track 1 Unrestricted Use SCOs but below Track 4 Site-Specific SCOs remains after excavation for the new garage, long-term costs for Alternative 2 would likely be higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

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 alternative 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 1.

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 proposed redevelopment of the Site is required by its current land use plan and is permitted by its C6-4.5 district zoning within the Special Downtown Brooklyn District ("SDBD"), which allows residential and commercial uses, including public parking garages. From 1961 until 2004, when the SDBD was established, the Site was in a C6-1 commercial district, which permits the same uses but allows for less density. Consistent with such zoning, the Site has been occupied by residential and commercial buildings and three at-grade public parking lots. In 2004, as part of the Downtown Brooklyn Development Plan, enacted in connection with the establishment of the SDBD, the Site was designated to include an approximately one acre street-level public park above an underground public parking garage. In accordance with this designation, the proposed development plans will include a below-grade parking garage as well as an at grade open space/park. Under the zoning regulations in effect in 2004, a public parking garage was allowed by special permit from the City Planning Commission ("CPC"). Per the current SDBD zoning regulations, public parking garages with no more than 225 spaces are allowed as of right, while a special permit is required for public parking garages in excess of 225 spaces. In 2004, CPC granted a special permit (the "Special Permit") to allow an unattended public parking garage with a maximum capacity of 694 spaces on a portion of the ground level, in the cellar and three sub-cellars on the Site (ULURP No. C 040181 ZSK). An application to renew the Special Permit for an additional three year term (ULURP No. N120164CMK) was submitted to the Department of City Planning ("DCP") in 2013. A draft application for a minor modification of the Special Permit to allow changes to the programming and configuration of the proposed garage was submitted to DCP in December 2014.

Following remedial actions, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, both of which are appropriate for its planned use. Both alternatives for remedial action at the Site are comparable with respect to the proposed use and to land uses in the vicinity of the Site. The Site is surrounded by residential and commercial properties and the

proposed alternative provides comprehensive protection of public health and the environment for these uses. Improvements in the current environmental condition of the property achieved by the alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. The alternatives are equally protective of natural resources and cultural resources. This RAWP will be subject to public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

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.

Both remedial alternatives are comparable with respect to the opportunity to achieve a 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. 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 2.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The preferred remedial action alternative is Alternative 1, 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 implementation 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 specified by disposal facility. A Waste Characterization Report documenting sample procedures, location, analytical results and disposal facility(s) approval letters will be submitted to NYCOER prior to the start of the remedial action;
6. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. For development purposes, the entire property will be excavated to a depth of 44 feet and 8 inches below grade for construction of the new subgrade parking garage. Approximately

122,096 tons of soil will be excavated and removed from this 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 (if encountered) and closure of petroleum spills (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;

11. Collection and analysis of eight end-point samples to determine the performance of the remedy with respect to attainment of 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;

13. Implementation of storm-water pollution prevention measures in compliance 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. 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;

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

16. As part of new development, installation of a vapor barrier below the proposed subgrade parking. The vapor barrier will include the application of Krystol Internal Membrane (KIM) waterproofing to the bottom and sidewall concrete slab cover;
17. As part of new development, construction and maintenance of an engineered composite cover consisting of a 2-feet thick bottom concrete slab to prevent human exposure to residual soil/fill remaining under the Site;
18. As part of new development, construction and operation of a subgrade ventilated parking garage as per NYC Building Department's codes and requirements;
19. If Track 1 SCOs are not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency; and
20. If Track 1 SCOs are not achieved, recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and Institutional Controls 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) use of groundwater without treatment rendering it safe for the intended use; (2) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (3) higher level of land usage without OER-approval.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track 1 Unrestricted Use Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are listed in Table 12. If Track 1 Unrestricted Use SCOs are not achieved, the 6NYCRR Part 375, Table 6.8(b) Track 2 Restricted Residential SCOs will be used as amended by the following Site-Specific (Track 4) SCOs:

Contaminant	Track 4 SCOs
Total SVOCs	250 ppm
Barium	750 ppm
Lead	1200 ppm

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 3. 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.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 122,096 tons. The lithology of the Site consists of historic fill material underlain by native soils; fill material was identified at a maximum depth of 38 feet below grade.

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

Disposal Facility	Waste Type	Estimated Quantities
To be determined	Native soil	71,532 tons
To be determined	Historic fill	20,026 tons
To be determined	Hazardous Lead	2,427 tons

End-Point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. Tenen proposes six confirmation samples to be collected from the base of the excavation at locations to be determined and approved by OER. For comparison to Track 1 - Unrestricted Use SCOs, samples will be analyzed for VOCs, SVOC, pesticides, PCBs and TAL metals according to analytical methods described below. For comparison to

Track 4 Site-Specific SCOs, analytes will only include trigger compounds and elements established on the Track 4 Site-Specific SCO list above. Proposed end-point sample locations are shown in Figure 3.

Hot-spot removal actions, whether established under this RAWP or identified during the remedial program, will be performed in conjunction with post remedial end-point samples 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. 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.

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

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 duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. One trip blank will be submitted to the laboratory with each shipment of soil samples.

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°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

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. Trip blanks will not be used for samples to be analyzed for metals, SVOCs or pesticides. One blind duplicate sample will be prepared and submitted for analysis every 20 samples.

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 3. The estimated quantity of onsite native soil expected to be reused/relocated on Site varies across the Site depending upon elevations between Gold Street and Willoughby Street. The varying depths of soil above the roof level elevation of 43.46-feet can be seen in Drawing F-101 entitled Foundation Section, found in the Development Plans in Appendix 5, Drawing F-102 entitled Foundation Sections. No imported fill is expected to be used for backfill and cover soil.

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 below will be incorporated into the foundation design as part of the development:

- A composite cover system consisting of the 2-feet thick concrete slab.
- Soil vapor barrier which will include the application of of Krystol Internal Membrane (KIM) waterproofing to the bottom and sidewall concrete slab cover.

If Track 1 is not achieved, these two elements will constitute Engineering Controls that will be employed in the remedial action to address residual contamination remaining at the Site.

Composite Cover System

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 minimum 2-feet thick concrete slab with a 6-inch thick layer of porous fill, compacted to 95% of maximum density in conformance to ASTM D1557-66T. Material will consist of hard, durable particles, free of organic matter, rubble and all deleterious substances. The concrete slab layout details in shown in Appendix 5.The composite cover system is a permanent engineering control for the Site.

The composite cover system is a permanent engineering control for the Site. 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 Site Management Plan 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 Site Management Plan in the RAR.

Vapor Barrier

Migration of soil vapor will be mitigated with a combination of concrete slab and vapor barrier. The vapor barrier will include the application of Krystol Internal Membrane (KIM) waterproofing to the bottom and sidewall concrete cover. The vapor barrier will be installed prior

to pouring the building's concrete slab behind and alongside the existing foundation slab. The vapor barrier will up the foundation sidewalls in accordance with manufacturer specifications. The specifications for installation will be provided to the construction management company and the foundation contractor or installer of the liner. The specifications state that all vapor barrier seam, penetrations, and repairs will be sealed either by the tape method or weld method, according to the manufacturer's recommendations and instructions.

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. Design specifications are included in Appendix 6.

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.

Ventilated Garage

The proposed development includes a sub grade ventilated garage which will be operated per requirements of the New York City Department of Buildings codes and regulations.

4.4 INSTITUTIONAL CONTROLS

Institutional Controls are not required on sites that achieve Track 1 Remedial Action. 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 title holder and will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

If Track 1 SCOs are not achieved, Institutional Controls for this remedial action are:

- Recording of an OER-approved Declaration of Covenant and Restrictions (DCR) with the City Register or county clerk, as appropriate. The DCR will include a description of all ECs and ICs, will summarize the requirements of the Site Management Plan, and will

note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;

- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. 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).
- 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 as a public below-grade parking garage as well as an at-grade open space/park 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 the DCR and 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 DCR and 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 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.

Investigations 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 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 Sources

Based on the results of the Remedial Investigation Report, historic fill was encountered at the Site only to a depth of approximately 14-21 feet. The following contaminants of concern were detected within the historic fill:

Soil

- Arsenic exceeded Restricted Residential Use SCOs;
- SVOCs (PAH compounds) including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded Restricted Residential Use SCO;
- Pesticides including aldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT and dieldrin were identified, but none exceeded Restricted Residential Use SCOs; and
- PCB-1260 was detected exceeding its Unrestricted Use SCOs.

Groundwater

- Metals including iron, manganese, nickel and sodium were detected above their respective GQSs.

Soil vapor

- Chlorinated VOCs including carbon tetrachloride, TCE and PCE detected at trace concentrations, well below NYS DOH monitoring thresholds; and
- Petroleum-related VOCs including BTEX were detected at low concentrations.

Nature, Extent, Fate and Transport of Contaminants

VOCs in soil were not detected above the Unrestricted SCOs, except acetone in one soil sample within native soil. Acetone is a known laboratory artifact and most likely not related to Site soil contamination. Historic fill-related SVOCs were not detected at levels exceeding the Unrestricted SCOs in several shallow soil samples. All detected metals were below the Commercial Use SCOs except lead in one sample. Individual metals detected above the Unrestricted Use SCOs include barium, cadmium, copper, lead, mercury, nickel and zinc. The majority of exceedances were detected in the shallow fill material, with the exception of nickel. Pesticides detected above Unrestricted Use SCOs were identified in shallow soil samples; no

samples were detected above Commercial Use SCOs. The majority of soil impacts are related to historic fill material.

No VOCs, SVOCs, pesticides or PCBs were detected in groundwater above the Class GA Standards. Iron, lead, manganese, and sodium exceeded Class GA Standards in the total metals sample. Lead and iron are likely related to the sediment in the groundwater. Manganese and sodium are common earth minerals and are considered a lower risk to human health and the environment compared to the other metals detected in the groundwater. Sodium was the only dissolved metal detected above the Class GA Standard in groundwater.

Receptor Populations

On-Site Receptors - The Site is currently capped with vacant buildings. Onsite receptors are limited to trespassers and Site representatives. During redevelopment of the Site, potential on-Site receptors will include construction workers, site representatives and visitors. Once the Site is redeveloped, the on-Site potential sensitive receptors will include workers and visitors.

Off-Site Receptors - Potential off-Site receptors within a 0.25-mile radius of the Site include: adult and child residents, and commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:

1. Commercial Businesses (up to 0.25 mile) – existing and future
2. Residential Buildings (up to 0.25 mile) – existing and future
3. Building Construction/Renovation (up to 0.25 mile) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to .25 mile) – existing and future
5. Schools (up to .25 mile) – existing and future

Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure

pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with soil

Potential Points of Exposure

Current Conditions: The potential for exposure to historic fill is limited. Direct contact with existing surface soils in limited as the Site is gated and locked, as well as covered with building slabs or pavement. Groundwater is marginally contaminated, but is not exposed at the Site, and because the Site is served by the public water supply and groundwater use for potable supply is prohibited, groundwater is not used at the Site and there is no potential exposure.

Construction/Remediation Activities: Once redevelopment activities begin, construction workers will come into direct contact with surface and subsurface soils, as a result of on-Site construction and excavation activities. 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, stormwater pollution prevention, 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 soil to a depth of approximately 44 feet 8 inches below-grade and in excess of Track 1 Unrestricted Use SCOs will be removed. The Site will be fully capped with a two-foot concrete slab, limiting potential direct exposure to soil and groundwater remaining in place and a vapor barrier system will prevent any exposure to potential off-Site soil vapors in the future. Potential post-remediation exposure to soil vapors migrating on-Site from an off-Site source do not pose a major concern after the remedial action due to the intended future of the Site. The Site is served by a public water

supply, and groundwater is not used at the Site for potable supply. There are no plausible off-Site pathways for ingestion, inhalation or dermal exposure to contaminants derived from the Site under future conditions.

Overall Human Health Exposure Assessment

The potential exposure pathways appear to exist only during current conditions and during the remedial action phase. Under current conditions, on-Site exposure pathways exist for site personnel. 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. After the remedial action is complete, there will be no remaining exposure pathway to on-Site soil/fill, as all soil above Site-Specific SCOs will have been removed and a vapor barrier system will have been installed as part of development. The vapor barrier system will prevent potential vapor intrusion and the composite cover system will prevent contact with residual soil or groundwater. This assessment takes into consideration the reasonably anticipated use of the Site, which includes a below-grade structure, concrete cover, and an at-grade open-space/park. 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 Mohamed Ahmed, Ph.D., Senior Geologist and Matthew Carroll, P.E., Project Manager of Tenen Environmental. The aforementioned personnel will provide oversight and consultation regarding the remedial action. Matthew Carroll, P.E., Project Manager of Tenen Environmental will provide consultation regarding the CAMP. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Matthew Carroll, P.E. and Mohamed Ahmed, Ph.D., of Tenen Environmental, respectively. PE oversight is required. QEP oversight is optional.

5.2 SITE SECURITY

Site access will be controlled by gated entrances to the fenced-in Site.

5.3 WORK HOURS

The hours for operation of remedial construction will be from 7:00 AM to 6:00 PM. These hours conform to the New York City Department of Buildings construction code requirements.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Mohamed Ahmed. 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 HASP. 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 baling/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. Exceedances 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 Markout 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

No dewatering is anticipated on site during the construction and soil excavation activities.

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; lose 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, haybales; 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. Storm-water 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 in the directions included as Attachment D.

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 and DUSR;
- 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.
- Recorded Declaration of Covenants and Restrictions.
- 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, Matthew Carroll, 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 Willoughby Square Site No. TBD and OER Project No. 15ENOS289K.

I, Mohamed Ahmed, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the Willoughby Square Site No. TBD and OER Project No. 15ENOS289K.

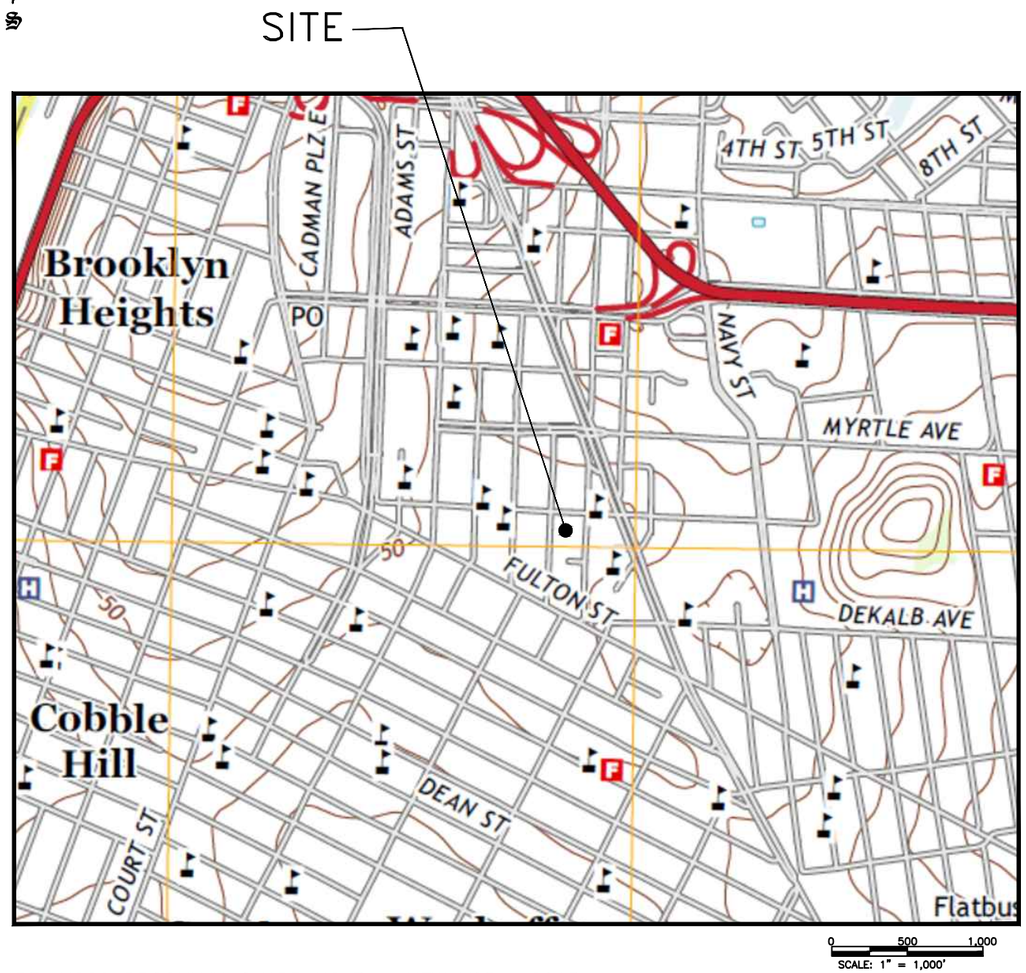
I certify that the OER-approved Remedial Action Work Plan dated March 2015 have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

7.0 SCHEDULE

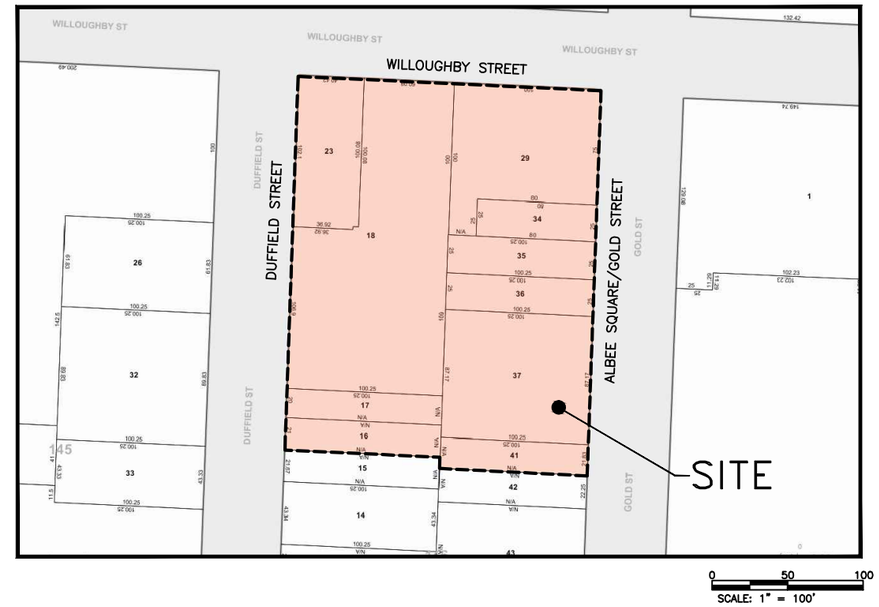
The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, the remediation period is to be determined.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	2
Fact Sheet 2 announcing start of remedy	2	4
Mobilization	6	2
Remedial Excavation	8	32
Demobilization	40	2
Record Declaration of Covenants and Restrictions	42	0
Submit Remedial Action Report	42	4

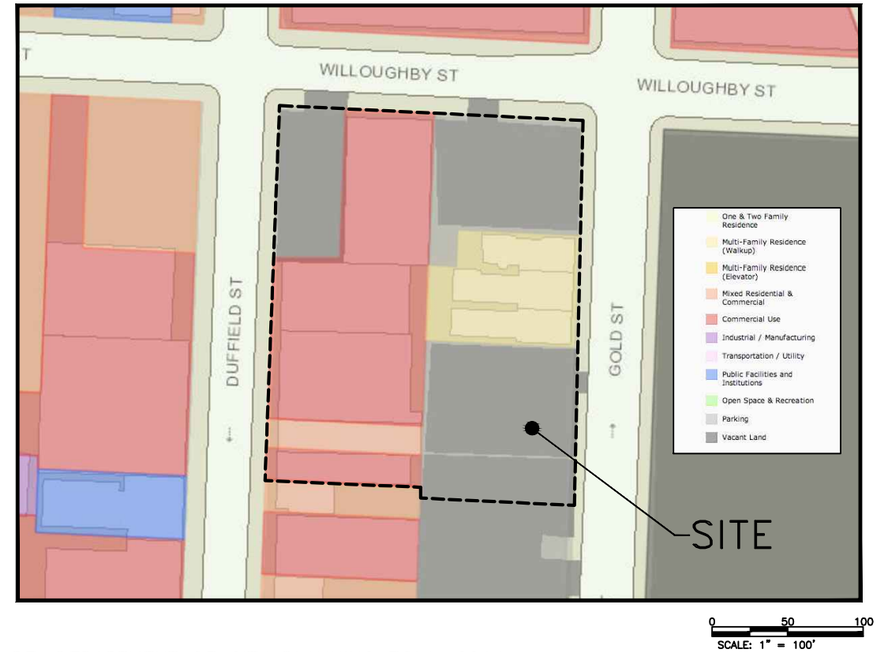
FIGURES



RE: USGS BROOKLYN QUADRANGLE – NEW YORK, 2013
http://www.usgs.gov



RE: DEPARTMENT OF FINANCE, DIGITAL TAX MAP, 2014
http://gis.nyc.gov/taxmap/map.htm



RE: DEPARTMENT OF CITY PLANNING ZOLA, 2014
http://gis.nyc.gov/doitt/nycitymap/template?applicationName=ZOLA

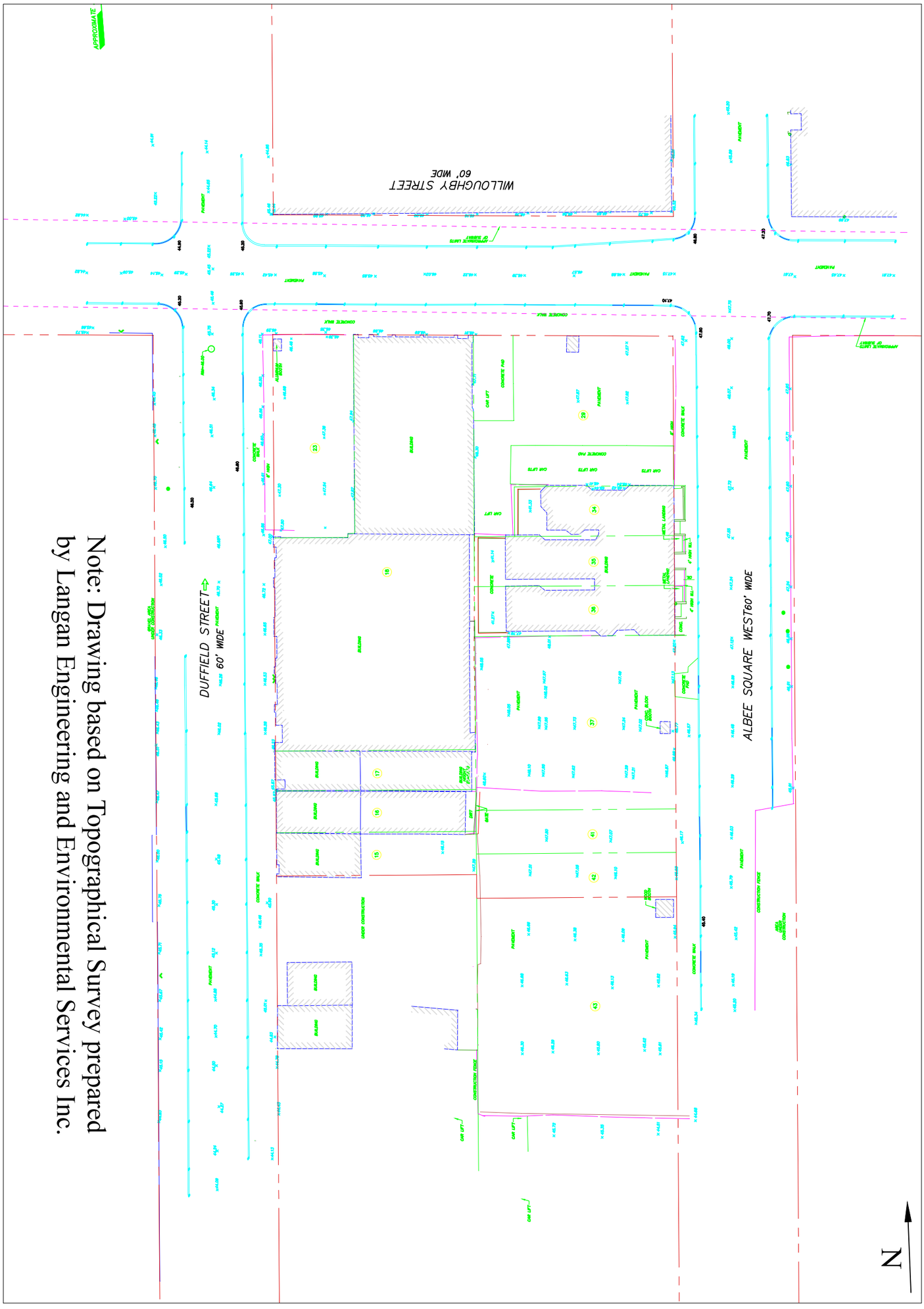
CLIENT
WILLOUGHBY SQUARE
BROOKLYN, NY

CONSULTANT
TENEN ENVIRONMENTAL
TENEN ENVIRONMENTAL, LLC
121 West 27th Street
Suite 1004
New York, NY 10001
D: 646-606-2332
F: 646-606-2379

DRAWN BY	JM
CHECKED BY	MC
DATE	APRIL 2014
SCALE:	AS NOTED

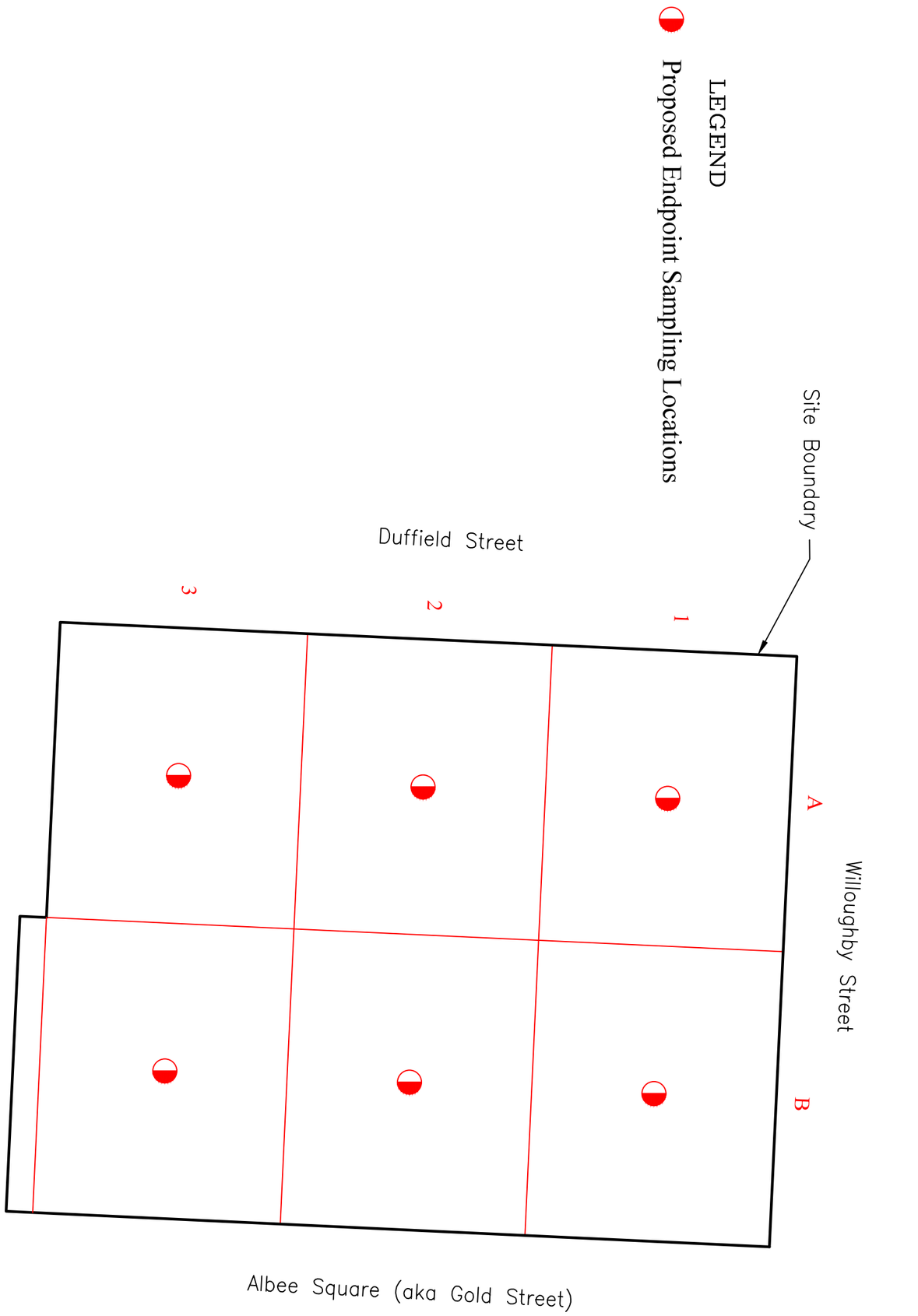
DRAWING TITLE.
SITE LOCATION

DRAWING NO.
FIGURE 1



Note: Drawing based on Topographical Survey prepared by Langan Engineering and Environmental Services Inc.

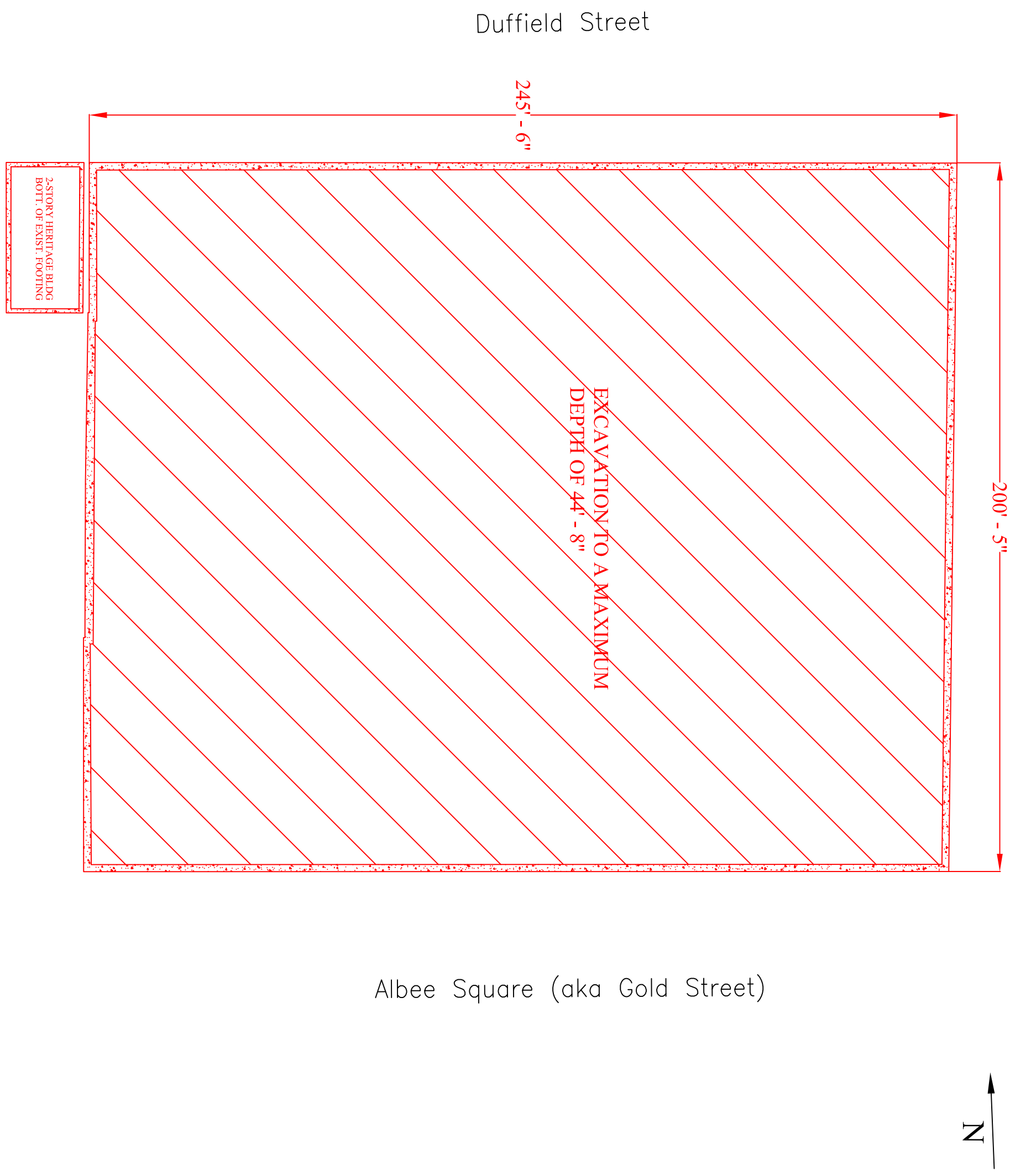
DRAWING TITLE SITE PLAN	DRAWN BY KM CHECKED BY MC	CONSULTANT TENEN ENVIRONMENTAL TENEN ENVIRONMENTAL, LLC 121 West 27th Street Suite 1004 New York, NY 10001 O: 646-606-2332 F: 646-606-2379	CLIENT Willoughby Square Garage Brooklyn, NY Block 146, Lots 16, 17, 18, 23, 29, 34-37 & 41
DRAWING NO. FIGURE 2	DATE JANUARY 2015 SCALE 1" = 30 FEET		



LEGEND

Proposed Endpoint Sampling Locations

DRAWING TITLE: PROPOSED ENDPOINT SAMPLING LOCATIONS	DRAWN BY: KM	CONSULTANT: TENEN ENVIRONMENTAL, LLC, 121 West 27th Street, Suite 1004, New York, NY 10001, O: 646-606-2332, F: 646-606-2379	CLIENT: Willoughby Square Garage, Brooklyn, NY, Block 146, Lots 16, 17, 18, 23, 29, 34-37 & 41
	CHECKED BY: MC		
DRAWING NO.: FIGURE 3	DATE: JANUARY 2015		
	SCALE: 1" = 40 FEET		



DRAWING TITLE. SITE EXCAVATION PLAN	DRAWN BY KM CHECKED BY MC	CONSULTANT TENEN ENVIRONMENTAL TENEN ENVIRONMENTAL, LLC 121 West 27th Street Suite 1004 New York, NY 10001 O: 646-606-2332 F: 646-606-2379	CLIENT Willoughby Square Garage Brooklyn, NY Block 146, Lots 16, 17, 18, 23, 29, 34-37 & 41
DRAWING NO. FIGURE 4	DATE JANUARY 2015 SCALE: 1" = 30 FEET		

TABLES

Table 1: Volatile Organic Compounds (VOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-5 (0-2')		SB-5 (24-26')		SB-6 (0-2')		SB-6 (12-14')		SB-7 (0-2')		SB-8 (0-2')	
SAMPLING DATE			9/17/2014		9/17/2014		9/18/2014		9/19/2014		9/23/2014		9/23/2014	
Volatile Organics (VOCs)	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg														
Methylene chloride	500	0.05	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
1,1-Dichloroethane	240	0.27	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.0001	U
Chloroform	350	0.37	0.00041	U	0.00039	U	0.0004	U	0.00039	U	0.0004	U	0.00041	U
Carbon tetrachloride	22	0.76	0.00023	U	0.00022	U	0.00023	U	0.00022	U	0.00022	U	0.00023	U
1,2-Dichloropropane			0.00025	U	0.00024	U	0.00025	U	0.00024	U	0.00024	U	0.00026	U
Dibromochloromethane			0.00017	U	0.00016	U	0.00017	U	0.00016	U	0.00016	U	0.00017	U
1,1,2-Trichloroethane	-	-	0.00033	U	0.00032	U	0.00033	U	0.00032	U	0.00032	U	0.00034	U
Tetrachloroethene	150	1.3	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Chlorobenzene	500	1.1	0.00038	U	0.00037	U	0.00038	U	0.00036	U	0.00037	U	0.00039	U
Trichlorofluoromethane	-	-	0.00043	U	0.00041	U	0.00042	U	0.0004	U	0.00042	U	0.00043	U
1,2-Dichloroethane	30	0.02	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
1,1,1-Trichloroethane	500	0.68	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U
Bromodichloromethane	-	-	0.00019	U	0.00018	U	0.00019	U	0.00018	U	0.00018	U	0.00019	U
trans-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
cis-1,3-Dichloropropene	-	-	0.00013	U	0.00012	U	0.00013	U	0.00012	U	0.00013	U	0.00013	U
1,3-Dichloropropene, Total	-	-	0.00013	U	0.00012	U	0.00013	U	0.00012	U	0.00013	U	0.00013	U
1,1-Dichloropropene	-	-	0.00016	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Bromoform	-	-	0.00026	U	0.00025	U	0.00026	U	0.00025	U	0.00025	U	0.00026	U
1,1,2,2-Tetrachloroethane	-	-	0.00011	U	0.00011	U	0.00011	U	0.0001	U	0.00011	U	0.00011	U
Benzene	44	0.06	0.00013	U	0.00012	U	0.00013	U	0.00012	U	0.00013	U	0.00013	U
Toluene	500	0.7	0.00021	U	0.00021	U	0.00021	U	0.0002	U	0.00021	U	0.00022	U
Ethylbenzene	390	1	0.00014	U	0.00014	U	0.00014	U	0.00013	U	0.00014	U	0.00014	U
Chloromethane	-	-	0.00032	U	0.00031	U	0.00032	U	0.00031	U	0.00032	U	0.00033	U
Bromomethane	-	-	0.00037	U	0.00036	U	0.00037	U	0.00035	U	0.00036	U	0.00038	U
Vinyl chloride	13	0.02	0.00013	U	0.00012	U	0.00013	U	0.00012	U	0.00012	U	0.00013	U
Chloroethane	-	-	0.00035	U	0.00034	U	0.00035	U	0.00033	U	0.00034	U	0.00035	U
1,1-Dichloroethene	500	0.33	0.00029	U	0.00028	U	0.00029	U	0.00027	U	0.00028	U	0.00029	U
trans-1,2-Dichloroethene	500	0.19	0.00023	U	0.00022	U	0.00023	U	0.00022	U	0.00023	U	0.00024	U
Trichloroethene	200	0.47	0.00014	U	0.00013	U	0.00014	U	0.00013	U	0.00013	U	0.00014	U
1,2-Dichlorobenzene	500	1.1	0.00017	U	0.00016	U	0.00017	U	0.00016	U	0.00016	U	0.00017	U
1,3-Dichlorobenzene	280	2.4	0.00015	U	0.00014	U	0.00015	U	0.00014	U	0.00014	U	0.00015	U
1,4-Dichlorobenzene	130	1.8	0.00015	U	0.00015	U	0.00015	U	0.00014	U	0.00015	U	0.00015	U
Methyl tert butyl ether	500	0.93	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.00009	U
p/m-Xylene	-	-	0.00022	U	0.00021	U	0.00022	U	0.00021	U	0.00021	U	0.00022	U
o-Xylene	-	-	0.00019	U	0.00018	U	0.00019	U	0.00018	U	0.00018	U	0.00019	U
Xylenes, Total	500	0.26	0.00019	U	0.00018	U	0.00019	U	0.00018	U	0.00018	U	0.00019	U
cis-1,2-Dichloroethene	500	0.25	0.00016	U	0.00015	U	0.00016	U	0.00015	U	0.00015	U	0.00016	U
1,2-Dichloroethene, Total	-	-	0.00016	U	0.00015	U	0.00016	U	0.00015	U	0.00015	U	0.00016	U
Dibromomethane	-	-	0.00018	U	0.00017	U	0.00018	U	0.00017	U	0.00018	U	0.00018	U
Styrene	-	-	0.00044	U	0.00043	U	0.00044	U	0.00042	U	0.00043	U	0.00045	U
Dichlorodifluoromethane	-	-	0.00021	U	0.0002	U	0.00021	U	0.0002	U	0.0002	U	0.00021	U
Acetone	500	0.05	0.0011	U	0.0011	U	0.016		0.0011	U	0.0028	J	0.0012	U
Carbon disulfide	-	-	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
2-Butanone	500	0.12	0.0003	U	0.00029	U	0.0003	U	0.00028	U	0.00029	U	0.0003	U
Vinyl acetate	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
4-Methyl-2-pentanone	-	-	0.00027	U	0.00026	U	0.00027	U	0.00026	U	0.00026	U	0.00027	U
1,2,3-Trichloropropane	-	-	0.00018	U	0.00017	U	0.00018	U	0.00017	U	0.00017	U	0.00018	U
2-Hexanone	-	-	0.00073	U	0.00071	U	0.00073	U	0.0007	U	0.00071	U	0.00074	U
Bromochloromethane	-	-	0.0003	U	0.00029	U	0.0003	U	0.00029	U	0.0003	U	0.00031	U
2,2-Dichloropropane	-	-	0.00025	U	0.00024	U	0.00025	U	0.00024	U	0.00024	U	0.00025	U
1,2-Dibromoethane	-	-	0.00019	U	0.00018	U	0.00019	U	0.00018	U	0.00019	U	0.0002	U
1,3-Dichloropropane	-	-	0.00016	U	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00016	U
1,1,1,2-Tetrachloroethane	-	-	0.00035	U	0.00034	U	0.00035	U	0.00033	U	0.00034	U	0.00036	U
Bromobenzene	-	-	0.00023	U	0.00022	U	0.00023	U	0.00022	U	0.00022	U	0.00023	U
n-Butylbenzene	500	12	0.00013	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
sec-Butylbenzene	500	11	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
tert-Butylbenzene	500	5.9	0.00015	U	0.00014	U	0.00015	U	0.00014	U	0.00014	U	0.00015	U
o-Chlorotoluene	-	-	0.00018	U	0.00017	U	0.00018	U	0.00017	U	0.00017	U	0.00018	U
p-Chlorotoluene	-	-	0.00015	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
1,2-Dibromo-3-chloropropane	-	-	0.00044	U	0.00042	U	0.00043	U	0.00041	U	0.00042	U	0.00044	U
Hexachlorobutadiene	-	-	0.00025	U	0.00024	U	0.00025	U	0.00024	U	0.00024	U	0.00026	U
Isopropylbenzene	-	-	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00012	U
p-Isopropyltoluene	-	-	0.00014	U	0.00013	U	0.00014	U	0.00013	U	0.00013	U	0.00014	U
Naphthalene	500	12	0.00015	U	0.00015	U	0.009		0.00014	U	0.00015	U	0.00015	U
Acrylonitrile	-	-	0.00056	U	0.00054	U	0.00056	U	0.00054	U	0.00055	U	0.00057	U
n-Propylbenzene	500	3.9	0.00012	U	0.00012	U	0.00012	U	0.00011	U	0.00012	U	0.00012	U
1,2,3-Trichlorobenzene	-	-	0.00016	U	0.00016	U	0.00016	U	0.00015	U	0.00016	U	0.00016	U
1,2,4-Trichlorobenzene	-	-	0.0002	U	0.00019	U	0.0002	U	0.00019	U	0.00019	U	0.0002	U
1,3,5-Trimethylbenzene	190	8.4	0.00016	U	0.00015	U	0.00016	U	0.00015	U	0.00015	U	0.00016	U
1,2,4-Trimethylbenzene	190	3.6	0.00016	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
1,4-Dioxane	130	0.1	0.016	U	0.015	U	0.016	U	0.015	U	0.015	U	0.016	U
p-Diethylbenzene	-	-	0.00018	U	0.00017	U	0.00018	U	0.00017	U	0.00017	U	0.00018	U
p-Ethyltoluene	-	-	0.00014	U	0.00013	U	0.00014	U	0.00013	U	0.00013	U	0.00014	U
1,2,4,5-Tetramethylbenzene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U
Ethyl ether	-	-	0.00029	U	0.00048	J	0.00028	U	0.00027	U	0.00028	U	0.00029	U
trans-1,4-Dichloro-2-butene	-	-	0.00043	U	0.0053	U	0.00043	U	0.00041	U	0.00042	U	0.00044	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 1: Volatile Organic Compounds (VOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-8 (4-6')		SB-9 (0-2')		SB-9 (4-6')		SB-10 (0-2')	
SAMPLING DATE			9/23/2014		9/25/2014		9/25/2014		9/24/2014	
Volatile Organics (VOCs)	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg										
Methylene chloride	500	0.05	0.0012	U	0.0012	U	0.0012	U	0.0013	U
1,1-Dichloroethane	240	0.27	0.00009	U	0.00009	U	0.00009	U	0.0001	U
Chloroform	350	0.37	0.00039	U	0.00039	U	0.00039	U	0.00044	U
Carbon tetrachloride	22	0.76	0.00022	U	0.00022	U	0.00022	U	0.00025	U
1,2-Dichloropropane			0.00024	U	0.00024	U	0.00024	U	0.00027	U
Dibromochloromethane			0.00016	U	0.00016	U	0.00016	U	0.00018	U
1,1,2-Trichloroethane	-	-	0.00032	U	0.00032	U	0.00032	U	0.00036	U
Tetrachloroethene	150	1.3	0.00015	U	0.00015	U	0.00015	U	0.00017	U
Chlorobenzene	500	1.1	0.00037	U	0.00037	U	0.00037	U	0.00041	U
Trichlorofluoromethane	-	-	0.00041	U	0.00041	U	0.00041	U	0.00046	U
1,2-Dichloroethane	30	0.02	0.00012	U	0.00012	U	0.00012	U	0.00013	U
1,1,1-Trichloroethane	500	0.68	0.00012	U	0.00012	U	0.00012	U	0.00013	U
Bromodichloromethane	-	-	0.00018	U	0.00018	U	0.00018	U	0.0002	U
trans-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00014	U
cis-1,3-Dichloropropene	-	-	0.00012	U	0.00012	U	0.00012	U	0.00014	U
1,3-Dichloropropene, Total	-	-	0.00012	U	0.00012	U	0.00012	U	0.00014	U
1,1-Dichloropropene	-	-	0.00015	U	0.00015	U	0.00015	U	0.00017	U
Bromoform	-	-	0.00025	U	0.00025	U	0.00025	U	0.00028	U
1,1,2,2-Tetrachloroethane	-	-	0.00011	U	0.00011	U	0.00011	U	0.00012	U
Benzene	44	0.06	0.00012	U	0.00012	U	0.00012	U	0.00014	U
Toluene	500	0.7	0.00021	U	0.00021	U	0.00021	U	0.00023	U
Ethylbenzene	390	1	0.00014	U	0.00013	U	0.00014	U	0.00015	U
Chloromethane	-	-	0.00031	U	0.00031	U	0.00031	U	0.00035	U
Bromomethane	-	-	0.00036	U	0.00036	U	0.00036	U	0.0004	U
Vinyl chloride	13	0.02	0.00012	U	0.00012	U	0.00012	U	0.00014	U
Chloroethane	-	-	0.00034	U	0.00033	U	0.00034	U	0.00038	U
1,1-Dichloroethene	500	0.33	0.00028	U	0.00028	U	0.00028	U	0.00031	U
trans-1,2-Dichloroethene	500	0.19	0.00022	U	0.00022	U	0.00022	U	0.00025	U
Trichloroethene	200	0.47	0.00013	U	0.00013	U	0.00013	U	0.00015	U
1,2-Dichlorobenzene	500	1.1	0.00016	U	0.00016	U	0.00016	U	0.00018	U
1,3-Dichlorobenzene	280	2.4	0.00014	U	0.00014	U	0.00014	U	0.00016	U
1,4-Dichlorobenzene	130	1.8	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Methyl tert butyl ether	500	0.93	0.00009	U	0.00009	U	0.00009	U	0.0001	U
p/m-Xylene	-	-	0.00021	U	0.00021	U	0.00021	U	0.00078	J
o-Xylene	-	-	0.00018	U	0.00018	U	0.00018	U	0.0002	U
Xylenes, Total	500	0.26	0.00018	U	0.00018	U	0.00018	U	0.00078	J
cis-1,2-Dichloroethene	500	0.25	0.00015	U	0.00015	U	0.00015	U	0.00017	U
1,2-Dichloroethene, Total	-	-	0.00015	U	0.00015	U	0.00015	U	0.00017	U
Dibromomethane	-	-	0.00017	U	0.00017	U	0.00017	U	0.00019	U
Styrene	-	-	0.00043	U	0.00042	U	0.00043	U	0.00048	U
Dichlorodifluoromethane	-	-	0.0002	U	0.0002	U	0.0002	U	0.00023	U
Acetone	500	0.05	0.0011	U	0.0048	J	0.003	J	0.0012	U
Carbon disulfide	-	-	0.0012	U	0.0012	U	0.0012	U	0.0013	U
2-Butanone	500	0.12	0.00029	U	0.00029	U	0.00029	U	0.00032	U
Vinyl acetate	-	-	0.00014	U	0.00014	U	0.00014	U	0.00016	U
4-Methyl-2-pentanone	-	-	0.00026	U	0.00026	U	0.00026	U	0.00029	U
1,2,3-Trichloropropane	-	-	0.00017	U	0.00017	U	0.00017	U	0.00019	U
2-Hexanone	-	-	0.00071	U	0.0007	U	0.00071	U	0.00079	U
Bromochloromethane	-	-	0.00029	U	0.00029	U	0.00029	U	0.00033	U
2,2-Dichloropropane	-	-	0.00024	U	0.00024	U	0.00024	U	0.00027	U
1,2-Dibromoethane	-	-	0.00018	U	0.00018	U	0.00018	U	0.00021	U
1,3-Dichloropropane	-	-	0.00015	U	0.00015	U	0.00015	U	0.00017	U
1,1,1,2-Tetrachloroethane	-	-	0.00034	U	0.00034	U	0.00034	U	0.00038	U
Bromobenzene	-	-	0.00022	U	0.00022	U	0.00022	U	0.00025	U
n-Butylbenzene	500	12	0.00012	U	0.00012	U	0.00012	U	0.00014	U
sec-Butylbenzene	500	11	0.00013	U	0.00013	U	0.00013	U	0.00014	U
tert-Butylbenzene	500	5.9	0.00014	U	0.00014	U	0.00014	U	0.00016	U
o-Chlorotoluene	-	-	0.00017	U	0.00017	U	0.00017	U	0.00019	U
p-Chlorotoluene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00016	U
1,2-Dibromo-3-chloropropane	-	-	0.00042	U	0.00042	U	0.00042	U	0.00047	U
Hexachlorobutadiene	-	-	0.00024	U	0.00024	U	0.00024	U	0.00027	U
Isopropylbenzene	-	-	0.00011	U	0.00011	U	0.00011	U	0.00012	U
p-Isopropyltoluene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00015	U
Naphthalene	500	12	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Acrylonitrile	-	-	0.00055	U	0.00054	U	0.00054	U	0.00061	U
n-Propylbenzene	500	3.9	0.00012	U	0.00012	U	0.00012	U	0.00013	U
1,2,3-Trichlorobenzene	-	-	0.00016	U	0.00016	U	0.00016	U	0.00018	U
1,2,4-Trichlorobenzene	-	-	0.00019	U	0.00019	U	0.00019	U	0.00022	U
1,3,5-Trimethylbenzene	190	8.4	0.00015	U	0.00015	U	0.00015	U	0.00017	U
1,2,4-Trimethylbenzene	190	3.6	0.00015	U	0.00015	U	0.00015	U	0.00017	U
1,4-Dioxane	130	0.1	0.015	U	0.015	U	0.015	U	0.017	U
p-Diethylbenzene	-	-	0.00017	U	0.00017	U	0.00017	U	0.00019	U
p-Ethyltoluene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00015	U
1,2,4,5-Tetramethylbenzene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00015	U
Ethyl ether	-	-	0.00028	U	0.00028	U	0.00028	U	0.00056	J
trans-1,4-Dichloro-2-butene	-	-	0.00042	U	0.00042	U	0.00042	U	0.00047	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 1: Volatile Organic Compounds (VOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-10 (12-14')		SB-11 (0-2')		SB-11 (24-26')		SB-12 (0-2')		SB-12 (22-24')	
SAMPLING DATE			9/24/2014		9/17/2014		9/17/2014		9/17/2014		9/17/2014	
Volatile Organics (VOCs)	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg												
Methylene chloride	500	0.05	0.0012	U	0.0012	U	0.0012	U	0.0013	U	0.0012	U
1,1-Dichloroethane	240	0.27	0.00009	U	0.0001	U	0.00009	U	0.0001	U	0.00009	U
Chloroform	350	0.37	0.0004	U	0.00041	U	0.00039	U	0.00042	U	0.00038	U
Carbon tetrachloride	22	0.76	0.00023	U	0.00023	U	0.00022	U	0.00024	U	0.00022	U
1,2-Dichloropropane			0.00024	U	0.00025	U	0.00024	U	0.00026	U	0.00024	U
Dibromochloromethane			0.00016	U	0.00017	U	0.00016	U	0.00018	U	0.00016	U
1,1,2-Trichloroethane	-	-	0.00033	U	0.00034	U	0.00032	U	0.00035	U	0.00032	U
Tetrachloroethene	150	1.3	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
Chlorobenzene	500	1.1	0.00038	U	0.00039	U	0.00036	U	0.0004	U	0.00036	U
Trichlorofluoromethane	-	-	0.00042	U	0.00043	U	0.00041	U	0.00044	U	0.0004	U
1,2-Dichloroethane	30	0.02	0.00012	U	0.00013	U	0.00012	U	0.00013	U	0.00012	U
1,1,1-Trichloroethane	500	0.68	0.00012	U	0.00012	U	0.00012	U	0.00013	U	0.00012	U
Bromodichloromethane	-	-	0.00019	U	0.00019	U	0.00018	U	0.0002	U	0.00018	U
trans-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00014	U	0.00012	U
cis-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00012	U	0.00013	U	0.00012	U
1,3-Dichloropropene, Total	-	-	0.00013	U	0.00013	U	0.00012	U	0.00013	U	0.00012	U
1,1-Dichloropropene	-	-	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
Bromoform	-	-	0.00025	U	0.00026	U	0.00025	U	0.00027	U	0.00025	U
1,1,2,2-Tetrachloroethane	-	-	0.00011	U	0.00011	U	0.0001	U	0.00012	U	0.0001	U
Benzene	44	0.06	0.00013	U	0.00013	U	0.00012	U	0.00013	U	0.00012	U
Toluene	500	0.7	0.00021	U	0.00022	U	0.0002	U	0.00022	U	0.0002	U
Ethylbenzene	390	1	0.00014	U	0.00014	U	0.00013	U	0.00014	U	0.00013	U
Chloromethane	-	-	0.00032	U	0.00033	U	0.00031	U	0.00034	U	0.00031	U
Bromomethane	-	-	0.00036	U	0.00038	U	0.00035	U	0.00039	U	0.00035	U
Vinyl chloride	13	0.02	0.00013	U	0.00013	U	0.00012	U	0.00013	U	0.00012	U
Chloroethane	-	-	0.00034	U	0.00035	U	0.00033	U	0.00036	U	0.00033	U
1,1-Dichloroethene	500	0.33	0.00028	U	0.00029	U	0.00027	U	0.0003	U	0.00027	U
trans-1,2-Dichloroethene	500	0.19	0.00023	U	0.00024	U	0.00022	U	0.00024	U	0.00022	U
Trichloroethene	200	0.47	0.00013	U	0.00014	U	0.00013	U	0.00014	U	0.00013	U
1,2-Dichlorobenzene	500	1.1	0.00016	U	0.00017	U	0.00016	U	0.00018	U	0.00016	U
1,3-Dichlorobenzene	280	2.4	0.00014	U	0.00015	U	0.00014	U	0.00015	U	0.00014	U
1,4-Dichlorobenzene	130	1.8	0.00015	U	0.00015	U	0.00014	U	0.00016	U	0.00014	U
Methyl tert butyl ether	500	0.93	0.00009	U	0.00009	U	0.00009	U	0.0001	U	0.00009	U
p/m-Xylene	-	-	0.00021	U	0.00022	U	0.00021	U	0.00023	U	0.00021	U
o-Xylene	-	-	0.00018	U	0.00019	U	0.00018	U	0.0002	U	0.00018	U
Xylenes, Total	500	0.26	0.00018	U	0.00019	U	0.00018	U	0.0002	U	0.00018	U
cis-1,2-Dichloroethene	500	0.25	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
1,2-Dichloroethene, Total	-	-	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
Dibromomethane	-	-	0.00018	U	0.00018	U	0.00017	U	0.00019	U	0.00017	U
Styrene	-	-	0.00043	U	0.00045	U	0.00042	U	0.00046	U	0.00042	U
Dichlorodifluoromethane	-	-	0.0002	U	0.00021	U	0.0002	U	0.00022	U	0.0002	U
Acetone	500	0.05	0.0033	J	0.014		0.025		0.0012	U	0.058	
Carbon disulfide	-	-	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0011	U
2-Butanone	500	0.12	0.00029	U	0.0003	U	0.00028	U	0.00031	U	0.00028	U
Vinyl acetate	-	-	0.00014	U	0.00015	U	0.00014	U	0.00015	U	0.00014	U
4-Methyl-2-pentanone	-	-	0.00026	U	0.00027	U	0.00026	U	0.00028	U	0.00025	U
1,2,3-Trichloropropane	-	-	0.00018	U	0.00018	U	0.00017	U	0.00018	U	0.00017	U
2-Hexanone	-	-	0.00072	U	0.00074	U	0.0007	U	0.00076	U	0.00069	U
Bromochloromethane	-	-	0.0003	U	0.00031	U	0.00029	U	0.00032	U	0.00029	U
2,2-Dichloropropane	-	-	0.00024	U	0.00025	U	0.00024	U	0.00026	U	0.00024	U
1,2-Dibromoethane	-	-	0.00019	U	0.00019	U	0.00018	U	0.0002	U	0.00018	U
1,3-Dichloropropane	-	-	0.00016	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
1,1,1,2-Tetrachloroethane	-	-	0.00034	U	0.00035	U	0.00033	U	0.00036	U	0.00033	U
Bromobenzene	-	-	0.00022	U	0.00023	U	0.00022	U	0.00024	U	0.00022	U
n-Butylbenzene	500	12	0.00012	U	0.00013	U	0.00012	U	0.00013	U	0.00012	U
sec-Butylbenzene	500	11	0.00013	U	0.00014	U	0.00013	U	0.00014	U	0.00013	U
tert-Butylbenzene	500	5.9	0.00015	U	0.00015	U	0.00014	U	0.00015	U	0.00014	U
o-Chlorotoluene	-	-	0.00017	U	0.00018	U	0.00017	U	0.00018	U	0.00017	U
p-Chlorotoluene	-	-	0.00014	U	0.00015	U	0.00014	U	0.00015	U	0.00014	U
1,2-Dibromo-3-chloropropane	-	-	0.00043	U	0.00044	U	0.00042	U	0.00045	U	0.00041	U
Hexachlorobutadiene	-	-	0.00024	U	0.00025	U	0.00024	U	0.00026	U	0.00024	U
Isopropylbenzene	-	-	0.00011	U	0.00012	U	0.00011	U	0.00012	U	0.00011	U
p-Isopropyltoluene	-	-	0.00013	U	0.00014	U	0.00013	U	0.00014	U	0.00013	U
Naphthalene	500	12	0.00015	U	0.00015	U	0.00014	U	0.00016	U	0.00014	U
Acrylonitrile	-	-	0.00055	U	0.00057	U	0.00054	U	0.00059	U	0.00054	U
n-Propylbenzene	500	3.9	0.00012	U	0.00012	U	0.00011	U	0.00012	U	0.00011	U
1,2,3-Trichlorobenzene	-	-	0.00016	U	0.00016	U	0.00015	U	0.00017	U	0.00015	U
1,2,4-Trichlorobenzene	-	-	0.0002	U	0.0002	U	0.00019	U	0.00021	U	0.00019	U
1,3,5-Trimethylbenzene	190	8.4	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
1,2,4-Trimethylbenzene	190	3.6	0.00015	U	0.00016	U	0.00015	U	0.00016	U	0.00015	U
1,4-Dioxane	130	0.1	0.016	U	0.016	U	0.015	U	0.016	U	0.015	U
p-Diethylbenzene	-	-	0.00017	U	0.00018	U	0.00017	U	0.00018	U	0.00017	U
p-Ethyltoluene	-	-	0.00013	U	0.00014	U	0.00013	U	0.00014	U	0.00013	U
1,2,4,5-Tetramethylbenzene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00015	U	0.00014	U
Ethyl ether	-	-	0.00028	U	0.00029	U	0.00027	U	0.0003	U	0.00027	U
trans-1,4-Dichloro-2-butene	-	-	0.00042	U	0.00044	U	0.00041	U	0.00045	U	0.00041	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 1: Volatile Organic Compounds (VOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-13 (0-2')		SB-13 (8-10')		SB-14 (0-2')		SB-14 (4-6')		SB-15 (0-2')	
SAMPLING DATE			9/19/2014		9/19/2014		9/22/2014		9/22/2014		9/22/2014	
Volatile Organics (VOCs)	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg												
Methylene chloride	500	0.05	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
1,1-Dichloroethane	240	0.27	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.0001	U
Chloroform	350	0.37	0.0004	U	0.00039	U	0.0004	U	0.00039	U	0.00042	U
Carbon tetrachloride	22	0.76	0.00023	U	0.00022	U	0.00023	U	0.00022	U	0.00024	U
1,2-Dichloropropane			0.00025	U	0.00024	U	0.00024	U	0.00024	U	0.00026	U
Dibromochloromethane			0.00017	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,1,2-Trichloroethane	-	-	0.00033	U	0.00032	U	0.00033	U	0.00032	U	0.00034	U
Tetrachloroethene	150	1.3	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Chlorobenzene	500	1.1	0.00038	U	0.00037	U	0.00037	U	0.00037	U	0.00039	U
Trichlorofluoromethane	-	-	0.00042	U	0.00041	U	0.00042	U	0.00041	U	0.00044	U
1,2-Dichloroethane	30	0.02	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
1,1,1-Trichloroethane	500	0.68	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U
Bromodichloromethane	-	-	0.00019	U	0.00018	U	0.00019	U	0.00018	U	0.0002	U
trans-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
cis-1,3-Dichloropropene	-	-	0.00013	U	0.00012	U	0.00013	U	0.00012	U	0.00013	U
1,3-Dichloropropene, Total	-	-	0.00013	U	0.00012	U	0.00013	U	0.00012	U	0.00013	U
1,1-Dichloropropene	-	-	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Bromoform	-	-	0.00026	U	0.00025	U	0.00025	U	0.00025	U	0.00027	U
1,1,2,2-Tetrachloroethane	-	-	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00011	U
Benzene	44	0.06	0.00091	J	0.00012	U	0.00013	U	0.00012	U	0.00013	U
Toluene	500	0.7	0.00021	U	0.00021	U	0.00021	U	0.00021	U	0.00022	U
Ethylbenzene	390	1	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U
Chloromethane	-	-	0.00031	U	0.00031	U	0.00032	U	0.00031	U	0.00033	U
Bromomethane	-	-	0.00036	U	0.00036	U	0.00036	U	0.00036	U	0.00038	U
Vinyl chloride	13	0.02	0.00012	U	0.00012	U	0.00013	U	0.00012	U	0.00013	U
Chloroethane	-	-	0.00034	U	0.00034	U	0.00034	U	0.00034	U	0.00036	U
1,1-Dichloroethene	500	0.33	0.00028	U	0.00028	U	0.00028	U	0.00028	U	0.0003	U
trans-1,2-Dichloroethene	500	0.19	0.00022	U	0.00022	U	0.00023	U	0.00022	U	0.00024	U
Trichloroethene	200	0.47	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
1,2-Dichlorobenzene	500	1.1	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,3-Dichlorobenzene	280	2.4	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
1,4-Dichlorobenzene	130	1.8	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Methyl tert butyl ether	500	0.93	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.0001	U
p/m-Xylene	-	-	0.00021	U	0.00021	U	0.00021	U	0.00021	U	0.00022	U
o-Xylene	-	-	0.00018	U	0.00018	U	0.00018	U	0.00018	U	0.00019	U
Xylenes, Total	500	0.26	0.00018	U	0.00018	U	0.00018	U	0.00018	U	0.00019	U
cis-1,2-Dichloroethene	500	0.25	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
1,2-Dichloroethene, Total	-	-	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Dibromomethane	-	-	0.00017	U	0.00017	U	0.00018	U	0.00017	U	0.00018	U
Styrene	-	-	0.00043	U	0.00043	U	0.00043	U	0.00043	U	0.00045	U
Dichlorodifluoromethane	-	-	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.00022	U
Acetone	500	0.05	0.0011	U	0.0011	U	0.015		0.0066	J	0.0012	U
Carbon disulfide	-	-	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U
2-Butanone	500	0.12	0.00029	U	0.00029	U	0.00029	U	0.00029	U	0.00031	U
Vinyl acetate	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
4-Methyl-2-pentanone	-	-	0.00026	U	0.00026	U	0.00026	U	0.00026	U	0.00028	U
1,2,3-Trichloropropane	-	-	0.00017	U	0.00017	U	0.00018	U	0.00017	U	0.00018	U
2-Hexanone	-	-	0.00071	U	0.00071	U	0.00072	U	0.00071	U	0.00075	U
Bromochloromethane	-	-	0.00029	U	0.00029	U	0.0003	U	0.00029	U	0.00031	U
2,2-Dichloropropane	-	-	0.00024	U	0.00024	U	0.00024	U	0.00024	U	0.00025	U
1,2-Dibromoethane	-	-	0.00018	U	0.00018	U	0.00019	U	0.00018	U	0.0002	U
1,3-Dichloropropane	-	-	0.00015	U	0.00015	U	0.00016	U	0.00015	U	0.00016	U
1,1,1,2-Tetrachloroethane	-	-	0.00034	U	0.00034	U	0.00034	U	0.00034	U	0.00036	U
Bromobenzene	-	-	0.00022	U	0.00022	U	0.00022	U	0.00022	U	0.00023	U
n-Butylbenzene	500	12	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
sec-Butylbenzene	500	11	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
tert-Butylbenzene	500	5.9	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
o-Chlorotoluene	-	-	0.00017	U	0.00017	U	0.00017	U	0.00017	U	0.00018	U
p-Chlorotoluene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
1,2-Dibromo-3-chloropropane	-	-	0.00042	U	0.00042	U	0.00043	U	0.00042	U	0.00045	U
Hexachlorobutadiene	-	-	0.00024	U	0.00024	U	0.00024	U	0.00024	U	0.00026	U
Isopropylbenzene	-	-	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00012	U
p-Isopropyltoluene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
Naphthalene	500	12	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Acrylonitrile	-	-	0.00055	U	0.00055	U	0.00055	U	0.00055	U	0.00058	U
n-Propylbenzene	500	3.9	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U
1,2,3-Trichlorobenzene	-	-	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,2,4-Trichlorobenzene	-	-	0.00019	U	0.00019	U	0.0002	U	0.00019	U	0.0002	U
1,3,5-Trimethylbenzene	190	8.4	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
1,2,4-Trimethylbenzene	190	3.6	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
1,4-Dioxane	130	0.1	0.015	U	0.015	U	0.016	U	0.015	U	0.016	U
p-Diethylbenzene	-	-	0.00017	U	0.00017	U	0.00017	U	0.00017	U	0.00018	U
p-Ethyltoluene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
1,2,4,5-Tetramethylbenzene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
Ethyl ether	-	-	0.00028	U	0.00028	U	0.00028	U	0.00028	U	0.00029	U
trans-1,4-Dichloro-2-butene	-	-	0.00042	U	0.00042	U	0.00042	U	0.00042	U	0.00044	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 1: Volatile Organic Compounds (VOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-15 (4-6')		SB-16 (0-2')		SB-16 (12-14')		SB-17 (0-2')		SB-17 (22-24')		SB-18 (0-2')	
SAMPLING DATE			9/22/2014		9/15/2014		9/15/2014		9/15/2014		9/15/2014		9/16/2014	
Volatile Organics (VOCs)	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg														
Methylene chloride	500	0.05	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0013	U
1,1-Dichloroethane	240	0.27	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.0001	U
Chloroform	350	0.37	0.0004	U	0.0004	U	0.0004	U	0.00041	U	0.00041	U	0.00043	U
Carbon tetrachloride	22	0.76	0.00023	U	0.00023	U	0.00023	U	0.00023	U	0.00023	U	0.00024	U
1,2-Dichloropropane			0.00025	U	0.00025	U	0.00025	U	0.00025	U	0.00025	U	0.00027	U
Dibromochloromethane			0.00017	U	0.00017	U	0.00017	U	0.00017	U	0.00017	U	0.00018	U
1,1,2-Trichloroethane	-	-	0.00033	U	0.00033	U	0.00033	U	0.00033	U	0.00034	U	0.00036	U
Tetrachloroethene	150	1.3	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Chlorobenzene	500	1.1	0.00038	U	0.00038	U	0.00038	U	0.00038	U	0.00038	U	0.00041	U
Trichlorofluoromethane	-	-	0.00042	U	0.00042	U	0.00042	U	0.00043	U	0.00043	U	0.00045	U
1,2-Dichloroethane	30	0.02	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
1,1,1-Trichloroethane	500	0.68	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
Bromodichloromethane	-	-	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.0002	U
trans-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
cis-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
1,3-Dichloropropene, Total	-	-	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
1,1-Dichloropropene	-	-	0.00015	U	0.00015	U	0.00015	U	0.00016	U	0.00016	U	0.00016	U
Bromoform	-	-	0.00026	U	0.00026	U	0.00026	U	0.00026	U	0.00026	U	0.00028	U
1,1,2,2-Tetrachloroethane	-	-	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00012	U
Benzene	44	0.06	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
Toluene	500	0.7	0.00021	U	0.00021	U	0.00021	U	0.00021	U	0.00022	U	0.00023	U
Ethylbenzene	390	1	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
Chloromethane	-	-	0.00032	U	0.00032	U	0.00032	U	0.00032	U	0.00032	U	0.00034	U
Bromomethane	-	-	0.00037	U	0.00037	U	0.00037	U	0.00037	U	0.00037	U	0.00039	U
Vinyl chloride	13	0.02	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
Chloroethane	-	-	0.00034	U	0.00034	U	0.00034	U	0.00035	U	0.00035	U	0.00037	U
1,1-Dichloroethene	500	0.33	0.00028	U	0.00028	U	0.00028	U	0.00029	U	0.00029	U	0.00031	U
trans-1,2-Dichloroethene	500	0.19	0.00023	U	0.00023	U	0.00023	U	0.00023	U	0.00023	U	0.00025	U
Trichloroethene	200	0.47	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
1,2-Dichlorobenzene	500	1.1	0.00017	U	0.00017	U	0.00017	U	0.00017	U	0.00017	U	0.00018	U
1,3-Dichlorobenzene	280	2.4	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
1,4-Dichlorobenzene	130	1.8	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Methyl tert butyl ether	500	0.93	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.00009	U	0.0001	U
p/m-Xylene	-	-	0.00022	U	0.00022	U	0.00021	U	0.00022	U	0.00022	U	0.00023	U
o-Xylene	-	-	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.0002	U
Xylenes, Total	500	0.26	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.0002	U
cis-1,2-Dichloroethene	500	0.25	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,2-Dichloroethene, Total	-	-	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
Dibromomethane	-	-	0.00018	U	0.00018	U	0.00018	U	0.00018	U	0.00018	U	0.00019	U
Styrene	-	-	0.00044	U	0.00044	U	0.00044	U	0.00044	U	0.00044	U	0.00047	U
Dichlorodifluoromethane	-	-	0.00021	U	0.00021	U	0.00021	U	0.00021	U	0.00021	U	0.00022	U
Acetone	500	0.05	0.0011	U	0.047		0.0011	U	0.0029	J	0.04		0.0044	J
Carbon disulfide	-	-	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0012	U	0.0013	U
2-Butanone	500	0.12	0.0003	U	0.0003	U	0.0003	U	0.0003	U	0.0024	J	0.00032	U
Vinyl acetate	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U	0.00015	U
4-Methyl-2-pentanone	-	-	0.00026	U	0.00027	U	0.00026	U	0.00027	U	0.00027	U	0.00028	U
1,2,3-Trichloropropane	-	-	0.00018	U	0.00018	U	0.00018	U	0.00018	U	0.00018	U	0.00019	U
2-Hexanone	-	-	0.00072	U	0.00073	U	0.00072	U	0.00073	U	0.00074	U	0.00078	U
Bromochloromethane	-	-	0.0003	U	0.0003	U	0.0003	U	0.0003	U	0.0003	U	0.00032	U
2,2-Dichloropropane	-	-	0.00025	U	0.00025	U	0.00024	U	0.00025	U	0.00025	U	0.00026	U
1,2-Dibromoethane	-	-	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.00019	U	0.0002	U
1,3-Dichloropropane	-	-	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,1,1,2-Tetrachloroethane	-	-	0.00035	U	0.00035	U	0.00034	U	0.00035	U	0.00035	U	0.00037	U
Bromobenzene	-	-	0.00023	U	0.00023	U	0.00022	U	0.00023	U	0.00023	U	0.00024	U
n-Butylbenzene	500	12	0.00012	U	0.00012	U	0.00012	U	0.00013	U	0.00013	U	0.00013	U
sec-Butylbenzene	500	11	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00013	U	0.00014	U
tert-Butylbenzene	500	5.9	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00015	U	0.00016	U
o-Chlorotoluene	-	-	0.00017	U	0.00017	U	0.00017	U	0.00018	U	0.00018	U	0.00019	U
p-Chlorotoluene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U	0.00016	U
1,2-Dibromo-3-chloropropane	-	-	0.00043	U	0.00043	U	0.00043	U	0.00044	U	0.00044	U	0.00046	U
Hexachlorobutadiene	-	-	0.00025	U	0.00025	U	0.00025	U	0.00025	U	0.00025	U	0.00027	U
Isopropylbenzene	-	-	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00011	U	0.00012	U
p-Isopropyltoluene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
Naphthalene	500	12	0.00015	U	0.00096	J	0.00015	U	0.00015	U	0.00015	U	0.00016	U
Acrylonitrile	-	-	0.00056	U	0.00056	U	0.00056	U	0.00056	U	0.00057	U	0.0006	U
n-Propylbenzene	500	3.9	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00012	U	0.00013	U
1,2,3-Trichlorobenzene	-	-	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,2,4-Trichlorobenzene	-	-	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.00021	U
1,3,5-Trimethylbenzene	190	8.4	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00016	U	0.00017	U
1,2,4-Trimethylbenzene	190	3.6	0.00015	U	0.00015	U	0.00015	U	0.00016	U	0.00016	U	0.00016	U
1,4-Dioxane	130	0.1	0.016	U	0.016	U	0.016	U	0.016	U	0.016	U	0.017	U
p-Diethylbenzene	-	-	0.00017	U	0.00017	U	0.00017	U	0.00018	U	0.00018	U	0.00019	U
p-Ethyltoluene	-	-	0.00014	U	0.00014	U	0.00013	U	0.00014	U	0.00014	U	0.00014	U
1,2,4,5-Tetramethylbenzene	-	-	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00014	U	0.00015	U
Ethyl ether	-	-	0.00028	U	0.00028	U	0.00046	J	0.00033	J	0.00038	J	0.0003	U
trans-1,4-Dichloro-2-butene	-	-	0.00043	U	0.00043	U	0.00042	U	0.00043	U	0.00043	U	0.00046	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 1: Volatile Organic Compounds (VOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-18 (24-26')		SB-20 (0-2')		SB-19 (0-2')		SB-19 (47-49')		SB-20 (24-26')	
SAMPLING DATE			9/16/2014		9/16/2014		9/18/2014		9/18/2014		9/16/2014	
Volatile Organics (VOCs)	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg												
Methylene chloride	500	0.05	0.0012	U	0.0012	U	0.0012	U	0.0014	U	0.0012	U
1,1-Dichloroethane	240	0.27	0.00009	U	0.0001	U	0.00009	U	0.00011	U	0.00009	U
Chloroform	350	0.37	0.0004	U	0.00042	U	0.00039	U	0.00047	U	0.00039	U
Carbon tetrachloride	22	0.76	0.00022	U	0.00024	U	0.00022	U	0.00027	U	0.00022	U
1,2-Dichloropropane			0.00024	U	0.00026	U	0.00024	U	0.00029	U	0.00024	U
Dibromochloromethane			0.00016	U	0.00017	U	0.00016	U	0.0002	U	0.00016	U
1,1,2-Trichloroethane	-	-	0.00033	U	0.00034	U	0.00032	U	0.00039	U	0.00032	U
Tetrachloroethene	150	1.3	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
Chlorobenzene	500	1.1	0.00037	U	0.00039	U	0.00037	U	0.00044	U	0.00037	U
Trichlorofluoromethane	-	-	0.00042	U	0.00044	U	0.00041	U	0.00049	U	0.00041	U
1,2-Dichloroethane	30	0.02	0.00012	U	0.00013	U	0.00012	U	0.00014	U	0.00012	U
1,1,1-Trichloroethane	500	0.68	0.00012	U	0.00012	U	0.00012	U	0.00014	U	0.00012	U
Bromodichloromethane	-	-	0.00019	U	0.0002	U	0.00018	U	0.00022	U	0.00018	U
trans-1,3-Dichloropropene	-	-	0.00013	U	0.00014	U	0.00013	U	0.00015	U	0.00013	U
cis-1,3-Dichloropropene	-	-	0.00013	U	0.00013	U	0.00012	U	0.00015	U	0.00012	U
1,3-Dichloropropene, Total	-	-	0.00013	U	0.00013	U	0.00012	U	0.00015	U	0.00012	U
1,1-Dichloropropene	-	-	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
Bromoform	-	-	0.00025	U	0.00027	U	0.00025	U	0.0003	U	0.00025	U
1,1,2,2-Tetrachloroethane	-	-	0.00011	U	0.00011	U	0.00011	U	0.00013	U	0.00011	U
Benzene	44	0.06	0.00013	U	0.00013	U	0.00086	J	0.00015	U	0.00012	U
Toluene	500	0.7	0.00021	U	0.00022	U	0.00021	U	0.00025	U	0.0002	U
Ethylbenzene	390	1	0.00014	U	0.00014	U	0.00013	U	0.00016	U	0.00013	U
Chloromethane	-	-	0.00032	U	0.00033	U	0.00031	U	0.00037	U	0.00031	U
Bromomethane	-	-	0.00036	U	0.00038	U	0.00036	U	0.00043	U	0.00036	U
Vinyl chloride	13	0.02	0.00013	U	0.00013	U	0.00012	U	0.00015	U	0.00012	U
Chloroethane	-	-	0.00034	U	0.00036	U	0.00033	U	0.0004	U	0.00033	U
1,1-Dichloroethene	500	0.33	0.00028	U	0.0003	U	0.00028	U	0.00033	U	0.00028	U
trans-1,2-Dichloroethene	500	0.19	0.00023	U	0.00024	U	0.00022	U	0.00027	U	0.00022	U
Trichloroethene	200	0.47	0.00013	U	0.00014	U	0.00013	U	0.00016	U	0.00013	U
1,2-Dichlorobenzene	500	1.1	0.00016	U	0.00017	U	0.00016	U	0.00019	U	0.00016	U
1,3-Dichlorobenzene	280	2.4	0.00014	U	0.00015	U	0.00014	U	0.00017	U	0.00014	U
1,4-Dichlorobenzene	130	1.8	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
Methyl tert butyl ether	500	0.93	0.00009	U	0.0001	U	0.00009	U	0.00011	U	0.00009	U
p/m-Xylene	-	-	0.00021	U	0.00022	U	0.00021	U	0.00025	U	0.00021	U
o-Xylene	-	-	0.00018	U	0.00019	U	0.00018	U	0.00022	U	0.00018	U
Xylenes, Total	500	0.26	0.00018	U	0.00019	U	0.00018	U	0.00022	U	0.00018	U
cis-1,2-Dichloroethene	500	0.25	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
1,2-Dichloroethene, Total	-	-	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
Dibromomethane	-	-	0.00018	U	0.00018	U	0.00017	U	0.00021	U	0.00017	U
Styrene	-	-	0.00043	U	0.00045	U	0.00042	U	0.00051	U	0.00042	U
Dichlorodifluoromethane	-	-	0.0002	U	0.00022	U	0.0002	U	0.00024	U	0.0002	U
Acetone	500	0.05	0.0064	J	0.0032	J	0.0066	J	0.0013	U	0.0041	J
Carbon disulfide	-	-	0.0012	U	0.0012	U	0.0012	U	0.0014	U	0.0012	U
2-Butanone	500	0.12	0.00029	U	0.00031	U	0.00029	U	0.00034	U	0.00029	U
Vinyl acetate	-	-	0.00014	U	0.00015	U	0.00014	U	0.00017	U	0.00014	U
4-Methyl-2-pentanone	-	-	0.00026	U	0.00028	U	0.00026	U	0.00031	U	0.00026	U
1,2,3-Trichloropropane	-	-	0.00017	U	0.00018	U	0.00017	U	0.00021	U	0.00017	U
2-Hexanone	-	-	0.00072	U	0.00075	U	0.0007	U	0.00085	U	0.0007	U
Bromochloromethane	-	-	0.0003	U	0.00031	U	0.00029	U	0.00035	U	0.00029	U
2,2-Dichloropropane	-	-	0.00024	U	0.00026	U	0.00024	U	0.00029	U	0.00024	U
1,2-Dibromoethane	-	-	0.00019	U	0.0002	U	0.00018	U	0.00022	U	0.00018	U
1,3-Dichloropropane	-	-	0.00016	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
1,1,1,2-Tetrachloroethane	-	-	0.00034	U	0.00036	U	0.00034	U	0.0004	U	0.00034	U
Bromobenzene	-	-	0.00022	U	0.00023	U	0.00022	U	0.00026	U	0.00022	U
n-Butylbenzene	500	12	0.00012	U	0.00013	U	0.00012	U	0.00014	U	0.00012	U
sec-Butylbenzene	500	11	0.00013	U	0.00014	U	0.00013	U	0.00016	U	0.00013	U
tert-Butylbenzene	500	5.9	0.00014	U	0.00015	U	0.00014	U	0.00017	U	0.00014	U
o-Chlorotoluene	-	-	0.00017	U	0.00018	U	0.00017	U	0.0002	U	0.00017	U
p-Chlorotoluene	-	-	0.00014	U	0.00015	U	0.00014	U	0.00017	U	0.00014	U
1,2-Dibromo-3-chloropropane	-	-	0.00042	U	0.00045	U	0.00042	U	0.0005	U	0.00042	U
Hexachlorobutadiene	-	-	0.00024	U	0.00026	U	0.00024	U	0.00029	U	0.00024	U
Isopropylbenzene	-	-	0.00011	U	0.00012	U	0.00011	U	0.00013	U	0.00011	U
p-Isopropyltoluene	-	-	0.00013	U	0.00014	U	0.00013	U	0.00016	U	0.00013	U
Naphthalene	500	12	0.00015	U	0.023		0.00015	U	0.00018	U	0.00015	U
Acrylonitrile	-	-	0.00055	U	0.00058	U	0.00054	U	0.00065	U	0.00054	U
n-Propylbenzene	500	3.9	0.00012	U	0.00012	U	0.00012	U	0.00014	U	0.00012	U
1,2,3-Trichlorobenzene	-	-	0.00016	U	0.00017	U	0.00016	U	0.00019	U	0.00016	U
1,2,4-Trichlorobenzene	-	-	0.0002	U	0.0002	U	0.00019	U	0.00023	U	0.00019	U
1,3,5-Trimethylbenzene	190	8.4	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
1,2,4-Trimethylbenzene	190	3.6	0.00015	U	0.00016	U	0.00015	U	0.00018	U	0.00015	U
1,4-Dioxane	130	0.1	0.016	U	0.016	U	0.015	U	0.018	U	0.015	U
p-Diethylbenzene	-	-	0.00017	U	0.0004	J	0.00017	U	0.0002	U	0.00017	U
p-Ethyltoluene	-	-	0.00013	U	0.00014	U	0.00013	U	0.00016	U	0.00013	U
1,2,4,5-Tetramethylbenzene	-	-	0.00014	U	0.00015	U	0.00014	U	0.00016	U	0.00014	U
Ethyl ether	-	-	0.00028	U	0.00033	J	0.00028	U	0.00033	U	0.00027	U
trans-1,4-Dichloro-2-butene	-	-	0.00042	U	0.00044	U	0.00042	U	0.0005	U	0.00041	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 2: Semi Volatile Organic Compounds (SVOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-5 (0-2')		SB-5 (24-26')		SB-6 (0-2')		SB-6 (12-14')		SB-10 (0-2')		SB-8 (0-2')		SB-8 (4-6')		SB-9 (4-6')		SB-7 (0-2')	
SAMPLING DATE			9/17/2014		9/17/2014		9/18/2014		9/19/2014		9/24/2014		9/23/2014		9/23/2014		9/25/2014		41905	
Semivolatile Organics (SVOCs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Acenaphthene	500	20	0.37	U	0.035	U	0.49	J	0.035	U	0.064	J	0.036	U	0.036	U	0.036	U	0.037	U
1,2,4-Trichlorobenzene		-	0.58	U	0.056	U	0.59	U	0.056	U	0.063	U	0.057	U	0.057	U	0.058	U	0.058	U
Hexachlorobenzene	6	0.33	0.33	U	0.032	U	0.34	U	0.032	U	0.036	U	0.033	U	0.033	U	0.033	U	0.033	U
Bis(2-chloroethyl)ether		-	0.5	U	0.048	U	0.51	U	0.048	U	0.054	U	0.049	U	0.049	U	0.05	U	0.05	U
2-Chloronaphthalene		-	0.58	U	0.056	U	0.59	U	0.056	U	0.063	U	0.057	U	0.057	U	0.058	U	0.058	U
1,2-Dichlorobenzene	500	1.1	0.58	U	0.056	U	0.59	U	0.056	U	0.063	U	0.058	U	0.058	U	0.058	U	0.058	U
1,3-Dichlorobenzene	280	2.4	0.56	U	0.054	U	0.57	U	0.054	U	0.061	U	0.055	U	0.055	U	0.056	U	0.056	U
1,4-Dichlorobenzene	130	1.8	0.54	U	0.052	U	0.55	U	0.052	U	0.058	U	0.053	U	0.053	U	0.054	U	0.054	U
3,3'-Dichlorobenzidine		-	0.47	U	0.046	U	0.48	U	0.046	U	0.051	U	0.047	U	0.047	U	0.047	U	0.047	U
2,4-Dinitrotoluene		-	0.38	U	0.037	U	0.39	U	0.037	U	0.042	U	0.038	U	0.038	U	0.038	U	0.038	U
2,6-Dinitrotoluene		-	0.46	U	0.044	U	0.46	U	0.044	U	0.049	U	0.045	U	0.045	U	0.045	U	0.046	U
Fluoranthene	500	100	0.33	U	0.032	U	5		0.032	U	0.87		0.032	U	0.032	U	0.032	U	0.054	U
4-Chlorophenyl phenyl ether		-	0.54	U	0.052	U	0.55	U	0.052	U	0.058	U	0.053	U	0.053	U	0.054	U		
4-Bromophenyl phenyl ether		-	0.41	U	0.04	U	0.42	U	0.04	U	0.044	U	0.04	U	0.04	U	0.041	U	0.041	U
Bis(2-chloroisopropyl)ether		-	0.63	U	0.061	U	0.64	U	0.06	U	0.068	U	0.062	U	0.062	U	0.062	U	0.063	U
Bis(2-chloroethoxy)methane		-	0.54	U	0.052	U	0.55	U	0.052	U	0.058	U	0.053	U	0.053	U	0.054	U	0.054	U
Hexachlorobutadiene		-	0.5	U	0.048	U	0.51	U	0.048	U	0.054	U	0.049	U	0.049	U	0.05	U	0.05	U
Hexachlorocyclopentadiene		-	1.1	U	0.11	U	1.2	U	0.11	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U
Hexachloroethane		-	0.32	U	0.031	U	0.33	U	0.031	U	0.035	U	0.032	U	0.032	U	0.032	U	0.032	U
Isophorone		-	0.47	U	0.046	U	0.48	U	0.046	U	0.051	U	0.047	U	0.047	U	0.047	U	0.047	U
Naphthalene	500	12	0.59	U	0.057	U	0.97	J	0.057	U	0.086	J	0.058	U	0.058	U	0.059	U	0.059	U
Nitrobenzene	69	-	0.42	U	0.041	U	0.43	U	0.041	U	0.046	U	0.042	U	0.042	U	0.042	U	0.042	U
NitrosoDiPhenylAmine(NDPA)/DPA		-	0.37	U	0.036	U	0.38	U	0.036	U	0.04	U	0.037	U	0.037	U	0.037	U	0.037	U
n-Nitrosodi-n-propylamine		-	0.53	U	0.051	U	0.54	U	0.051	U	0.057	U	0.052	U	0.052	U	0.053	U	0.053	U
Bis(2-Ethylhexyl)phthalate		-	0.47	U	0.045	U	0.61	J	0.045	U	0.05	U	0.046	U	0.046	U	0.046	U	0.047	U
Butyl benzyl phthalate		-	0.35	U	0.034	U	0.35	U	0.034	U	0.038	U	0.034	U	0.034	U	0.035	U	0.035	U
Di-n-butylphthalate		-	0.34	U	0.033	U	0.35	U	0.033	U	0.037	U	0.034	U	0.034	U	0.034	U	0.034	U
Di-n-octylphthalate		-	0.44	U	0.042	U	0.44	U	0.042	U	0.047	U	0.043	U	0.043	U	0.044	U	0.044	U
Diethyl phthalate		-	0.38	U	0.036	U	0.38	U	0.036	U	0.041	U	0.037	U	0.037	U	0.038	U	0.038	U
Dimethyl phthalate		-	0.45	U	0.044	U	0.46	U	0.044	U	0.049	U	0.044	U	0.044	U	0.045	U	0.045	U
Benzo(a)anthracene	5.6	1	0.35	U	0.034	U	2.3		0.034	U	0.34		0.034	U	0.034	U	0.035	U	0.035	U
Benzo(a)pyrene	1	1	0.44	U	0.042	U	2.3		0.042	U	0.32		0.043	U	0.043	U	0.043	U	0.044	U
Benzo(b)fluoranthene	5.6	1	0.36	U	0.035	U	3		0.035	U	0.42		0.035	U	0.035	U	0.036	U	0.036	U
Benzo(k)fluoranthene	56	0.8	0.34	U	0.033	U	1.7		0.033	U	0.16		0.033	U	0.033	U	0.034	U	0.034	U
Chrysene	500	1	0.35	U	0.034	U	2.3		0.034	U	0.42		0.034	U	0.034	U	0.035	U	0.035	U
Acenaphthylene		100	0.33	U	0.032	U	0.34	U	0.032	U	0.036	U	0.033	U	0.033	U	0.033	U	0.033	U
Anthracene	500	100	0.3	U	0.029	U	0.92	J	0.029	U	0.11	J	0.029	U	0.029	U	0.03	U	0.03	U
Benzo(ghi)perylene	500	100	0.37	U	0.036	U	1.4		0.036	U	0.21		0.036	U	0.036	U	0.037	U	0.037	U
Fluorene	500	30	0.51	U	0.049	U	0.52	J	0.049	U	0.055	U	0.05	U	0.05	U	0.051	U	0.051	U
Phenanthrene	500	100	0.35	U	0.034	U	4.3		0.034	U	0.87		0.034	U	0.034	U	0.035	U	0.035	U
Dibenzo(a,h)anthracene	0.56	0.33	0.34	U	0.033	U	0.35	U	0.033	U	0.052	J	0.034	U	0.034	U	0.034	U	0.034	U
Indeno(1,2,3-cd)Pyrene	5.6	0.5	0.4	U	0.038	U	1.8		0.038	U	0.21		0.039	U	0.039	U	0.039	U	0.04	U
Pyrene	500	100	0.39	J	0.033	U	3.6		0.033	U	0.74		0.034	U	0.034	U	0.034	U	0.035	U
Biphenyl		-	0.59	U	0.057	U	0.6	U	0.057	U	0.063	U	0.058	U	0.058	U	0.058	U	0.059	U
4-Chloroaniline		-	0.47	U	0.045	U	0.48	U	0.045	U	0.051	U	0.046	U	0.046	U	0.047	U	0.047	U
2-Nitroaniline		-	0.5	U	0.048	U	0.51	U	0.048	U	0.054	U	0.049	U	0.049	U	0.05	U	0.05	U
3-Nitroaniline		-	0.49	U	0.048	U	0.5	U	0.047	U	0.053	U	0.048	U	0.048	U	0.049	U	0.049	U
4-Nitroaniline		-	0.48	U	0.046	U	0.49	U	0.046	U	0.052	U	0.047	U	0.047	U	0.048	U	0.048	U
Dibenzofuran	350	7	0.59	U	0.057	U	0.6	U	0.057	U	0.064	U	0.058	U	0.058	U	0.059	U	0.059	U
2-Methylnaphthalene		-	0.57	U	0.055	U	0.58	U	0.055	U	0.061	U	0.056	U	0.056	U	0.057	U	0.057	U
1,2,4,5-Tetrachlorobenzene		-	0.55	U	0.053	U	0.56	U	0.053	U	0.06	U	0.054	U	0.054	U	0.055	U	0.055	U
Acetophenone		-	0.55	U	0.053	U	0.56	U	0.053	U	0.06	U	0.054	U	0.054	U	0.055	U	0.055	U
2,4,6-Trichlorophenol		-	0.34	U	0.032	U	0.34	U	0.032	U	0.036	U	0.033	U	0.033	U	0.033	U	0.034	U
P-Chloro-M-Cresol		-	0.52	U	0.05	U	0.52	U	0.05	U	0.056	U	0.051	U	0.051	U	0.051	U	0.052	U
2-Chlorophenol		-	0.54	U	0.052	U	0.54	U	0.052	U	0.058	U	0.053	U	0.053	U	0.054	U	0.054	U
2,4-Dichlorophenol		-	0.58	U	0.056	U	0.58	U	0.056	U	0.062	U	0.057	U	0.057	U	0.058	U	0.058	U
2,4-Dimethylphenol		-	0.53	U	0.051	U	0.54	U	0.051	U	0.057	U	0.052	U	0.052	U	0.053	U	0.053	U
2-Nitrophenol		-	0.56	U	0.054	U	0.56	U	0.054	U	0.06	U	0.055	U	0.055	U	0.055	U	0.056	U
4-Nitrophenol		-	0.58	U	0.056	U	0.58	U	0.056	U	0.062	U	0.057	U	0.057	U	0.058	U	0.058	U
2,4-Dinitrophenol		-	2.4	U	0.24	U	2.5	U	0.24	U	0.26	U	0.24	U	0.24	U	0.24	U	0.24	U
4,6-Dinitro-o-cresol		-	0.65	U	0.063	U	0.66	U	0.063	U	0.07	U	0.064	U	0.064	U	0.065	U	0.065	U
Pentachlorophenol	6.7	0.8	0.38	U	0.037	U	0.39	U	0.037	U	0.041	U	0.038	U	0.038	U	0.038	U	0.038	U
Phenol	500	0.33	0.53	U	0.051	U	0.53	U	0.051	U	0.057	U	0.052	U	0.052	U	0.052	U	0.053	U
2-Methylphenol	500	0.33	0.57	U	0.055	U	0.58	U	0.055	U	0.062	U	0.056	U	0.056	U	0.057	U	0.057	U
3-Methylphenol/4-Methylphenol	500	0.33	0.58	U	0.056	U	0.59	U	0.056	U	0.063	U	0.057	U	0.057	U	0.058	U	0.058	U
2,4,5-Trichlorophenol		-	0.58	U	0.056	U	0.58	U	0.056	U	0.062	U	0.057	U	0.057	U	0.058	U	0.058	U
Benzoic Acid		-	1.8	U	0.17	U	1.8	U	0.17	U	0.19	U	0.18	U	0.18	U	0.18	U	0.18	U
Benzyl Alcohol		-	0.55	U	0.053	U	0.56	U	0.053	U	0.059	U	0.054	U	0.054	U	0.055	U	0.055	U
Carbazole		-	0.38	U	0.037	U	0.56	J	0.037	U	0.08	J	0.038	U	0.038	U	0.038	U	0.038	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 2: Semi Volatile Organic Compounds (SVOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-10 (12-14')		SB-9 (0-2')		SB-11 (0-2')		SB-11 (24-26')		SB-12 (0-2')		SB-12 (22-24')	
SAMPLING DATE			9/24/2014		9/25/2014		9/17/2014		9/17/2014		9/17/2014		9/17/2014	
Semivolatile Organics (SVOCs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Acenaphthene	500	20	0.036	U	0.04	U	0.038	U	0.036	U	0.038	U	0.035	U
1,2,4-Trichlorobenzene		-	0.057	U	0.063	U	0.06	U	0.057	U	0.65		0.055	U
Hexachlorobenzene	6	0.33	0.032	U	0.036	U	0.034	U	0.032	U	0.035	U	0.032	U
Bis(2-chloroethyl)ether		-	0.049	U	0.054	U	0.051	U	0.048	U	0.052	U	0.047	U
2-Chloronaphthalene		-	0.057	U	0.063	U	0.06	U	0.056	U	0.2		0.055	U
1,2-Dichlorobenzene	500	1.1	0.057	U	0.063	U	0.06	U	0.057	U	0.6		0.055	U
1,3-Dichlorobenzene	280	2.4	0.055	U	0.061	U	0.058	U	0.054	U	0.62		0.053	U
1,4-Dichlorobenzene	130	1.8	0.053	U	0.059	U	0.056	U	0.052	U	0.42		0.051	U
3,3'-Dichlorobenzidine		-	0.046	U	0.051	U	0.049	U	0.046	U	0.049	U	0.045	U
2,4-Dinitrotoluene		-	0.038	U	0.042	U	0.039	U	0.037	U	0.04	U	0.036	U
2,6-Dinitrotoluene		-	0.045	U	0.049	U	0.047	U	0.044	U	0.048	U	0.043	U
Fluoranthene	500	100	0.032	U	0.26		0.64		0.032	U	0.21		0.031	U
4-Chlorophenyl phenyl ether		-	0.053	U	0.059	U	0.056	U	0.052	U	0.057	U	0.051	U
4-Bromophenyl phenyl ether		-	0.04	U	0.044	U	0.042	U	0.04	U	0.043	U	0.039	U
Bis(2-chloroisopropyl)ether		-	0.061	U	0.068	U	0.064	U	0.061	U	0.065	U	0.059	U
Bis(2-chloroethoxy)methane		-	0.053	U	0.058	U	0.055	U	0.052	U	0.056	U	0.051	U
Hexachlorobutadiene		-	0.049	U	0.054	U	0.052	U	0.049	U	0.052	U	0.048	U
Hexachlorocyclopentadiene		-	0.11	U	0.12	U	0.12	U	0.11	U	0.12	U	0.11	U
Hexachloroethane		-	0.032	U	0.035	U	0.033	U	0.031	U	0.034	U	0.031	U
Isophorone		-	0.046	U	0.051	U	0.049	U	0.046	U	0.049	U	0.045	U
Naphthalene	500	12	0.058	U	0.064	U	0.061	U	0.057	U	0.3		0.056	U
Nitrobenzene	69	-	0.042	U	0.046	U	0.044	U	0.041	U	0.044	U	0.04	U
NitrosoDiPhenylAmine(NDPA)/DPA		-	0.037	U	0.04	U	0.038	U	0.036	U	0.039	U	0.035	U
n-Nitrosodi-n-propylamine		-	0.052	U	0.058	U	0.054	U	0.051	U	0.055	U	0.05	U
Bis(2-Ethylhexyl)phthalate		-	0.046	U	0.12	J	0.048	U	0.045	U	0.084	J	0.044	U
Butyl benzyl phthalate		-	0.034	U	0.38		0.047J	J	0.034	U	0.036	U	0.033	U
Di-n-butylphthalate		-	0.034	U	0.037	U	0.035	U	0.033	U	0.036	U	0.033	U
Di-n-octylphthalate		-	0.043	U	0.048	U	0.045	U	0.042	U	0.046	U	0.042	U
Diethyl phthalate		-	0.037	U	0.041	U	0.039	U	0.036	U	0.039	U	0.036	U
Dimethyl phthalate		-	0.044	U	0.049	U	0.046	U	0.044	U	0.047	U	0.043	U
Benzo(a)anthracene	5.6	1	0.034	U	0.13		0.33		0.034	U	0.068	J	0.033	U
Benzo(a)pyrene	1	1	0.043	U	0.1	J	0.33		0.042	U	0.052	J	0.041	U
Benzo(b)fluoranthene	5.6	1	0.035	U	0.15		0.44		0.035	U	0.11		0.034	U
Benzo(k)fluoranthene	56	0.8	0.033	U	0.049	J	0.16		0.033	U	0.036	U	0.032	U
Chrysene	500	1	0.034	U	0.15		0.36		0.034	U	0.12		0.033	U
Acenaphthylene		100	0.033	U	0.036	U	0.041	J	0.032	U	0.074	J	0.032	U
Anthracene	500	100	0.029	U	0.042	J	0.072	J	0.029	U	0.032	J	0.028	U
Benzo(ghi)perylene	500	100	0.036	U	0.066	J	0.23		0.036	U	0.041	J	0.035	U
Fluorene	500	30	0.05	U	0.055	U	0.052	U	0.05	U	0.053	U	0.048	U
Phenanthrene	500	100	0.034	U	0.31		0.27		0.034	U	0.2		0.033	U
Dibenzo(a,h)anthracene	0.56	0.33	0.034	U	0.037	U	0.056	J	0.033	U	0.036	U	0.033	U
Indeno(1,2,3-cd)Pyrene	5.6	0.5	0.039	U	0.069	J	0.24		0.038	U	0.041	J	0.038	U
Pyrene	500	100	0.034	U	0.25		0.58		0.034	U	0.16		0.033	U
Biphenyl		-	0.058	U	0.064	U	0.06	U	0.057	U	0.061	U	0.056	U
4-Chloroaniline		-	0.046	U	0.051	U	0.048	U	0.046	U	0.049	U	0.045	U
2-Nitroaniline		-	0.049	U	0.054	U	0.052	U	0.049	U	0.052	U	0.048	U
3-Nitroaniline		-	0.048	U	0.053	U	0.05	U	0.048	U	0.051	U	0.047	U
4-Nitroaniline		-	0.047	U	0.052	U	0.049	U	0.047	U	0.05	U	0.046	U
Dibenzofuran	350	7	0.058	U	0.064	U	0.061	U	0.058	U	0.062	U	0.056	U
2-Methylnaphthalene		-	0.056	U	0.062	U	0.058	U	0.055	U	0.1	J	0.054	U
1,2,4,5-Tetrachlorobenzene		-	0.054	U	0.06	U	0.057	U	0.054	U	0.16	J	0.052	U
Acetophenone		-	0.054	U	0.06	U	0.057	U	0.054	U	0.058	U	0.052	U
2,4,6-Trichlorophenol		-	0.033	U	0.036	U	0.034	U	0.032	U	0.035	U	0.032	U
P-Chloro-M-Cresol		-	0.051	U	0.056	U	0.053	U	0.05	U	0.054	U	0.049	U
2-Chlorophenol		-	0.053	U	0.058	U	0.055	U	0.052	U	0.056	U	0.051	U
2,4-Dichlorophenol		-	0.056	U	0.063	U	0.059	U	0.056	U	0.06	U	0.055	U
2,4-Dimethylphenol		-	0.052	U	0.058	U	0.054	U	0.051	U	0.055	U	0.05	U
2-Nitrophenol		-	0.054	U	0.06	U	0.057	U	0.054	U	0.058	U	0.053	U
4-Nitrophenol		-	0.056	U	0.063	U	0.059	U	0.056	U	0.06	U	0.055	U
2,4-Dinitrophenol		-	0.24	U	0.26	U	0.25	U	0.24	U	0.25	U	0.23	U
4,6-Dinitro-o-cresol		-	0.064	U	0.071	U	0.067	U	0.063	U	0.068	U	0.062	U
Pentachlorophenol	6.7	0.8	0.037	U	0.041	U	0.039	U	0.037	U	0.04	U	0.036	U
Phenol	500	0.33	0.052	U	0.057	U	0.054	U	0.051	U	0.055	U	0.05	U
2-Methylphenol	500	0.33	0.056	U	0.062	U	0.059	U	0.056	U	0.06	U	0.054	U
3-Methylphenol/4-Methylphenol	500	0.33	0.057	U	0.063	U	0.06	U	0.057	U	0.061	U	0.055	U
2,4,5-Trichlorophenol		-	0.056	U	0.063	U	0.059	U	0.056	U	0.06	U	0.055	U
Benzoic Acid		-	0.18	U	0.2	U	0.18	U	0.17	U	0.19	U	0.17	U
Benzyl Alcohol		-	0.054	U	0.06	U	0.056	U	0.053	U	0.057	U	0.052	U
Carbazole		-	0.038	U	0.042	U	0.039	U	0.037	U	0.04	U	0.036	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 2: Semi Volatile Organic Compounds (SVOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-13 (0-2')		SB-13 (8-10')		SB-14 (0-2')		SB-14 (4-6')		SB-15 (0-2')		SB-15 (4-6')	
SAMPLING DATE			9/19/2014		9/19/2014		9/22/2014		9/22/2014		9/22/2014		9/22/2014	
Semivolatile Organics (SVOCs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Acenaphthene	500	20	0.037	U	0.036	U	0.036	U	0.036	U	0.038	U	0.037	U
1,2,4-Trichlorobenzene		-	0.059	U	0.058	U	0.058	U	0.056	U	0.06	U	0.059	U
Hexachlorobenzene	6	0.33	0.034	U	0.033	U	0.033	U	0.032	U	0.034	U	0.033	U
Bis(2-chloroethyl)ether		-	0.051	U	0.049	U	0.05	U	0.048	U	0.052	U	0.05	U
2-Chloronaphthalene		-	0.059	U	0.057	U	0.058	U	0.056	U	0.06	U	0.058	U
1,2-Dichlorobenzene	500	1.1	0.059	U	0.058	U	0.058	U	0.056	U	0.06	U	0.059	U
1,3-Dichlorobenzene	280	2.4	0.057	U	0.055	U	0.056	U	0.054	U	0.058	U	0.056	U
1,4-Dichlorobenzene	130	1.8	0.055	U	0.053	U	0.054	U	0.052	U	0.056	U	0.054	U
3,3'-Dichlorobenzidine		-	0.048	U	0.047	U	0.047	U	0.046	U	0.049	U	0.048	U
2,4-Dinitrotoluene		-	0.039	U	0.038	U	0.038	U	0.037	U	0.04	U	0.039	U
2,6-Dinitrotoluene		-	0.046	U	0.045	U	0.045	U	0.044	U	0.047	U	0.046	U
Fluoranthene	500	100	0.033	U	0.032	U	0.037	J	0.032	U	0.042	J	0.033	U
4-Chlorophenyl phenyl ether		-	0.055	U	0.053	U	0.054	U	0.052	U	0.056	U	0.054	U
4-Bromophenyl phenyl ether		-	0.042	U	0.04	U	0.041	U	0.04	U	0.042	U	0.041	U
Bis(2-chloroisopropyl)ether		-	0.064	U	0.062	U	0.062	U	0.061	U	0.065	U	0.063	U
Bis(2-chloroethoxy)methane		-	0.055	U	0.053	U	0.054	U	0.052	U	0.056	U	0.054	U
Hexachlorobutadiene		-	0.051	U	0.049	U	0.05	U	0.049	U	0.052	U	0.05	U
Hexachlorocyclopentadiene		-	0.12	U	0.11	U	0.11	U	0.11	U	0.12	U	0.11	U
Hexachloroethane		-	0.033	U	0.032	U	0.032	U	0.031	U	0.033	U	0.032	U
Isophorone		-	0.048	U	0.047	U	0.047	U	0.046	U	0.049	U	0.048	U
Naphthalene	500	12	0.06	U	0.058	U	0.059	U	0.057	U	0.061	U	0.059	U
Nitrobenzene	69	-	0.043	U	0.042	U	0.042	U	0.041	U	0.044	U	0.043	U
NitrosoDiPhenylAmine(NDPA)/DPA		-	0.038	U	0.037	U	0.037	U	0.036	U	0.039	U	0.038	U
n-Nitrosodi-n-propylamine		-	0.054	U	0.052	U	0.053	U	0.051	U	0.055	U	0.053	U
Bis(2-Ethylhexyl)phthalate		-	0.047	U	0.046	U	0.046	U	0.045	U	3.4		0.16	J
Butyl benzyl phthalate		-	0.035	U	0.034	U	0.034	U	0.034	U	29	E	0.15	J
Di-n-butylphthalate		-	0.035	U	0.034	U	0.034	U	0.033	U	0.23		0.034	U
Di-n-octylphthalate		-	0.044	U	0.043	U	0.044	U	0.042	U	0.045	U	0.044	U
Diethyl phthalate		-	0.038	U	0.037	U	0.037	U	0.036	U	0.039	U	0.038	U
Dimethyl phthalate		-	0.046	U	0.044	U	0.045	U	0.044	U	0.047	U	0.045	U
Benzo(a)anthracene	5.6	1	0.035	U	0.034	U	0.049	J	0.034	U	0.036	U	0.035	U
Benzo(a)pyrene	1	1	0.044	U	0.043	U	0.06	J	0.042	U	0.045	U	0.044	U
Benzo(b)fluoranthene	5.6	1	0.036	U	0.035	U	0.073	J	0.035	U	0.037	U	0.036	U
Benzo(k)fluoranthene	56	0.8	0.034	U	0.033	U	0.034	U	0.033	U	0.035	U	0.034	U
Chrysene	500	1	0.035	U	0.034	U	0.06	J	0.034	U	0.036	U	0.035	U
Acenaphthylene		100	0.034	U	0.033	U	0.033	U	0.032	U	0.034	U	0.033	U
Anthracene	500	100	0.03	U	0.029	U	0.029	U	0.029	U	0.031	U	0.03	U
Benzo(ghi)perylene	500	100	0.038	U	0.036	U	0.055	J	0.036	U	0.038	U	0.037	U
Fluorene	500	30	0.052	U	0.05	U	0.051	U	0.049	U	0.053	U	0.051	U
Phenanthrene	500	100	0.035	U	0.034	U	0.035	U	0.034	U	0.048	J	0.035	U
Dibenzo(a,h)anthracene	0.56	0.33	0.035	U	0.034	U	0.034	U	0.033	U	0.036	U	0.035	U
Indeno(1,2,3-cd)Pyrene	5.6	0.5	0.04	U	0.039	U	0.046	J	0.038	U	0.041	U	0.04	U
Pyrene	500	100	0.035	U	0.034	U	0.082	J	0.034	U	0.048	J	0.035	U
Biphenyl		-	0.06	U	0.058	U	0.058	U	0.057	U	0.061	U	0.059	U
4-Chloroaniline		-	0.048	U	0.046	U	0.047	U	0.045	U	0.048	U	0.047	U
2-Nitroaniline		-	0.051	U	0.049	U	0.05	U	0.049	U	0.052	U	0.05	U
3-Nitroaniline		-	0.05	U	0.048	U	0.049	U	0.048	U	0.051	U	0.049	U
4-Nitroaniline		-	0.049	U	0.047	U	0.048	U	0.046	U	0.05	U	0.048	U
Dibenzofuran	350	7	0.06	U	0.058	U	0.059	U	0.058	U	0.061	U	0.06	U
2-Methylnaphthalene		-	0.058	U	0.056	U	0.056	U	0.055	U	0.059	U	0.057	U
1,2,4,5-Tetrachlorobenzene		-	0.056	U	0.054	U	0.055	U	0.053	U	0.057	U	0.055	U
Acetophenone		-	0.056	U	0.054	U	0.055	U	0.053	U	0.057	U	0.056	U
2,4,6-Trichlorophenol		-	0.034	U	0.033	U	0.033	U	0.032	U	0.035	U	0.034	U
P-Chloro-M-Cresol		-	0.052	U	0.051	U	0.051	U	0.05	U	0.053	U	0.052	U
2-Chlorophenol		-	0.054	U	0.053	U	0.053	U	0.052	U	0.056	U	0.054	U
2,4-Dichlorophenol		-	0.058	U	0.057	U	0.057	U	0.056	U	0.06	U	0.058	U
2,4-Dimethylphenol		-	0.054	U	0.052	U	0.053	U	0.051	U	0.055	U	0.053	U
2-Nitrophenol		-	0.056	U	0.055	U	0.055	U	0.054	U	0.057	U	0.056	U
4-Nitrophenol		-	0.058	U	0.057	U	0.057	U	0.056	U	0.06	U	0.058	U
2,4-Dinitrophenol		-	0.25	U	0.24	U	0.24	U	0.24	U	0.25	U	0.24	U
4,6-Dinitro-o-cresol		-	0.066	U	0.064	U	0.065	U	0.063	U	0.067	U	0.066	U
Pentachlorophenol	6.7	0.8	0.039	U	0.038	U	0.038	U	0.037	U	0.039	U	0.038	U
Phenol	500	0.33	0.053	U	0.052	U	0.052	U	0.051	U	0.054	U	0.053	U
2-Methylphenol	500	0.33	0.058	U	0.056	U	0.057	U	0.055	U	0.059	U	0.058	U
3-Methylphenol/4-Methylphenol	500	0.33	0.059	U	0.058	U	0.058	U	0.056	U	0.06	U	0.059	U
2,4,5-Trichlorophenol		-	0.058	U	0.057	U	0.057	U	0.056	U	0.06	U	0.058	U
Benzoic Acid		-	0.18	U	0.18	U	0.18	U	0.17	U	0.19	U	0.18	U
Benzyl Alcohol		-	0.056	U	0.054	U	0.054	U	0.053	U	0.057	U	0.055	U
Carbazole		-	0.039	U	0.038	U	0.038	U	0.037	U	0.04	U	0.038	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 2: Semi Volatile Organic Compounds (SVOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-16 (0-2')		SB-16 (12-14')		SB-17 (0-2')		SB-17 (22-24')		SB-18 (0-2')		SB-18 (24-26')	
SAMPLING DATE			9/15/2014		9/15/2014		9/15/2014		9/15/2014		9/16/2014		9/16/2014	
Semivolatile Organics (SVOCs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Acenaphthene	500	20	0.12	J	0.037	U	0.37	U	0.038	U	0.094	J	0.036	U
1,2,4-Trichlorobenzene		-	0.058	U	0.059	U	0.58	U	0.06	U	0.12	U	0.058	U
Hexachlorobenzene	6	0.33	0.033	U	0.034	U	0.33	U	0.034	U	0.072	U	0.033	U
Bis(2-chloroethyl)ether		-	0.05	U	0.05	U	0.5	U	0.051	U	0.11	U	0.049	U
2-Chloronaphthalene		-	0.058	U	0.059	U	0.58	U	0.06	U	0.12	U	0.057	U
1,2-Dichlorobenzene	500	1.1	0.058	U	0.059	U	0.58	U	0.06	U	0.13	U	0.058	U
1,3-Dichlorobenzene	280	2.4	0.056	U	0.057	U	0.56	U	0.058	U	0.12	U	0.056	U
1,4-Dichlorobenzene	130	1.8	0.054	U	0.055	U	0.54	U	0.056	U	0.12	U	0.054	U
3,3'-Dichlorobenzidine		-	0.047	U	0.048	U	0.47	U	0.049	U	0.1	U	0.047	U
2,4-Dinitrotoluene		-	0.038	U	0.039	U	0.38	U	0.039	U	0.083	U	0.038	U
2,6-Dinitrotoluene		-	0.046	U	0.046	U	0.46	U	0.047	U	0.098	U	0.045	U
Fluoranthene	500	100	2.3		0.033	U	1.5		0.034	U	1.6		0.032	U
4-Chlorophenyl phenyl ether		-	0.054	U	0.055	U	0.54	U	0.056	U	0.12	U	0.054	U
4-Bromophenyl phenyl ether		-	0.041	U	0.041	U	0.41	U	0.042	U	0.088	U	0.04	U
Bis(2-chloroisopropyl)ether		-	0.063	U	0.063	U	0.62	U	0.064	U	0.14	U	0.062	U
Bis(2-chloroethoxy)methane		-	0.054	U	0.054	U	0.54	U	0.055	U	0.12	U	0.053	U
Hexachlorobutadiene		-	0.05	U	0.051	U	0.5	U	0.052	U	0.11	U	0.05	U
Hexachlorocyclopentadiene		-	0.11	U	0.12	U	1.1	U	0.12	U	0.25	U	0.11	U
Hexachloroethane		-	0.032	U	0.033	U	0.32	U	0.033	U	0.07	U	0.032	U
Isophorone		-	0.047	U	0.048	U	0.47	U	0.049	U	0.1	U	0.047	U
Naphthalene	500	12	0.072	J	0.06	U	0.59	U	0.061	U	0.15	J	0.058	U
Nitrobenzene	69	-	0.042	U	0.043	U	0.42	U	0.044	U	0.091	U	0.042	U
NitrosoDiPhenylAmine(NDPA)/DPA		-	0.037	U	0.038	U	0.37	U	0.038	U	0.081	U	0.037	U
n-Nitrosodi-n-propylamine		-	0.053	U	0.054	U	0.53	U	0.054	U	0.11	U	0.052	U
Bis(2-Ethylhexyl)phthalate		-	0.062	J	0.047	U	0.46	U	0.048	U	1.3		0.046	U
Butyl benzyl phthalate		-	0.035	U	0.035	U	0.35	U	0.036	U	0.075	U	0.034	U
Di-n-butylphthalate		-	0.034	U	0.035	U	0.34	U	0.035	U	0.074	U	0.034	U
Di-n-octylphthalate		-	0.044	U	0.044	U	0.44	U	0.045	U	0.094	U	0.043	U
Diethyl phthalate		-	0.038	U	0.038	U	0.38	U	0.039	U	0.081	U	0.037	U
Dimethyl phthalate		-	0.045	U	0.046	U	0.45	U	0.046	U	0.098	U	0.045	U
Benzo(a)anthracene	5.6	1	1.1		0.035	U	0.71	J	0.036	U	0.9		0.034	U
Benzo(a)pyrene	1	1	0.98		0.044	U	0.65	J	0.045	U	0.9		0.043	U
Benzo(b)fluoranthene	5.6	1	1.1		0.036	U	0.86	J	0.037	U	1		0.036	U
Benzo(k)fluoranthene	56	0.8	0.41		0.034	U	0.36	J	0.035	U	0.41		0.034	U
Chrysene	500	1	1.2		0.035	U	0.78	J	0.036	U	0.98		0.035	U
Acenaphthylene		100	0.052	J	0.034	U	0.33	U	0.034	U	0.09	J	0.033	U
Anthracene	500	100	0.35		0.03	U	0.3	U	0.03	U	0.22	J	0.029	U
Benzo(ghi)perylene	500	100	0.64		0.037	U	0.46	J	0.038	U	0.62		0.037	U
Fluorene	500	30	0.091	J	0.052	U	0.51	U	0.052	U	0.11	U	0.05	U
Phenanthrene	500	100	1.4		0.035	U	0.93	J	0.036	U	1.1		0.034	U
Dibenzo(a,h)anthracene	0.56	0.33	0.15		0.035	U	0.34	U	0.035	U	0.14	J	0.034	U
Indeno(1,2,3-cd)Pyrene	5.6	0.5	0.66		0.04	U	0.48	J	0.041	U	0.66		0.039	U
Pyrene	500	100	2.1		0.035	U	1.2		0.036	U	1.5		0.034	U
Biphenyl		-	0.059	U	0.059	U	0.59	U	0.06	U	0.13	U	0.058	U
4-Chloroaniline		-	0.047	U	0.048	U	0.47	U	0.048	U	0.1	U	0.046	U
2-Nitroaniline		-	0.05	U	0.051	U	0.5	U	0.052	U	0.11	U	0.05	U
3-Nitroaniline		-	0.049	U	0.05	U	0.49	U	0.05	U	0.11	U	0.049	U
4-Nitroaniline		-	0.048	U	0.049	U	0.48	U	0.049	U	0.1	U	0.048	U
Dibenzofuran	350	7	0.06	U	0.06	U	0.59	U	0.061	U	0.13	U	0.059	U
2-Methylnaphthalene		-	0.057	U	0.057	U	0.57	U	0.058	U	0.19	J	0.056	U
1,2,4,5-Tetrachlorobenzene		-	0.055	U	0.056	U	0.55	U	0.057	U	0.12	U	0.055	U
Acetophenone		-	0.055	U	0.056	U	0.55	U	0.057	U	0.12	U	0.055	U
2,4,6-Trichlorophenol		-	0.034	U	0.034	U	0.34	U	0.034	U	0.072	U	0.033	U
P-Chloro-M-Cresol		-	0.052	U	0.052	U	0.52	U	0.053	U	0.11	U	0.051	U
2-Chlorophenol		-	0.054	U	0.054	U	0.54	U	0.055	U	0.12	U	0.053	U
2,4-Dichlorophenol		-	0.058	U	0.058	U	0.58	U	0.059	U	0.12	U	0.057	U
2,4-Dimethylphenol		-	0.053	U	0.054	U	0.53	U	0.054	U	0.11	U	0.052	U
2-Nitrophenol		-	0.056	U	0.056	U	0.55	U	0.057	U	0.12	U	0.055	U
4-Nitrophenol		-	0.058	U	0.058	U	0.58	U	0.059	U	0.12	U	0.057	U
2,4-Dinitrophenol		-	0.24	U	0.25	U	2.4	U	0.25	U	0.52	U	0.24	U
4,6-Dinitro-o-cresol		-	0.065	U	0.066	U	0.65	U	0.067	U	0.14	U	0.064	U
Pentachlorophenol	6.7	0.8	0.038	U	0.038	U	0.38	U	0.039	U	0.082	U	0.038	U
Phenol	500	0.33	0.053	U	0.053	U	0.53	U	0.054	U	0.11	U	0.052	U
2-Methylphenol	500	0.33	0.057	U	0.058	U	0.57	U	0.059	U	0.12	U	0.057	U
3-Methylphenol/4-Methylphenol	500	0.33	0.058	U	0.059	U	0.58	U	0.06	U	0.13	U	0.058	U
2,4,5-Trichlorophenol		-	0.058	U	0.058	U	0.58	U	0.059	U	0.12	U	0.057	U
Benzoic Acid		-	0.18	U	0.18	U	1.8	U	0.18	U	0.39	U	0.18	U
Benzyl Alcohol		-	0.055	U	0.055	U	0.55	U	0.056	U	0.12	U	0.054	U
Carbazole		-	0.079	J	0.039	U	0.38	U	0.039	U	0.083	U	0.038	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 2: Semi Volatile Organic Compounds (SVOCs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-20 (0-2')		SB-19 (0-2')		SB-19 (47-49')		SB-20 (24-26')	
SAMPLING DATE			9/16/2014		9/18/2014		9/18/2014		9/16/2014	
Semivolatile Organics (SVOCs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Acenaphthene	500	20	6.1		0.36	U	0.043	U	0.036	U
1,2,4-Trichlorobenzene		-	0.6	U	0.57	U	0.068	U	0.057	U
Hexachlorobenzene	6	0.33	0.34	U	0.32	U	0.039	U	0.032	U
Bis(2-chloroethyl)ether		-	0.52	U	0.49	U	0.058	U	0.049	U
2-Chloronaphthalene		-	0.6	U	0.56	U	0.068	U	0.057	U
1,2-Dichlorobenzene	500	1.1	0.61	U	0.57	U	0.068	U	0.057	U
1,3-Dichlorobenzene	280	2.4	0.58	U	0.55	U	0.066	U	0.055	U
1,4-Dichlorobenzene	130	1.8	0.56	U	0.53	U	0.063	U	0.053	U
3,3'-Dichlorobenzidine		-	0.49	U	0.46	U	0.055	U	0.046	U
2,4-Dinitrotoluene		-	0.4	U	0.37	U	0.045	U	0.037	U
2,6-Dinitrotoluene		-	0.47	U	0.44	U	0.053	U	0.044	U
Fluoranthene	500	100	77	E	0.32	U	0.038	U	0.033	J
4-Chlorophenyl phenyl ether		-	0.56	U	0.53	U	0.063	U	0.053	U
4-Bromophenyl phenyl ether		-	0.42	U	0.4	U	0.048	U	0.04	U
Bis(2-chloroisopropyl)ether		-	0.65	U	0.61	U	0.073	U	0.061	U
Bis(2-chloroethoxy)methane		-	0.56	U	0.52	U	0.063	U	0.052	U
Hexachlorobutadiene		-	0.52	U	0.49	U	0.059	U	0.049	U
Hexachlorocyclopentadiene		-	1.2	U	1.1	U	0.13	U	0.11	U
Hexachloroethane		-	0.34	U	0.32	U	0.038	U	0.032	U
Isophorone		-	0.49	U	0.46	U	0.055	U	0.046	U
Naphthalene	500	12	2.3		0.58	U	0.069	U	0.058	U
Nitrobenzene	69	-	0.44	U	0.41	U	0.049	U	0.041	U
NitrosoDiPhenylAmine(NDPA)/DPA		-	0.39	U	0.36	U	0.044	U	0.036	U
n-Nitrosodi-n-propylamine		-	0.55	U	0.52	U	0.062	U	0.052	U
Bis(2-Ethylhexyl)phthalate		-	0.48	U	0.45	U	0.054	U	0.045	U
Butyl benzyl phthalate		-	0.36	U	0.34	U	0.041	U	0.034	U
Di-n-butylphthalate		-	0.36	U	0.33	U	0.04	U	0.034	U
Di-n-octylphthalate		-	0.45	U	0.43	U	0.051	U	0.043	U
Diethyl phthalate		-	0.39	U	0.37	U	0.044	U	0.037	U
Dimethyl phthalate		-	0.47	U	0.44	U	0.053	U	0.044	U
Benzo(a)anthracene	5.6	1	35		0.34	U	0.041	U	0.034	U
Benzo(a)pyrene	1	1	35		0.42	U	0.051	U	0.042	U
Benzo(b)fluoranthene	5.6	1	44		0.35	U	0.042	U	0.035	U
Benzo(k)fluoranthene	56	0.8	15		0.33	U	0.04	U	0.033	U
Chrysene	500	1	33		0.34	U	0.041	U	0.034	U
Acenaphthylene		100	0.48	J	0.32	U	0.039	U	0.032	U
Anthracene	500	100	13		0.29	U	0.035	U	0.029	U
Benzo(ghi)perylene	500	100	22		0.36	U	0.043	U	0.036	U
Fluorene	500	30	4.5		0.5	U	0.06	U	0.05	U
Phenanthrene	500	100	53		0.34	U	0.041	U	0.034	U
Dibenzo(a,h)anthracene	0.56	0.33	4.6		0.34	U	0.04	U	0.034	U
Indeno(1,2,3-cd)Pyrene	5.6	0.5	24		0.38	U	0.046	U	0.038	U
Pyrene	500	100	69		0.34	U	0.04	U	0.034	U
Biphenyl		-	0.61	U	0.57	U	0.068	U	0.057	U
4-Chloroaniline		-	0.49	U	0.46	U	0.055	U	0.046	U
2-Nitroaniline		-	0.52	U	0.49	U	0.059	U	0.049	U
3-Nitroaniline		-	0.51	U	0.48	U	0.057	U	0.048	U
4-Nitroaniline		-	0.5	U	0.47	U	0.056	U	0.047	U
Dibenzofuran	350	7	2.5		0.58	U	0.069	U	0.058	U
2-Methylnaphthalene		-	1.1	J	0.55	U	0.066	U	0.055	U
1,2,4,5-Tetrachlorobenzene		-	0.57	U	0.54	U	0.064	U	0.054	U
Acetophenone		-	0.57	U	0.54	U	0.064	U	0.054	U
2,4,6-Trichlorophenol		-	0.35	U	0.33	U	0.039	U	0.033	U
P-Chloro-M-Cresol		-	0.54	U	0.5	U	0.06	U	0.05	U
2-Chlorophenol		-	0.56	U	0.52	U	0.063	U	0.052	U
2,4-Dichlorophenol		-	0.6	U	0.56	U	0.067	U	0.056	U
2,4-Dimethylphenol		-	0.55	U	0.52	U	0.062	U	0.052	U
2-Nitrophenol		-	0.58	U	0.54	U	0.065	U	0.054	U
4-Nitrophenol		-	0.6	U	0.56	U	0.067	U	0.056	U
2,4-Dinitrophenol		-	2.5	U	2.4	U	0.28	U	0.24	U
4,6-Dinitro-o-cresol		-	0.68	U	0.63	U	0.076	U	0.064	U
Pentachlorophenol	6.7	0.8	0.4	U	0.37	U	0.044	U	0.037	U
Phenol	500	0.33	0.55	U	0.51	U	0.062	U	0.051	U
2-Methylphenol	500	0.33	0.6	U	0.56	U	0.067	U	0.056	U
3-Methylphenol/4-Methylphenol	500	0.33	0.61	U	0.57	U	0.068	U	0.057	U
2,4,5-Trichlorophenol		-	0.6	U	0.56	U	0.067	U	0.056	U
Benzoic Acid		-	1.9	U	1.8	U	0.21	U	0.18	U
Benzyl Alcohol		-	0.57	U	0.53	U	0.064	U	0.053	U
Carbazole		-	0.4		0.37	U	0.045	U	0.037	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 3: Metals in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-5 (0-2')		SB-5 (24-26')		SB-6 (0-2')		SB-6 (12-14')		SB-7 (0-2')		SB-8 (0-2')		SB-8 (4-6')		SB-9 (0-2')		SB-9 (4-6')		SB-10 (0-2')	
SAMPLING DATE			9/17/2014		9/17/2014		9/18/2014		9/19/2014		9/23/2014		9/23/2014		9/23/2014		9/25/2014		9/25/2014		9/24/2014	
Total Metals	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg																						
Aluminum, Total			2900		3400		5200		5100		4600		8700		4300		3800		6500		5800	
Antimony, Total			0.84	J	2.8	J	1.6	J	0.65	U	0.65	U	0.7	U	0.64	U	6.8		0.66	U	0.72	U
Arsenic, Total	16	13	4.1		3.2		9.9		1.2		0.8	J	2.4		0.57	J	12		5.5		11	
Barium, Total	400	350	52		26		330		31		40		47		29		220		44		370	
Beryllium, Total	590	7.2	0.17	J	0.19	J	0.25	J	0.22	J	0.26	J	0.4	J	0.33	J	0.26	J	0.18	J	0.26	J
Cadmium, Total	9.3	2.5	0.18	J	0.06	U	8.6		0.06	U	0.06	U	0.06	U	0.06	U	3.3		0.06	U	0.11	J
Calcium, Total			40000		1100		38000		2100		900		5100		1700		10000		900		28000	
Chromium, Total			7.5		8		18		14		11		25		13		15		15		20	
Cobalt, Total			4.6		3.5		7		6.1		7		17		5.8		5.3		10		15	
Copper, Total	270	50	21		8.5		25		18		9.7		22		45		70		25		40	
Iron, Total			6400		9500		16000		10000		11000		17000		12000		18000		12000		13000	
Lead, Total	1000	63	110		0.53	J	1000		5.9		4.1		17		6		550		17		750	
Magnesium, Total			3300		2600		5400		4000		2400		5600		4000		1600		4200		2700	
Manganese, Total	10000	1600	120		190		280		310		180		310		250		150		460		250	
Mercury, Total	2.8	0.18	0.04	J	0.02	U	0.44		0.02	U	0.03	J	0.04	J	0.01	U	1.2		0.09		0.58	
Nickel, Total	310	30	14		14		18		41		12		70		49		19		49		21	
Potassium, Total			680		670		1000		1200		1500		3400		1100		570		1500		710	
Selenium, Total	1500	3.9	0.59	J	0.43	J	0.34	J	0.24	U	0.24	U	0.26	U	0.24	U	0.27	U	0.25	U	0.27	U
Silver, Total	1500	2	0.17	U	0.16	U	0.16	U	0.16	U	0.16	U	0.17	U	0.16	U	9.6		1.5		0.18	U
Sodium, Total			410		110	J	350		400		120	J	290		210		200		130	J	200	
Thallium, Total			0.34	U	0.33	U	0.33	U	0.32	U	0.32	U	0.35	U	0.32	U	0.36	U	0.33	U	0.36	U
Vanadium, Total			18		14		21		18		16		30		12		12		19		19	
Zinc, Total	10000	109	120		22		3000		25		41		54		35		1100		49		310	

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 3: Metals in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-10 (12-14')		SB-11 (0-2')		SB-11 (24-26')		SB-12 (0-2')		SB-12 (22-24')		SB-13 (0-2')		SB-13 (8-10')		SB-14 (0-2')		SB-14 (4-6')		SB-15 (0-2')		SB-15 (4-6')	
SAMPLING DATE			9/24/2014		9/17/2014		9/17/2014		9/17/2014		9/17/2014		9/19/2014		9/19/2014		9/22/2014		9/22/2014		9/22/2014		9/22/2014	
Total Metals	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg																								
Aluminum, Total			3700		5600		3100		1400		5300		5100		5500		3900		5600		7300		6800	
Antimony, Total			0.66	U	1.9	J	0.67	J	1.1	J	0.66	U	2.2	J	0.67	U	0.66	U	0.66	U	0.69	U	0.66	U
Arsenic, Total	16	13	5.8		5.9		4		4.6		3.4		5		1.4		1.8		0.49	J	2.4		3.2	
Barium, Total	400	350	42		110		25		83		36		48		30		39		35		33		69	
Beryllium, Total	590	7.2	0.25	J	0.23	J	0.23	J	0.1	J	0.36	J	0.4	J	0.41	J	0.25	J	0.25	J	0.34	J	0.39	J
Cadmium, Total	9.3	2.5	0.06	U	0.69	J	0.06	U	0.75	J	0.06	U	0.06	U	0.06	U	0.06	U	0.06	U	0.06	U	0.06	U
Calcium, Total			1400		51000		930		1400		1800		11000		1900		9800		1600		5300		4400	
Chromium, Total			17		14		12		4.7		22		14		15		15		13		16		22	
Cobalt, Total			16		6.8		4.3		4.4		5.8		4.8		6.2		4.3		7.1		13		11	
Copper, Total	270	50	18		42		14		29		20		18		19		13		17		18		49	
Iron, Total			11000		12000		12000		2800		11000		10000		11000		8900		12000		12000		15000	
Lead, Total	1000	63	7		200		3.7	J	170		4.9		24		4.5		21		4J	J	13		12	
Magnesium, Total			11000		6600		1700		120		3900		2800		4000		2900		4100		2700		3300	
Manganese, Total	10000	1600	290		240		260		19		230		270		180		180		250		270		330	
Mercury, Total	2.8	0.18	0.02	U	0.17		0.01	U	0.07	J	0.01	U	0.02	U	0.02	U	0.08		0.02	U	0.04	J	0.02	U
Nickel, Total	310	30	150		17		23		14		45		33		27		25		69		42		47	
Potassium, Total			1000		830		550		170	J	1600		790		2000		880		1500		1100		1600	
Selenium, Total	1500	3.9	0.25	U	0.26	U	0.25	J	0.98	J	0.25	U	0.56	J	0.25	U	0.25	U	0.25	U	0.34	J	0.25	U
Silver, Total	1500	2	0.16	U	0.17	U	0.16	U	0.18	U	0.16	U	0.16	U	0.17	U	0.17	U	0.29	J	0.17	U	0.16	U
Sodium, Total			170		420		160		220		510		110	J	440		110	J	320		120	J	170	
Thallium, Total			0.33	U	0.35	U	0.32	U	0.35	U	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U	0.34	U	0.33	U
Vanadium, Total			17		21		17		25		22		19		24		16		15		19		24	
Zinc, Total	10000	109	36		250		26		68		37		68		33		25		33		37		40	

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 3: Metals in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-16 (0-2')		SB-16 (12-14')		SB-17 (0-2')		SB-17 (22-24')		SB-18 (0-2')	
SAMPLING DATE			9/15/2014		9/15/2014		9/15/2014		9/15/2014		9/16/2014	
Total Metals	NY-RESC	NY-UNRES	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Units: mg/kg												
Aluminum, Total			7300		5700		5100		2200		3900	
Antimony, Total			0.96	J	0.66	U	1	J	0.67	U	3.2	J
Arsenic, Total	16	13	10		4.4		7.7		2		12	
Barium, Total	400	350	120		34		280		14		270	
Beryllium, Total	590	7.2	0.28	J	0.39	J	0.2	J	0.12	J	0.3	J
Cadmium, Total	9.3	2.5	0.12	J	0.06	U	0.75	J	0.06	U	1.7	
Calcium, Total			27000		1400		11000		860		9900	
Chromium, Total			40		20		13		7.1		14	
Cobalt, Total			9.5		8.2		4.9		3.5		6	
Copper, Total	270	50	54		27		55		9.3		76	
Iron, Total			14000		11000		13000		5800		9900	
Lead, Total	1000	63	380		22		520		2.9	J	1800	
Magnesium, Total			5200		3700		5900		2600		1900	
Manganese, Total	10000	1600	270		280		200		200		140	
Mercury, Total	2.8	0.18	0.67		0.06	J	1.4		0.02	U	0.67	
Nickel, Total	310	30	52		53		12		21		21	
Potassium, Total			550		1000		620		430		670	
Selenium, Total	1500	3.9	0.54	J	0.34	J	0.39	J	0.25	U	1	J
Silver, Total	1500	2	0.26	J	0.16	U	0.17	U	0.17	U	0.18	U
Sodium, Total			140	J	120	J	110	J	99	J	280	
Thallium, Total			0.33	U	0.33	U	0.34	U	0.33	U	0.36	U
Vanadium, Total			20		20		34		7.8		42	
Zinc, Total	10000	109	160		58		700		18		370	

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 3: Metals in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-18 (24-26')		SB-20 (0-2')		SB-19 (0-2')		SB-19 (47-49')		SB-20 (24-26')	
SAMPLING DATE			9/16/2014		9/16/2014		9/18/2014		9/18/2014		9/16/2014	
Total Metals	NY-RESC	NY-UNRES	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Units: mg/kg												
Aluminum, Total			2300		4700		4500		3000		3600	
Antimony, Total			0.66	U	10		0.64	U	0.8	U	0.67	U
Arsenic, Total	16	13	2.9		7.8		4.5		3.9		3.9	
Barium, Total	400	350	23		56		28		25		34	
Beryllium, Total	590	7.2	0.17	J	0.24	J	0.24	J	0.37	J	0.22	J
Cadmium, Total	9.3	2.5	0.06	U	0.35	J	0.06	U	0.07	U	0.06	U
Calcium, Total			910		56000		12000		1200		1200	
Chromium, Total			10		9.8		11		16		11	
Cobalt, Total			3.2		5.1		5.9		12		4	
Copper, Total	270	50	8.4		19		19		13		8.4	
Iron, Total			7100		9000		10000		11000		9800	
Lead, Total	1000	63	4.4		110		45		1.9	J	0.82	J
Magnesium, Total			1200		4800		7100		12000		2900	
Manganese, Total	10000	1600	140		460		230		510		200	
Mercury, Total	2.8	0.18	0.02	U	0.06	J	0.11		0.02	U	0.01	U
Nickel, Total	310	30	7		11		23		170		15	
Potassium, Total			340		870		640		560		860	
Selenium, Total	1500	3.9	0.25	U	0.26	U	0.24	U	0.3	U	0.25	U
Silver, Total	1500	2	0.17	U	0.17	U	0.16	U	0.2	U	0.17	U
Sodium, Total			110	J	610		130	J	110	J	140	J
Thallium, Total			0.33	U	0.34	U	0.32	U	0.4	U	0.34	U
Vanadium, Total			13		24		22		14		17	
Zinc, Total	10000	109	18		87		48		36		22	

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 4: Pesticides in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-5 (0-2')		SB-5 (24-26')		SB-6 (0-2')		SB-6 (12-14')		SB-7 (0-2')		SB-8 (0-2')		SB-8 (4-6')	
SAMPLING DATE			9/17/2014		9/17/2014		9/18/2014		9/19/2014		9/23/2014		9/23/2014		9/23/2014	
Pesticides Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Delta-BHC	500	0.04	0.000341	U	0.000316	U	0.000331	U	0.000324	U	0.000328	U	0.000335	U	0.000325	U
Lindane	9.2	0.1	0.000324	U	0.000301	U	0.000315	U	0.000308	U	0.000312	U	0.000318	U	0.000309	U
Alpha-BHC	3.4	0.02	0.000206	U	0.000191	U	0.0002	U	0.000196	U	0.000198	U	0.000202	U	0.000196	U
Beta-BHC	3	0.036	0.00066	U	0.000612	U	0.000641	U	0.000628	U	0.000635	U	0.000648	U	0.000629	U
Heptachlor	15	0.042	0.00039	U	0.000362	U	0.000379	U	0.000371	U	0.000833	JB	0.000669	JB	0.000372	U
Aldrin	0.68	0.005	0.000613	U	0.000568	U	0.000596	U	0.000583	U	0.00059	U	0.000602	U	0.000584	U
Heptachlor epoxide	-	-	0.000979	U	0.000908	U	0.000952	U	0.000931	U	0.000942	U	0.000962	U	0.000934	U
Endrin	89	0.014	0.000297	U	0.000276	U	0.000289	U	0.000283	U	0.000286	U	0.000292	U	0.000284	U
Endrin ketone	-	-	0.000448	U	0.000416	U	0.000436	U	0.000426	U	0.000431	U	0.00044	U	0.000427	U
Dieldrin	-	0.005	0.000544	U	0.000504	U	0.000529	U	0.000517	U	0.000523	U	0.000534	U	0.000519	U
4,4'-DDE	1.4	0.0033	0.000402	U	0.000373	U	0.00238		0.000383	U	0.00094	J	0.00158	J	0.000384	U
4,4'-DDD	62	0.0033	0.000621	U	0.000576	U	0.000603	U	0.000591	U	0.000597	U	0.00061	U	0.000592	U
4,4'-DDT	92	0.0033	0.00178	J	0.0013	U	0.0261		0.00133	U	0.00135	U	0.00138	U	0.00133	U
Endosulfan I	47	2.4	0.000411	U	0.000381	U	0.0004	U	0.000391	U	0.000396	U	0.000404	U	0.000392	U
Endosulfan II	200	2.4	0.000582	U	0.00054	U	0.000565	U	0.000553	U	0.00056	U	0.000571	U	0.000555	U
Endosulfan sulfate	200	2.4	0.000345	U	0.00032	U	0.000335	U	0.000328	U	0.000332	U	0.000339	U	0.000329	U
Methoxychlor	200	-	0.00102	U	0.000942	U	0.000987	U	0.000966	U	0.000977	U	0.000997	U	0.000968	U
Toxaphene	-	-	0.00914	U	0.00848	U	0.00888	U	0.00869	U	0.00879	U	0.00898	U	0.00872	U
cis-Chlordane	-	0.094	0.000606	U	0.000562	U	0.000589	U	0.000577	U	0.000948	J	0.000871	J	0.000578	U
trans-Chlordane	-	-	0.000574	U	0.000533	U	0.000558	U	0.000546	U	0.000556	J	0.000564	U	0.000548	U
Chlordane	-	-	0.00576	U	0.00535	U	0.0056	U	0.00548	U	0.00555	U	0.00566	U	0.0055	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
P - The RPD between the results for the two columns exceeds the method-specified criteria.
B - The analyte was detected above the reporting limit in the associated method blank.
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 4: Pesticides in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-9 (0-2')		SB-9 (4-6')		SB-10 (0-2')		SB-10 (12-14')		SB-11 (0-2')		SB-11 (24-26')		SB-12 (0-2')	
SAMPLING DATE			9/25/2014		9/25/2014		9/24/2014		9/24/2014		9/17/2014		9/17/2014		9/17/2014	
Pesticides Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Delta-BHC	500	0.04	0.000423	J	0.000324	U	0.000353	U	0.000334	U	0.000333	U	0.000327	U	0.000343	U
Lindane	9.2	0.1	0.00466		0.000308	U	0.000336	U	0.000318	U	0.000316	U	0.000311	U	0.000326	U
Alpha-BHC	3.4	0.02	0.000212	U	0.000196	U	0.000213	U	0.000202	U	0.000201	U	0.000198	U	0.000207	U
Beta-BHC	3	0.036	0.000678	U	0.000627	U	0.000683	U	0.000648	U	0.000644	U	0.000634	U	0.000664	U
Heptachlor	15	0.042	0.00101	PI	0.000371	U	0.000404	U	0.000383	U	0.000381	U	0.000375	U	0.000392	U
Aldrin	0.68	0.005	0.00063	U	0.000582	U	0.000634	U	0.000601	U	0.000598	U	0.000588	U	0.000616	U
Heptachlor epoxide	-	-	0.00317	J	0.00093	U	0.00101	U	0.000961	U	0.000955	U	0.00094	U	0.000984	U
Endrin	89	0.014	0.000306	U	0.000282	U	0.000308	U	0.000292	U	0.00029	U	0.000285	U	0.000299	U
Endrin ketone	-	-	0.00046	U	0.000426	U	0.000464	U	0.00044	U	0.000437	U	0.00043	U	0.000451	U
Dieldrin	-	0.005	0.000559	U	0.000517	U	0.000563	U	0.000534	U	0.000531	U	0.000522	U	0.00198	P
4,4'-DDE	1.4	0.0033	0.0834		0.00168		0.000417	U	0.000395	U	0.000856	J	0.000386	U	0.00941	
4,4'-DDD	62	0.0033	0.0718		0.00145	J	0.000642	U	0.000609	U	0.000606	U	0.000596	U	0.000624	U
4,4'-DDT	92	0.0033	0.358	E	0.00942		0.00145	U	0.00137	U	0.00601		0.00134	U	0.0127	
Endosulfan I	47	2.4	0.000422	U	0.000391	U	0.000426	U	0.000403	U	0.000401	U	0.000395	U	0.000414	U
Endosulfan II	200	2.4	0.000598	U	0.000552	U	0.000602	U	0.000571	U	0.000568	U	0.000558	U	0.000585	U
Endosulfan sulfate	200	2.4	0.000355	U	0.000328	U	0.000357	U	0.000339	U	0.000337	U	0.000331	U	0.000347	U
Methoxychlor	200	-	0.00104	U	0.000964	U	0.00105	U	0.000996	U	0.000991	U	0.000975	U	0.00102	U
Toxaphene	-	-	0.00939	U	0.00868	U	0.00946	U	0.00896	U	0.00892	U	0.00877	U	0.00919	U
cis-Chlordane	-	0.094	0.0127		0.000576	U	0.000628	U	0.000595	U	0.00186	J	0.000582	U	0.00061	U
trans-Chlordane	-	-	0.00584	PI	0.000546	U	0.000594	U	0.000564	U	0.00056	U	0.000551	U	0.000578	U
Chlordane	-	-	0.00592	U	0.00548	U	0.00597	U	0.00566	U	0.00563	U	0.00554	U	0.0058	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
P - The RPD between the results for the two columns exceeds the method-specified criteria.
B - The analyte was detected above the reporting limit in the associated method blank.
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 4: Pesticides in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-12 (22-24')		SB-13 (0-2')		SB-13 (8-10')		SB-14 (0-2')		SB-14 (4-6')		SB-15 (0-2')		SB-15 (4-6')	
SAMPLING DATE			9/17/2014		9/19/2014		9/19/2014		9/22/2014		9/22/2014		9/22/2014		9/22/2014	
Pesticides	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg																
Delta-BHC	500	0.04	0.000309	U	0.000325	U	0.000326	U	0.000326	U	0.00032	U	0.000345	U	0.000329	U
Lindane	9.2	0.1	0.000294	U	0.000309	U	0.00031	U	0.00031	U	0.000304	U	0.000328	U	0.000313	U
Alpha-BHC	3.4	0.02	0.000186	U	0.000196	U	0.000197	U	0.000197	U	0.000193	U	0.000208	U	0.000199	U
Beta-BHC	3	0.036	0.000598	U	0.000628	U	0.000632	U	0.000632	U	0.00062	U	0.000667	U	0.000637	U
Heptachlor	15	0.042	0.000353	U	0.000372	U	0.000374	U	0.00061	JB	0.000474	JB	0.000535	JB	0.000448	J
Aldrin	0.68	0.005	0.000555	U	0.000584	U	0.000587	U	0.000587	U	0.000575	U	0.00062	U	0.000592	U
Heptachlor epoxide	-	-	0.000886	U	0.000932	U	0.000937	U	0.000938	U	0.000919	U	0.00099	U	0.000945	U
Endrin	89	0.014	0.000269	U	0.000283	U	0.000285	U	0.000285	U	0.000279	U	0.000301	U	0.000287	U
Endrin ketone	-	-	0.000406	U	0.000427	U	0.000429	U	0.000429	U	0.000421	U	0.000453	U	0.000433	U
Dieldrin	-	0.005	0.000492	U	0.000518	U	0.000521	U	0.000521	U	0.00051	U	0.00055	U	0.000525	U
4,4'-DDE	1.4	0.0033	0.000364	U	0.000383	U	0.000385	U	0.000385	U	0.000378	U	0.00078	J	0.000388	U
4,4'-DDD	62	0.0033	0.000562	U	0.000591	U	0.000594	U	0.000594	U	0.000583	U	0.000628	U	0.000599	U
4,4'-DDT	92	0.0033	0.00127	U	0.00133	U	0.00134	U	0.00134	U	0.00131	U	0.00142	U	0.00135	U
Endosulfan I	47	2.4	0.000372	U	0.000392	U	0.000394	U	0.000394	U	0.000386	U	0.000416	U	0.000397	U
Endosulfan II	200	2.4	0.000527	U	0.000554	U	0.000557	U	0.000557	U	0.000546	U	0.000588	U	0.000561	U
Endosulfan sulfate	200	2.4	0.000312	U	0.000329	U	0.00033	U	0.00033	U	0.000324	U	0.000349	U	0.000333	U
Methoxychlor	200	-	0.000919	U	0.000967	U	0.000972	U	0.000972	U	0.000953	U	0.00103	U	0.00098	U
Toxaphene	-	-	0.00827	U	0.0087	U	0.00875	U	0.00875	U	0.00858	U	0.00924	U	0.00882	U
cis-Chlordane	-	0.094	0.000549	U	0.000577	U	0.00058	U	0.00058	U	0.000569	U	0.000929	J	0.000905	J
trans-Chlordane	-	-	0.00052	U	0.000547	U	0.00055	U	0.00055	U	0.000539	U	0.000581	U	0.000554	U
Chlordane	-	-	0.00522	U	0.00549	U	0.00552	U	0.00552	U	0.00541	U	0.00583	U	0.00556	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
P - The RPD between the results for the two columns exceeds the method-specified criteria.
B - The analyte was detected above the reporting limit in the associated method blank.
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 4: Pesticides in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-16 (0-2')		SB-16 (12-14')		SB-17 (0-2')		SB-17 (22-24')		SB-18 (0-2')		SB-18 (24-26')	
SAMPLING DATE			9/15/2014		9/15/2014		9/15/2014		9/15/2014		9/16/2014		9/16/2014	
Pesticides	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg														
Delta-BHC	500	0.04	0.000334	U	0.000338	U	0.00033	U	0.000327	U	0.000359	U	0.000322	U
Lindane	9.2	0.1	0.000318	U	0.000321	U	0.000314	U	0.000311	U	0.000342	U	0.000306	U
Alpha-BHC	3.4	0.02	0.000202	U	0.000204	U	0.0002	U	0.000197	U	0.000217	U	0.000195	U
Beta-BHC	3	0.036	0.000647	U	0.000654	U	0.00064	U	0.000632	U	0.000696	U	0.000624	U
Heptachlor	15	0.042	0.000382	U	0.000386	U	0.000378	U	0.000374	U	0.000411	U	0.000369	U
Aldrin	0.68	0.005	0.000601	U	0.000607	U	0.000594	U	0.000587	U	0.000646	U	0.000579	U
Heptachlor epoxide	-	-	0.00096	U	0.00097	U	0.000949	U	0.000938	U	0.00103	U	0.000926	U
Endrin	89	0.014	0.000291	U	0.000295	U	0.000288	U	0.000285	U	0.000313	U	0.000281	U
Endrin ketone	-	-	0.000439	U	0.000444	U	0.000434	U	0.000429	U	0.000472	U	0.000424	U
Dieldrin	-	0.005	0.00581		0.000539	U	0.00224	PI	0.000521	U	0.000573	U	0.000514	U
4,4'-DDE	1.4	0.0033	0.00981	P	0.000399	U	0.0236		0.000386	U	0.0104		0.00038	U
4,4'-DDD	62	0.0033	0.00129	J	0.000615	U	0.0024	PI	0.000595	U	0.000654	U	0.000587	U
4,4'-DDT	92	0.0033	0.0398		0.00139	U	0.085		0.00134	U	0.0429		0.00132	U
Endosulfan I	47	2.4	0.000403	U	0.000407	U	0.000399	U	0.000394	U	0.000433	U	0.000389	U
Endosulfan II	200	2.4	0.00057	U	0.000576	U	0.000564	U	0.000557	U	0.000613	U	0.00055	U
Endosulfan sulfate	200	2.4	0.000338	U	0.000342	U	0.000335	U	0.000331	U	0.000364	U	0.000326	U
Methoxychlor	200	-	0.000995	U	0.00101	U	0.000984	U	0.000973	U	0.00107	U	0.00096	U
Toxaphene	-	-	0.00896	U	0.00905	U	0.00886	U	0.00876	U	0.00963	U	0.00864	U
cis-Chlordane	-	0.094	0.00517	PI	0.000601	U	0.000588	U	0.000581	U	0.000639	U	0.000573	U
trans-Chlordane	-	-	0.00438	PI	0.000569	U	0.0109PI	PI	0.00055	U	0.000606	U	0.000543	U
Chlordane	-	-	0.0241		0.00571	U	0.00559	U	0.00552	U	0.00608	U	0.00545	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
P - The RPD between the results for the two columns exceeds the method-specified criteria.
B - The analyte was detected above the reporting limit in the associated method blank.
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 4: Pesticides in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-20 (0-2')		SB-19 (0-2')		SB-19 (47-49')		SB-20 (24-26')	
SAMPLING DATE			9/16/2014		9/18/2014		9/18/2014		9/16/2014	
Pesticides	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Units: mg/kg										
Delta-BHC	500	0.04	0.000342	U	0.000313	U	0.000388	U	0.000327	U
Lindane	9.2	0.1	0.000325	U	0.000298	U	0.000369	U	0.000311	U
Alpha-BHC	3.4	0.02	0.000206	U	0.000189	U	0.000234	U	0.000198	U
Beta-BHC	3	0.036	0.000661	U	0.000606	U	0.000751	U	0.000634	U
Heptachlor	15	0.042	0.000391	U	0.000358	U	0.000444	U	0.000375	U
Aldrin	0.68	0.005	0.000614	U	0.000563	U	0.000698	U	0.000588	U
Heptachlor epoxide	-	-	0.000981	U	0.000899	U	0.00111	U	0.00094	U
Endrin	89	0.014	0.000298	U	0.000273	U	0.000338	U	0.000286	U
Endrin ketone	-	-	0.000449	U	0.000412	U	0.00051	U	0.00043	U
Dieldrin	-	0.005	0.000545	U	0.00312		0.000619	U	0.000522	U
4,4'-DDE	1.4	0.0033	0.000403	U	0.00037	U	0.000458	U	0.000386	U
4,4'-DDD	62	0.0033	0.000622	U	0.00057	U	0.000707	U	0.000596	U
4,4'-DDT	92	0.0033	0.0014	U	0.00223	J	0.00159	U	0.00134	U
Endosulfan I	47	2.4	0.000412	U	0.000378	U	0.000468	U	0.000395	U
Endosulfan II	200	2.4	0.000583	U	0.000534	U	0.000662	U	0.000559	U
Endosulfan sulfate	200	2.4	0.000346	U	0.000317	U	0.000393	U	0.000332	U
Methoxychlor	200	-	0.00102	U	0.000933	U	0.00116	U	0.000975	U
Toxaphene	-	-	0.00916	U	0.00839	U	0.0104	U	0.00878	U
cis-Chlordane	-	0.094	0.000608	U	0.000557	U	0.00069	U	0.000582	U
trans-Chlordane	-	-	0.000576	U	0.000528	U	0.000654	U	0.000552	U
Chlordane	-	-	0.00578	U	0.0053	U	0.00656	U	0.00554	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
E - Conc. of analyte exceeds range of calibration curve and/or linear range of the instrument.
P - The RPD between the results for the two columns exceeds the method-specified criteria.
B - The analyte was detected above the reporting limit in the associated method blank.
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 5: Polychlorinated Biphenyls (PCBs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-5 (0-2')		SB-5 (24-26')		SB-6 (0-2')		SB-6 (12-14')	
SAMPLING DATE			9/17/2014		9/17/2014		9/18/2014		9/19/2014	
Polychlorinated Biphenyls (PCBs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	1	0.1	0.00272	U	0.00267	U	0.00284	U	0.00259	U
Aroclor 1221	1	0.1	0.00318	U	0.00312	U	0.00331	U	0.00302	U
Aroclor 1232	1	0.1	0.00404	U	0.00397	U	0.00421	U	0.00384	U
Aroclor 1242	1	0.1	0.00422	U	0.00414	U	0.0044	U	0.00402	U
Aroclor 1248	1	0.1	0.00291	U	0.00286	U	0.00303	U	0.00277	U
Aroclor 1254	1	0.1	0.00283	U	0.0134	J	0.0137	J	0.0027	U
Aroclor 1260	1	0.1	0.00263	U	0.00258	U	0.00274	U	0.0025	U
Aroclor 1262	1	0.1	0.00171	U	0.00168	U	0.00178	U	0.00163	U
Aroclor 1268	1	0.1	0.005	U	0.00491	U	0.00521	U	0.00476	U
PCBs, Total			0.00171	U	0.0134	J	0.0137	J	0.00163	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 5: Polychlorinated Biphenyls (PCBs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-7 (0-2')		SB-8 (0-2')		SB-8 (4-6')		SB-9 (0-2')		SB-9 (4-6')		SB-10 (0-2')	
SAMPLING DATE			9/23/2014		9/23/2014		9/23/2014		9/25/2014		9/25/2014		9/24/2014	
Polychlorinated Biphenyls (PCBs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	1	0.1	0.00266	U	0.00288	U	0.00267	U	0.00298	U	0.00273	U	0.00297	U
Aroclor 1221	1	0.1	0.00311	U	0.00336	U	0.00312	U	0.00348	U	0.00319	U	0.00346	U
Aroclor 1232	1	0.1	0.00395	U	0.00427	U	0.00397	U	0.00443	U	0.00405	U	0.0044	U
Aroclor 1242	1	0.1	0.00412	U	0.00446	U	0.00414	U	0.00462	U	0.00423	U	0.0046	U
Aroclor 1248	1	0.1	0.00284	U	0.00308	U	0.00286	U	0.00319	U	0.00292	U	0.00317	U
Aroclor 1254	1	0.1	0.00277	U	0.003	U	0.00278	U	0.0031	U	0.00284	U	0.00309	U
Aroclor 1260	1	0.1	0.00257	U	0.00278	U	0.00258	U	0.00288	U	0.00263	U	0.00286	U
Aroclor 1262	1	0.1	0.00167	U	0.00181	U	0.00168	U	0.00187	U	0.00172	U	0.00186	U
Aroclor 1268	1	0.1	0.00489	U	0.00529	U	0.00491	U	0.00548	U	0.00501	U	0.00545	U
PCBs, Total			0.00167	U	0.00181	U	0.00168	U	0.00187	U	0.00172	U	0.00186	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 5: Polychlorinated Biphenyls (PCBs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-10 (12-14')		SB-11 (0-2')		SB-11 (24-26')		SB-12 (0-2')		SB-12 (22-24')		SB-13 (0-2')	
SAMPLING DATE			9/24/2014		9/17/2014		9/17/2014		9/17/2014		9/17/2014		9/19/2014	
Polychlorinated Biphenyls (PCBs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	1	0.1	0.00268	U	0.00284	U	0.00261	U	0.0029	U	0.00262	U	0.0028	U
Aroclor 1221	1	0.1	0.00312	U	0.00332	U	0.00305	U	0.00339	U	0.00306	U	0.00327	U
Aroclor 1232	1	0.1	0.00397	U	0.00421	U	0.00387	U	0.00431	U	0.00389	U	0.00415	U
Aroclor 1242	1	0.1	0.00415	U	0.0044	U	0.00404	U	0.0045	U	0.00406	U	0.00434	U
Aroclor 1248	1	0.1	0.00286	U	0.00303	U	0.00279	U	0.0031	U	0.0028	U	0.00299	U
Aroclor 1254	1	0.1	0.00279	U	0.0192	J	0.0172	J	0.028	J	0.0198	J	0.00291	U
Aroclor 1260	1	0.1	0.00258	U	0.0114	J	0.00252	U	0.0348	J	0.00253	U	0.0027	U
Aroclor 1262	1	0.1	0.00168	U	0.00178	U	0.00164	U	0.00182	U	0.00165	U	0.00176	U
Aroclor 1268	1	0.1	0.00492	U	0.00521	U	0.00479	U	0.00533	U	0.00481	U	0.00514	U
PCBs, Total			0.00168	U	0.0306	J	0.0172	J	0.0628	J	0.0198	J	0.00176	U

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 5: Polychlorinated Biphenyls (PCBs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-13 (8-10')		SB-14 (0-2')		SB-14 (4-6')		SB-15 (0-2')		SB-15 (4-6')		SB-16 (0-2')	
SAMPLING DATE			9/19/2014		9/22/2014		9/22/2014		9/22/2014		9/22/2014		9/15/2014	
Polychlorinated Biphenyls (PCBs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	1	0.1	0.00265	U	0.00275	U	0.00276	U	0.00279	U	0.00278	U	0.00276	U
Aroclor 1221	1	0.1	0.00309	U	0.00321	U	0.00322	U	0.00325	U	0.00324	U	0.00322	U
Aroclor 1232	1	0.1	0.00393	U	0.00408	U	0.0041	U	0.00414	U	0.00412	U	0.0041	U
Aroclor 1242	1	0.1	0.0041	U	0.00426	U	0.00428	U	0.00432	U	0.0043	U	0.00428	U
Aroclor 1248	1	0.1	0.00283	U	0.00294	U	0.00295	U	0.00298	U	0.00296	U	0.00295	U
Aroclor 1254	1	0.1	0.00276	U	0.00286	U	0.00287	U	0.0029	U	0.00289	U	0.0139	J
Aroclor 1260	1	0.1	0.00255	U	0.00265	U	0.00266	U	0.00269	U	0.00268	U	0.0068	J
Aroclor 1262	1	0.1	0.00166	U	0.00173	U	0.00173	U	0.00175	U	0.00174	U	0.00173	U
Aroclor 1268	1	0.1	0.00486	U	0.00505	U	0.00507	U	0.00512	U	0.0051	U	0.00507	U
PCBs, Total			0.00166	U	0.00173	U	0.00173	U	0.00175	U	0.00174	U	0.0207	J

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 5: Polychlorinated Biphenyls (PCBs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-16 (12-14')		SB-17 (0-2')		SB-17 (22-24')		SB-18 (0-2')		SB-18 (24-26')		SB-20 (0-2')	
SAMPLING DATE			9/15/2014		9/15/2014		9/15/2014		9/16/2014		9/16/2014		9/16/2014	
Polychlorinated Biphenyls (PCBs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	1	0.1	0.00284	U	0.00279	U	0.00289	U	0.0029	U	0.00273	U	0.00284	U
Aroclor 1221	1	0.1	0.00331	U	0.00325	U	0.00337	U	0.00338	U	0.00319	U	0.00331	U
Aroclor 1232	1	0.1	0.00421	U	0.00414	U	0.00428	U	0.0043	U	0.00406	U	0.00421	U
Aroclor 1242	1	0.1	0.00439	U	0.00432	U	0.00448	U	0.00449	U	0.00424	U	0.0044	U
Aroclor 1248	1	0.1	0.00303	U	0.00298	U	0.00309	U	0.0031	U	0.00292	U	0.00303	U
Aroclor 1254	1	0.1	0.0188	J	0.018	J	0.0174	J	0.0198	J	0.0177	J	0.018	J
Aroclor 1260	1	0.1	0.00274	U	0.0122	J	0.00279	U	0.0299	J	0.00264	U	0.00274	U
Aroclor 1262	1	0.1	0.00178	U	0.00175	U	0.00181	U	0.00182	U	0.00172	U	0.00178	U
Aroclor 1268	1	0.1	0.00521	U	0.00512	U	0.0053	U	0.00532	U	0.00502	U	0.00521	U
PCBs, Total			0.0188	J	0.0302	J	0.0174	J	0.0497	J	0.0177	J	0.018	J

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 5: Polychlorinated Biphenyls (PCBs) in Soil
Willoughby Square
Brooklyn, NY

LOCATION	SCOs		SB-19 (0-2')		SB-19 (47-49')		SB-20 (24-26')	
SAMPLING DATE			9/18/2014		9/18/2014		9/16/2014	
Polychlorinated Biphenyls (PCBs) Units: mg/kg	NY-RESC	NY-UNRES	Result	Qual	Result	Qual	Result	Qual
Aroclor 1016	1	0.1	0.00267	U	0.00316	U	0.00264	U
Aroclor 1221	1	0.1	0.00311	U	0.00369	U	0.00309	U
Aroclor 1232	1	0.1	0.00396	U	0.00469	U	0.00392	U
Aroclor 1242	1	0.1	0.00413	U	0.0049	U	0.0041	U
Aroclor 1248	1	0.1	0.00285	U	0.00338	U	0.00282	U
Aroclor 1254	1	0.1	0.015	J	0.017	J	0.0154	J
Aroclor 1260	1	0.1	0.00257	U	0.00305	U	0.00255	U
Aroclor 1262	1	0.1	0.00167	U	0.00199	U	0.00166	U
Aroclor 1268	1	0.1	0.00489	U	0.00581	U	0.00485	U
PCBs, Total			0.015	J	0.017	J	0.0154	J

NY-UNRES = New York State Part 375 Unrestricted Use SCOs
NY-RESC = New York State Part 375 Commercial Criteria, New York Restricted use
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value
Cells shaded in grey indicate MDL values above the NY-UNRES or NY-RESC SCO
DUP = designation for duplicate sample
SCO = Soil Cleanup Objective
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = Not detected (ND) at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results and MDL values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location
- = No standard

Table 6: Volatile Organic Compounds (VOCs) in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Volatile Organics (VOCs) Units: ug/l	NY-AWQS	**Result**	**Qual**	**Result**	**Qual**
Methylene chloride	5	0.7	U	0.7	U
1,1-Dichloroethane	5	0.7	U	0.7	U
Chloroform	7	0.7	U	3	
Carbon tetrachloride	5	0.13	U	0.13	U
1,2-Dichloropropane	1	0.13	U	0.13	U
Dibromochloromethane	50	0.15	U	0.15	U
1,1,2-Trichloroethane	1	0.5	U	0.5	U
Tetrachloroethene	5	0.18	U	0.18	U
Chlorobenzene	5	0.7	U	0.7	U
Trichlorofluoromethane	5	0.7	U	0.7	U
1,2-Dichloroethane	0.6	0.13	U	0.13	U
1,1,1-Trichloroethane	5	0.7	U	0.7	U
Bromodichloromethane	50	0.19	U	0.23	J
trans-1,3-Dichloropropene	0.4	0.16	U	0.16	U
cis-1,3-Dichloropropene	0.4	0.14	U	0.14	U
1,3-Dichloropropene, Total		0.14	U	0.14	U
1,1-Dichloropropene	5	0.7	U	0.7	U
Bromoform	50	0.65	U	0.65	U
1,1,2,2-Tetrachloroethane	5	0.14	U	0.14	U
Benzene	1	0.16	U	0.16	U
Toluene	5	0.7	U	0.7	U
Ethylbenzene	5	0.7	U	0.7	U
Chloromethane		0.7	U	0.7	U
Bromomethane	5	0.7	U	0.7	U
Vinyl chloride	2	0.33	U	0.33	U
Chloroethane	5	0.7	U	0.7	U
1,1-Dichloroethene	5	0.14	U	0.14	U
trans-1,2-Dichloroethene	5	0.7	U	0.7	U
Trichloroethene	5	0.18	U	0.18	U
1,2-Dichlorobenzene	3	0.7	U	0.7	U
1,3-Dichlorobenzene	3	0.7	U	0.7	U
1,4-Dichlorobenzene	3	0.7	U	0.7	U
Methyl tert butyl ether	10	0.7	U	0.7	U
p/m-Xylene	5	0.7	U	0.7	U
o-Xylene	5	0.7	U	0.7	U
Xylenes, Total		0.7	U	0.7	U
cis-1,2-Dichloroethene	5	0.7	U	0.7	U
1,2-Dichloroethene, Total		0.7	U	0.7	U
Dibromomethane	5	1	U	1	U
1,2,3-Trichloropropane	0.04	0.7	U	0.7	U
Acrylonitrile	5	1.5	U	1.5	U
Styrene	5	0.7	U	0.7	U
Dichlorodifluoromethane	5	1	U	1	U
Acetone	50	1.5	U	1.5	U
Carbon disulfide	60	1	U	1	U

Table 6: Volatile Organic Compounds (VOCs) in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Volatile Organics (VOCs) Units: ug/l	NY-AWQS	Result	Qual	Result	Qual
2-Butanone	50	1.9	U	1.9	U
Vinyl acetate		1	U	1	U
4-Methyl-2-pentanone		1	U	1	U
2-Hexanone	50	1	U	1	U
Bromochloromethane	5	0.7	U	0.7	U
2,2-Dichloropropane	5	0.7	U	0.7	U
1,2-Dibromoethane	0.0006	0.65	U	0.65	U
1,3-Dichloropropane	5	0.7	U	0.7	U
1,1,1,2-Tetrachloroethane	5	0.7	U	0.7	U
Bromobenzene	5	0.7	U	0.7	U
n-Butylbenzene	5	0.7	U	0.7	U
sec-Butylbenzene	5	0.7	U	0.7	U
tert-Butylbenzene	5	0.7	U	0.7	U
o-Chlorotoluene	5	0.7	U	0.7	U
p-Chlorotoluene	5	0.7	U	0.7	U
1,2-Dibromo-3-chloropropane	0.04	0.7	U	0.7	U
Hexachlorobutadiene	0.5	0.7	U	0.7	U
Isopropylbenzene	5	0.7	U	0.7	U
p-Isopropyltoluene	5	0.7	U	0.7	U
Naphthalene	10	0.7	U	0.7	U
n-Propylbenzene	5	0.7	U	0.7	U
1,2,3-Trichlorobenzene	5	0.7	U	0.7	U
1,2,4-Trichlorobenzene	5	0.7	U	0.7	U
1,3,5-Trimethylbenzene	5	0.7	U	0.7	U
1,2,4-Trimethylbenzene	5	0.7	U	0.7	U
1,4-Dioxane		41	U	41	U
p-Diethylbenzene		0.7	U	0.7	U
p-Ethyltoluene		0.7	U	0.7	U
1,2,4,5-Tetramethylbenzene		0.65	U	0.65	U
Ethyl ether		0.7	U	0.7	U
trans-1,4-Dichloro-2-butene	5	0.7	U	0.7	U

NY-AWQS = New York State Ambient Water Quality Standard
Cells highlighted in yellow indicate concentrations above the NY-AWQS
Cells shaded in grey indicate MDL values above the NY-AWQS
DUP = designation for duplicate sample
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
-- = No standard
Results and MDL values are in micrograms per liter (ug/l)

Table 7: Semivolatile Organic Compounds (SVOCs) in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Semivolatile Organics (SVOCs) Units: ug/l	NY-AWQS	Result	Qual	Result	Qual
1,2,4-Trichlorobenzene	5	0.21	U	0.21	U
Bis(2-chloroethyl)ether	1	0.41	U	0.41	U
1,2-Dichlorobenzene	3	0.3	U	0.3	U
1,3-Dichlorobenzene	3	0.35	U	0.35	U
1,4-Dichlorobenzene	3	0.32	U	0.32	U
3,3'-Dichlorobenzidine	5	0.48	U	0.48	U
2,4-Dinitrotoluene	5	1	U	1	U
2,6-Dinitrotoluene	5	0.89	U	0.89	U
4-Chlorophenyl phenyl ether		0.36	U	0.36	U
4-Bromophenyl phenyl ether		0.43	U	0.43	U
Bis(2-chloroisopropyl)ether	5	0.6	U	0.6	U
Bis(2-chloroethoxy)methane	5	0.6	U	0.6	U
Hexachlorocyclopentadiene	5	0.58	U	0.58	U
Isophorone	50	0.79	U	0.79	U
Nitrobenzene	0.4	0.4	U	0.4	U
NitrosoDiPhenylAmine(NDPA)/DPA	50	0.34	U	0.34	U
n-Nitrosodi-n-propylamine		0.64	U	0.64	U
Bis(2-Ethylhexyl)phthalate	5	0.93	U	0.93	U
Butyl benzyl phthalate	50	1.1	U	1.1	U
Di-n-butylphthalate	50	0.77	U	0.77	U
Di-n-octylphthalate	50	1.2	U	1.2	U
Diethyl phthalate	50	0.39	U	0.39	U
Dimethyl phthalate	50	0.33	U	0.33	U
Biphenyl	5	0.24	U	0.24	U
4-Chloroaniline	5	0.84	U	0.84	U
2-Nitroaniline	5	0.96	U	0.96	U
3-Nitroaniline	5	0.67	U	0.67	U
4-Nitroaniline	5	0.83	U	0.83	U
Dibenzofuran		0.22	U	0.22	U
1,2,4,5-Tetrachlorobenzene	5	0.36	U	0.36	U
Acetophenone		0.43	U	0.43	U
2,4,6-Trichlorophenol		0.78	U	0.78	U
P-Chloro-M-Cresol		0.54	U	0.54	U
2-Chlorophenol		0.58	U	0.58	U
2,4-Dichlorophenol	1	0.56	U	0.56	U
2,4-Dimethylphenol	50	0.58	U	0.58	U
2-Nitrophenol		1	U	1	U
4-Nitrophenol		1.1	U	1.1	U
2,4-Dinitrophenol	10	1.4	U	1.4	U
4,6-Dinitro-o-cresol		1.4	U	1.4	U
Phenol	1	0.27	U	0.27	U
2-Methylphenol		0.7	U	0.7	U
3-Methylphenol/4-Methylphenol		0.72	U	0.72	U
2,4,5-Trichlorophenol		0.75	U	0.75	U
Benzoic Acid		1	U	1	U

Table 7: Semivolatile Organic Compounds (SVOCs) in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Benzyl Alcohol		0.68	U	0.68	U
Carbazole		0.37	U	0.37	U
Acenaphthene	20	0.06	U	0.06	U
2-Chloronaphthalene	10	0.07	U	0.07	U
Fluoranthene	50	0.04	U	0.04	U
Hexachlorobutadiene	0.5	0.07	U	0.07	U
Naphthalene	10	0.06	U	0.06	U
Benzo(a)anthracene	0.002	0.06	U	0.06	U
Benzo(a)pyrene	0	0.07	U	0.07	U
Benzo(b)fluoranthene	0.002	0.07	U	0.07	U
Benzo(k)fluoranthene	0.002	0.07	U	0.07	U
Chrysene	0.002	0.05	U	0.05	U
Acenaphthylene		0.05	U	0.05	U
Anthracene	50	0.06	U	0.06	U
Benzo(ghi)perylene		0.07	U	0.07	U
Fluorene	50	0.06	U	0.06	U
Phenanthrene	50	0.06	U	0.06	U
Dibenzo(a,h)anthracene		0.07	U	0.07	U
Indeno(1,2,3-cd)Pyrene	0.002	0.08	U	0.08	U
Pyrene	50	0.06	U	0.06	U
2-Methylnaphthalene		0.06	U	0.06	U
Pentachlorophenol	1	0.19	U	0.19	U
Hexachlorobenzene	0.04	0.01	U	0.01	U
Hexachloroethane	5	0.07	U	0.07	U

NY-AWQS = New York State Ambient Water Quality Standard
Cells highlighted in yellow indicate concentrations above the NY-AWQS
Cells shaded in grey indicate MDL values above the NY-AWQS
DUP = designation for duplicate sample
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
-- = No standard
Results and MDL values are in micrograms per liter (ug/l)

Table 8: Total Metals in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Metals, total Units: ug/l	**NY-AWQS**	**Result**	**Qual**	**Result**	**Qual**
Aluminum, Total	-	13800	R2	26.4	
Antimony, Total	3	0.35	J,R1	0.53	J
Arsenic, Total	25	4.97	R1	0.12	U
Barium, Total	1000	271.7	R1	3.03	
Beryllium, Total	3	1.01	R1	0.15	U
Cadmium, Total	5	0.32	R1	0.05	U
Calcium, Total	-	79700		1010	
Chromium, Total	50	45.4	R1	0.62	J
Cobalt, Total	-	16.43	R1	0.06	U
Copper, Total	200	45.06	R1	1.09	
Iron, Total	300	22400	R1	12	U
Lead, Total	25	107	R1	0.12	U
Magnesium, Total	35000	33000	R1	232	
Manganese, Total	300	1099		1.16	
Mercury, Total	0.7	0.08	J	0.06	U
Nickel, Total	100	98.67	R1	0.39	J
Potassium, Total	-	8270	R1	112	
Selenium, Total	10	2.42	J,R1	1	U
Silver, Total	50	0.07	U,R1	0.07	U
Sodium, Total	20000	80700		1020	
Thallium, Total	0.5	0.16	J,R1	0.05	U
Vanadium, Total	-	29.91	R1	0.55	U
Zinc, Total	2000	120.6	R1	58.14	

NY-AWQS = New York State Ambient Water Quality Standard
Cells highlighted in yellow indicate concentrations above the NY-AWQS
Cells shaded in grey indicate MDL values above the NY-AWQS
DUP = designation for duplicate sample
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
R - Analytical results are from sample re-analysis (1 and 2)
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
-- = No standard
Results and MDL values are in micrograms per liter (ug/l)

Table 9: Dissolved Metals in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1	
SAMPLING DATE		9/26/2014	
LAB SAMPLE ID		L1422739-01	
Metals, dissolved Units: ug/l	**NY-AWQS**	**Result**	**Qual**
Aluminum, Dissolved	-	133	R1
Antimony, Dissolved	3	1.88	J,R1
Arsenic, Dissolved	25	0.24	J,R1
Barium, Dissolved	1000	70.82	R1
Beryllium, Dissolved	3	0.15	U,R1
Cadmium, Dissolved	5	0.05	U,R1
Calcium, Dissolved	-	79400	
Chromium, Dissolved	50	7.98	R1
Cobalt, Dissolved	-	0.74	R1
Copper, Dissolved	200	0.39	J,R1
Iron, Dissolved	300	205	R1
Lead, Dissolved	25	0.93	J,R1
Magnesium, Dissolved	35000	24100	R1
Manganese, Dissolved	300	145.6	R1
Mercury, Dissolved	0.7	0.06	
Nickel, Dissolved	100	4.45	R1
Potassium, Dissolved	-	5840	R1
Selenium, Dissolved	10	1.64	J,R1
Silver, Dissolved	50	0.07	U,R1
Sodium, Dissolved	20000	87800	
Thallium, Dissolved	0.5	0.05	U,R1
Vanadium, Dissolved	-	0.55	U,R1
Zinc, Dissolved	2000	2.56	U,R1

NY-AWQS = New York State Ambient Water Quality Standard
Cells highlighted in yellow indicate concentrations above the NY-AWQS
Cells shaded in grey indicate MDL values above the NY-AWQS
DUP = designation for duplicate sample
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
R - Analytical results are from sample re-analysis (1 and 2)
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
-- = No standard
Results and MDL values are in micrograms per liter (ug/l)

Table 10: Pesticides in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Pesticides Units ug/l	NY-AWQS	Result	Qual	Result	Qual
Delta-BHC	0.04	0.005	U	0.005	U
Lindane	0.05	0.004	U	0.004	U
Alpha-BHC	0.01	0.004	U	0.004	U
Beta-BHC	0.04	0.006	U	0.006	U
Heptachlor	0.04	0.003	U	0.003	U
Aldrin	0	0.002	U	0.002	U
Heptachlor epoxide	0.03	0.004	U	0.004	U
Endrin	0	0.004	U	0.004	U
Endrin ketone	5	0.005	U	0.005	U
Dieldrin	0.004	0.004	U	0.004	U
4,4'-DDE	0.2	0.004	U	0.004	U
4,4'-DDD	0.3	0.005	U	0.005	U
4,4'-DDT	0.2	0.004	U	0.004	U
Endosulfan I		0.003	U	0.003	U
Endosulfan II		0.005	U	0.005	U
Endosulfan sulfate		0.005	U	0.005	U
Methoxychlor	35	0.007	U	0.007	U
Toxaphene	0.06	0.063	U	0.063	U
cis-Chlordane		0.007	U	0.007	U
trans-Chlordane		0.006	U	0.006	U
Chlordane	0.05	0.046	U	0.046	U

NY-AWQS = New York State Ambient Water Quality Standard
Cells highlighted in yellow indicate concentrations above the NY-AWQS
Cells shaded in grey indicate MDL values above the NY-AWQS
MDL = Maximum Detection Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
-- = No standard
Results and MDL values are in micrograms per liter (ug/l)

Table 11: Polychlorinated Biphenyls (PCBs) in Groundwater
Willoughby Square
Brooklyn, NY

LOCATION		MW-1		FB	
SAMPLING DATE		9/26/2014		9/26/2014	
LAB SAMPLE ID		L1422739-01		L1422739-02	
Polychlorinated Biphenyls (PCBs) Units: ug/l	**NY-AWQS**	**Result**	**Qual**	**Result**	**Qual**
Aroclor 1016	0.09	0.055	U	0.055	U
Aroclor 1221	0.09	0.053	U	0.053	U
Aroclor 1232	0.09	0.031	U	0.031	U
Aroclor 1242	0.09	0.06	U	0.06	U
Aroclor 1248	0.09	0.051	U	0.051	U
Aroclor 1254	0.09	0.034	U	0.034	U
Aroclor 1260	0.09	0.032	U	0.032	U
Aroclor 1262	0.09	0.029	U	0.029	U
Aroclor 1268	0.09	0.038	U	0.038	U
PCBs, Total		0.029	U	0.029	U

NY-AWQS = New York State Ambient Water Quality Standard
Cells highlighted in yellow indicate concentrations above the NY-AWQS
Cells shaded in grey indicate MDL values above the NY-AWQS
DUP = designation for duplicate sample
MDL = Maximum Detection Limit
RL = Reporting Limit
Qual = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
-- = No standard
Results and MDL values are in micrograms per liter (ug/l)

Table 12
6NYCRR Part 375-6(a) Unrestricted Use SCOs
Willoughby Square, Brooklyn--NY
NYC BCP Number: 15CVCP092K
E-Designation Site Number: 15ENOS289K

From Table 375-6.8(a) Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	SCO
Metals		
Arsenic	7440-38-2	13[c]
Barium	7440-39-3	350[c]
Beryllium	7440-41-7	7.2
Cadmium	7440-43-9	2.5[c]
Chromium, hexavalent[e]	18540-29-9	1[b]
Chromium, trivalent[e]	16065-83-1	30[c]
Copper	7440-50-8	50
Total Cyanide[e,f]		27
Lead	7439-92-1	63[c]
Manganese	7439-96-5	1,600[c]
Total Mercury		0.18[c]
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9[c]
Silver	7440-22-4	2
Zinc	7440-66-6	109[c]
PCBs/Pesticides		
2,4,5-TP Acid (Silvex)[f]	93-72-1	3.8
4,4'-DDE	72-55-9	0.0033[b]
4,4'-DDT	50-29-3	0.0033[b]
4,4'-DDD	72-54-8	0.0033[b]
Aldrin	309-00-2	0.005[c]
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.036
Chlordane (alpha)	5103-71-9	0.094
delta-BHC[g]	319-86-8	0.04
Dibenzofuran[f]	132-64-9	7
Dieldrin	60-57-1	0.005[c]
Endosulfan I[d,f]	959-98-8	2.4
Endosulfan Ii[d,f]	33213-65-9	2.4
Endosulfan sulfate[d,f]	1031-07-8	2.4
Endrin	72-20-8	0.014
Heptachlor	76-44-8	0.042
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	0.1

Contaminant	CAS Number	SCO
Semivolatiles		
Acenaphthene	83-32-9	20
Acenapthylene[f]	208-96-8	100[a]
Anthracene[f]	120-12-7	100[a]
Benz(a)anthracene[f]	56-55-3	1[c]
Benzo(a)pyrene	50-32-8	1[c]
Benzo(b)fluoranthene[f]	205-99-2	1[c]
Benzo(g,h,i)perylene[f]	191-24-2	100
Benzo(k)fluoranthene[f]	207-08-9	0.8[c]
Chrysene[f]	218-01-9	1[c]
Dibenz(a,h)anthracene[f]	53-70-3	0.33[b]
Fluoranthene[f]	206-44-0	100[a]
Fluorene[f]	86-73-7	30
Indeno(1,2,3-cd)pyrene[f]	193-39-5	0.5[c]
m-Cresol[f]	108-39-4	0.33[b]
Naphthalene[f]	91-20-3	12
o-Cresol[f]	95-48-7	0.33[b]
p-Cresol[f]	106-44-5	0.33[b]
Pentachlorophenol	87-86-5	0.8[b]
Phenanthrene[f]	85-01-8	100
Phenol	108-95-2	0.33[b]
Pyrene[f]	129-00-0	100
Volatiles		
1,1,1-Trichloroethane[f]	71-55-6	0.68
1,1-Dichloroethane[f]	75-34-3	0.27
1,1-Dichloroethene[f]	75-35-4	0.33
1,2-Dichlorobenzene[f]	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.2[c]
cis-1,2-Dichloroethene[f]	156-59-2	0.25
trans-1,2-Dichloroethene[f]	156-60-5	0.19
1,3-Dichlorobenzene[f]	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1[b]
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
n-Butylbenzene[f]	104-51-8	12
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene[f]	100-41-4	1
Hexachlorobenzene[f]	118-74-1	0.33[b]
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether[f]	1634-04-4	0.93
Methylene chloride	75-09-2	0.05
n-Propylbenzene[f]	103-65-1	3.9
sec-Butylbenzene[f]	135-98-8	11
tert-Butylbenzene[f]	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.07
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene[f]	95-63-6	3.6
1,3,5- Trimethylbenzene[f]	108-67-8	8.4
Vinyl chloride[f]	75-01-4	0.02
Xylene (mixed)	1330-20-7	0.26

Notes:
All soil cleanup objectives (SCOs) are in parts per million (ppm). NS=Not specified.
Footnotes (designations are from Table in Part 375). See Technical Support Document (TSD).
a The SCOs for unrestricted use were capped at a maximum value of 100 ppm. See TSD section 9.3.
b For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.
c For constituents where the calculated SCO was lower than the rural soil background concentration, as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.
d SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.
e The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
f Protection of ecological resources SCOs were not developed for contaminants identified in Table 375-6.8(b) with "NS". Where such contaminants appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources SCO according to the TSD.

APPENDIX 1
CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and American Development Ground, LLC 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, American Development Ground, LLC 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, Sara Pong, 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 in the nearest public library that maintains evening and weekend hours. 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. American Development Ground, LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Brooklyn Heights Library

280 Cadman Plaza West, Brooklyn, NY 11201

(718) 623-7100

10:00 am – 8:00 pm

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. Willoughby Operating Company LLC is not aware of any issues of public concern at the present time.

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 American Development Ground, LLC, reviewed and approved by OER prior to distribution and mailed by American Development Ground, LLC. 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 2
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.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

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.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

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.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

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.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

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

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

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.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Brownfield Cleanup Program. American Development Ground, LLC 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. American Development Ground, LLC 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.

APPENDIX 3

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 Attachment D. 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 Brooklyn, 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 materials 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 established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in Table Number 12. '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. The expected location for placement of reused material is shown in the Structural Drawings found in Appendix 5, Drawing F-101.00. Native soil will be used for on-Site reuse at varying depths through the Site.

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 will meet the unrestricted soil cleanup objectives.

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 STORM-WATER POLLUTION PREVENTION

Applicable laws and regulations pertaining to storm-water 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 minimum, procedures will include: (a) limiting the area of open excavations; and (b) shrouding open excavations with tarps and other covers;. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (c) direct load-out of soils to trucks for off-Site disposal; and (d) 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 4

CONSTRUCTION HEALTH AND SAFETY PLAN

Appendix C
Construction Health and Safety Plan

for
Willoughby Square
Remedial Action Plan

Willoughby Square; Brooklyn, NY
Block 146, Lots 16, 17, 18, 23, 29, 34-37, and 41
OER Project Number: TBD
CEQR No. 03DME016K

Submitted to:
New York City Office of Environmental Remediation
100 Gold Street, 2nd Floor
New York, NY 10038

Prepared for:
Willoughby Operating Company, LLC
411 Hempstead Turnpike, Suite 200
West Hempstead, NY 11552

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 1004
New York, NY 10001

March, 2015

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Scope of CHASP 2
2.0 PROJECT SAFETY AUTHORITY 3
2.1 Designated Personnel 3
3.0 HAZARD ASSESSMENT AND CONTROL MEASURES 4
3.1 Human Exposure Pathways 4
3.2 Chemical Hazards 4
3.3 Physical Hazards 5
4.0 AIR MONITORING 8
5.0 PERSONAL PROTECTIVE EQUIPMENT 10
6.0 EXPOSURE MONITORING 11
7.0 SITE ACCESS 12
8.0 WORK AREAS 13
9.0 DECONTAMINATION PROCEDURES 14
10.0 GENERAL SAFE WORK PRACTICES 15
11.0 EMERGENCY PROCEDURES 16
11.1 Route to Hospital 17
11.2 Emergency Contacts 18
12.0 TRAINING 19
13.0 MEDICAL SURVEILLANCE 20

Figures
Figure 1 – Route to Hospital (page 17)

Tables
Table 1 – Emergency Contact Information (page 18)

Appendices
Appendix A – Acknowledgement of CHASP
Appendix B – Injury Reporting Form (OSHA Form 300)
Appendix C – Material Safety Data Sheets

1.0 INTRODUCTION

This Construction Health and Safety Plan (CHASP) has been prepared in conformance with the Occupational Safety and Health Administration (OSHA) standards and guidance that govern site investigation activities, other applicable regulations, and Tenen Environmental LLC (Tenen) health and safety policies and procedures. The purpose of this CHASP is the protection of Tenen field personnel and others during the implementation of the Remedial Action Plan.

The Site is located on the south side of Willoughby Street between Duffield and Gold Streets in the Borough of Brooklyn, Kings County, New York The Site is an approximately 1.16 acre (50,180 square feet) mixed use property. The following table provides a summary, of the current site buildings and uses.

Site Location and Area	Site Improvements
Block 146, Lot 16 (225 Duffield Street) - 0.04 acres	Two-story and a cellar commercial building; unoccupied
Block 146, Lot 17 (223 Duffield Street) - 0.04 acres	Three-story and a cellar commercial building; bookstore, on first floor and unoccupied office space on second and third floors
Block 146, Lot 18 (213-221 Duffield Street) - 0.4 acres	Seven and two-story commercial/ office/warehouse building with a full cellar and partial sub-cellar in the seven-story portion of the building. Office and warehouse space unoccupied
Block 146, Lot 23 (106-108 Willoughby Street) - 0.09 acres	Asphalt pavement, with small permanent structure. Parking attendant booth and parking lot,
Block 146, Lot 29 (116-124 Willoughby Street) - 0.17 acres	Asphalt pavement, with small permanent structure. Parking attendant booth and parking lo
Block 146, Lot 34 (402 Albee Square West) - 0.05 acres	Five-story and a cellar residential dwelling
Block 146, Lot 35 (404 Albee Square West) - 0.06 acres	Five-story and a cellar residential dwelling
Block 146, Lot 36 (406 Albee Square West) - 0.06 acres	Five-story and a cellar residential dwelling
Block 146, Lot 37 (408-414 Albee Square West) - 0.2 acres	Asphalt pavement, with small permanent structure. Parking lot, MPG Parking
Block 146, Lot 41 (416 Albee Square West) 0.05 acres	Asphalt pavement, with no permanent structures. Parking lot

The Site and surrounding areas have been developed since at least 1887. The historic Sanborn fire insurance maps indicated that commercial occupants of the Site have included a dental laboratory (1938) and a printing shop (1950-1996).

The proposed development will consist of a below-grade parking garage along with an at-grade open space/park. The total excavation depth will be approximately 43 feet below grade from Willoughby Square, and will be within the footprint of the proposed parking garage.

1.1 Scope of CHASP

This CHASP includes safety procedures to be used by Tenen staff during the following activities:

- Implementation of remedial oversight and air monitoring activities; and,
- collection of grab end-point soil samples.

Contractors performing remedial construction work will ensure that performance of the work is in compliance with this CHASP and applicable laws and regulations. The CHASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Satisfaction.

2.0 PROJECT SAFETY AUTHORITY

The following personnel are responsible for project health and safety under this CHASP.

- Project Manager – Mohamed Ahmed
- Health and Safety Officer (HSO) – Matthew Carroll

In addition, each individual working at the Site will be responsible for compliance with this CHASP and general safe working practices. All Site workers will have the authority to stop work if a potentially hazardous situation or event is observed.

2.1 Designated Personnel

The Project Manager is responsible for the overall operation of the project, including compliance with the CHASP and general safe work practices. The Project Manager may also act as the Health and Safety Officer (HSO) for this project.

Tenen will appoint one of its on-site personnel as the on-site HSO. This individual will be responsible for the implementation of the CHASP. The HSO will have a 4-year college degree in occupational safety or a related science/engineering field, and at least two (2) years of experience in implementation of air monitoring and hazardous materials sampling programs. The HSO will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards.

The HSO will be present on-site during all field operations involving drilling or other subsurface disturbance, and will be responsible for all health and safety activities and the delegation of duties to the field crew. The HSO has stop-work authorization, which he/she will execute on his/her determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation. If the HSO must be absent from the field, a replacement who is familiar with the Construction Health and Safety Plan, air monitoring and personnel protective equipment (PPE) will be designated.

3.0 HAZARD ASSESSMENT AND CONTROL MEASURES

Prior uses of Lots 16, 17, and 29 include a dental laboratory, a printing shop, and a laboratory, respectively. Regulatory records indicate that there is one (1) active 15,000-gallon fuel oil UST, one (1) closed-in-place 2,500-gallon fuel oil UST, and one (1) administratively closed 20,000-gallon fuel oil UST at 213 Duffield Street (Block 146, Lot 18). Regulatory records also indicate that one (1) 2,500-gallon fuel oil tank was removed from 213 Duffield Street in December 2006. Based upon historical information and the results of prior sampling investigations, petroleum-related contamination, metals, polyaromatic hydrocarbons (PAHs), pesticides, and PCBs may be encountered during investigation activities.

3.1 Human Exposure Pathways

The media of concern at the Site include potentially-impacted soil. Potential exposure pathways include dermal contact, incidental ingestion and inhalation of vapors. The risk of dermal contact and incidental ingestion will be minimized through general safe work practices, a personal hygiene program and the use of PPE. The risk of inhalation will be minimized through the use of an air monitoring program for volatile organic compounds and particulates.

3.2 Chemical Hazards

Based on historic research and sampling data, the following contaminants of concern are present at the Site:

VOCs

- Acetone

SVOCs

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Metals

- Barium
- Cadmium
- Copper
- Iron
- Lead
- Magnesium
- Mercury

- Nickel
- Silver
- Sodium
- Zinc

Pesticides
- 4,4'-DDT
- 4,4'-DDD
- 4-4'-DDE
- Dieldrin

Material Safety Data Sheets (MSDSs) for each contaminant of concern are included in Appendix C. All personnel are required to review the MSDSs included in this CHASP.

3.3 Physical Hazards

The physical hazards associated with the field activities likely present a greater risk of injury than the chemical constituents at the Site. Activities within the scope of this project shall comply with New York State and Federal OSHA construction safety standards.

Head Trauma

To minimize the potential for head injuries, field personnel will be required to wear National Institutes of Occupational Safety and Health (NIOSH)-approved hard hats during field activities. Hats must be worn properly and not altered in any way that would decrease the degree of protection provided.

Foot Trauma

To avoid foot injuries, field personnel will be required to wear steel-toed safety shoes while field activities are being performed. To afford maximum protection, all safety shoes must meet American National Standards Institute (ANSI) standards.

Eye Trauma

Field personnel will be required to wear eye protection (safety glasses with side shields) while field activities are being performed to prevent eye injuries caused by contact with chemical or physical agents.

Noise Exposure

Field personnel will be required to wear hearing protection (ear plugs or muffs) in high noise areas (noise from heavy equipment) while field activities are being performed. High noise areas are those areas in which a conversation can be clearly understand as each individual speaks at

normal level

Buried Utilities and Overhead Power Lines

Boring locations were cleared by an underground utility locator service during the Phase II Investigation in January 2014. In addition, prior to any intrusive activities, the drilling subcontractor will contact the One Call Center to arrange for a utility mark-out, in accordance with New York State requirements. Protection from overhead power lines will be accomplished by maintaining safe distances of at least 15 feet at all times.

Thermal Stress

The effects of ambient temperature can cause physical discomfort, personal injury, and increase the probability of accidents. In addition, heat stress due to lack of body ventilation caused by protective clothing is an important consideration. Heat-related illnesses commonly consist of heat stroke and heat exhaustion.

The symptoms of heat stroke include: sudden onset; change in behavior; confusion; dry, hot and flushed skin; dilated pupils; fast pulse rate; body temperature reaching 105° or more; and/or deep breathing, later followed by shallow breathing.

The symptoms of heat exhaustion include: weak pulse; general weakness and fatigue; rapid shallow breathing; cold, pale and clammy skin; nausea or headache; profuse perspiration; unconsciousness; and/or appearance of having fainted.

Heat-stress monitoring will be conducted if air temperatures exceed 70 degrees Fahrenheit. The initial work period will be set at 2 hours. Each worker will check his/her pulse at the wrist for 30 seconds early in each rest period. If the pulse rate exceeds 110 beats per minute, the next work period will be shortened by one-third.

One or more of the following precautions will reduce the risk of heat stress on the Site:

- Provide plenty of liquids to replace lost body fluids; water, electrolytic drinks, or both will be made available to minimize the risk of dehydration and heat stress
- Establish a work schedule that will provide appropriate rest periods
- Establish work regimens consistent with the American Conference of Governmental Industrial Hygienists (ACGIH) guidelines
- Provide adequate employee training on the causes of heat stress and preventive measures

In the highly unlikely event of extreme low temperatures, reasonable precautions will be made to avoid risks associated with low temperature exposure.

Traffic

Field activities will occur near public roadways. As a result, vehicular traffic will be a potential hazard during these activities and control of these areas will be established using barricades or traffic cones. Additional staff will be assigned, as warranted, for the sole purpose of coordinating traffic. Personnel will also be required to wear high-visibility traffic vests while working in the vicinity of the public roadways and local requirements for lane closure will be observed as needed. All work in public rights-of-way will be coordinated with local authorities and will adhere to their requirements for working in traffic zones.

Hazardous Weather Conditions

All Site workers will be made aware of hazardous weather conditions, specifically including extreme heat, and will be requested to take the precautions described herein to avoid adverse health risks. All workers are encouraged to take reasonable, common sense precautions to avoid potential injury associated with possible rain or high wind. Conditions of sleet, snow or freezing are extremely unlikely.

Slip, Trip and Fall

Areas at the Site may be slippery from mud or water. Great care should be taken by all Site workers to avoid slip, trip and fall hazards. Workers shall not enter areas that not have adequate lighting. Additional portable lighting will be provided at the discretion of the HSO.

Biological Hazards

Drugs and alcohol are prohibited from the Site. Any on-site personnel violating this requirement will be immediately expelled from the Site.

It is the responsibility of any worker or oversight personnel with a medical condition that may require attention should inform the HSO of such condition. The HSO will describe appropriate measures to be taken if the individual should become symptomatic.

Due to the Site location in an urban area, it is highly unlikely that poisonous snakes, spiders, plants, and insects will be encountered. However, other animals (dogs, cats, etc.) may be encountered, and care should be taken to avoid contact.

4.0 AIR MONITORING

The NYSDOH Generic Community Air Monitoring Plan (CAMP), included as Appendix 1A of DER-10, will be implemented during all ground-intrusive sampling and remedial activities. Continuous monitoring will be implemented during all soil handling activities and endpoint soil sampling. Air monitoring activities will be performed at all time during the excavation of the fill material on the entire site. The after the completion of the fill material excavation and during the excavation of the native soil, air monitoring will be performed once a week for the first month of excavation and twice per month for the remaining of excavation activities.

VOC Monitoring, Response Levels, and Actions

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

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down.
4. All 15-minute readings must be recorded and be available for New York City Office of Environmental Remediation (OER) review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.
3. All readings must be recorded and be available for OER review.

5.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protection equipment required for various kinds of site investigation tasks is based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, "General Description and Discussion of the Levels of Protection and Protective Gear."

Tenen field personnel and other site personnel will wear Level D personal protective equipment. During activities such as air monitoring and endpoint sampling, where there is a chance of contact with contaminated materials, modified Level D equipment will be worn. The protection will be upgraded to Level C if warranted by the results of the air monitoring. A description of the personnel protective equipment for Levels D and C is provided below.

Level D
Respiratory Protection: None
Protective Clothing: Hard hat, steel-toed shoes, long pants, nitrile gloves

Modified Level D
Respiratory Protection: None
Protective Clothing: Hard hat, steel-toed shoes, coveralls/tyvek, nitrile gloves

Level C
Respiratory Protection: Air purifying respirator with organic vapor cartridges and filters.
Protective Clothing: Same as modified Level D

6.0 EXPOSURE MONITORING

Selective monitoring of workers in the exclusion area may be conducted, as determined by the HSO, if sources of hazardous materials are identified. Personal monitoring may be conducted in the breathing zone at the discretion of the Project Manager or HSO and, if workers are wearing respiratory protective equipment, outside the face-piece.

7.0 SITE ACCESS

Access to the Site during the investigation will be controlled by the Project Manager or HSO. Unauthorized personnel will not be allowed access to the Site.

8.0 WORK AREAS

During any activities involving soil disturbance, the work area must be divided into various zones to prevent the spread of contamination, clarify the type of protective equipment needed, and provide an area for decontamination.

The Exclusion Zone is defined as the area where potentially contaminated materials are generated as the result of drilling, sampling, or similar activities. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located adjacent to the Exclusion Zone. The Support Zone is the area where support facilities such as vehicles, a field phone, fire extinguisher and/or first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all Site workers will assemble in the event of an emergency. These zones shall be designated daily, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

Control measures such as "Caution" tape and traffic cones will be placed around the perimeter of the work area when work is being done in the areas of concern (i.e., areas with exposed soil) to prevent unnecessary access.

9.0 DECONTAMINATION PROCEDURES

Personnel Decontamination

Personnel decontamination (decon), if deemed necessary by the HSO, will take place in the designated decontamination area delineated for each sampling location. Personnel decontamination will consist of the following steps:

- Soap and potable water wash and potable water rinse of gloves;
- Tyvek removal;
- Glove removal;
- Disposable clothing removal; and
- Field wash of hands and face.

Equipment Decontamination

Sampling equipment, such as split-spoons and bailers, will be decontaminated in accordance with U.S. Environmental Protection Agency methodologies, as described in the work plan. Because site soil is considered essentially non-hazardous, there is no need to decontaminate vehicles used for transporting equipment and personnel over the Site.

Disposal of Materials

Purged well water, water used to decontaminate any equipment and well cuttings will be containerized and disposed off-site in accordance with federal, state and local regulations.

10.0 GENERAL SAFE WORK PRACTICES

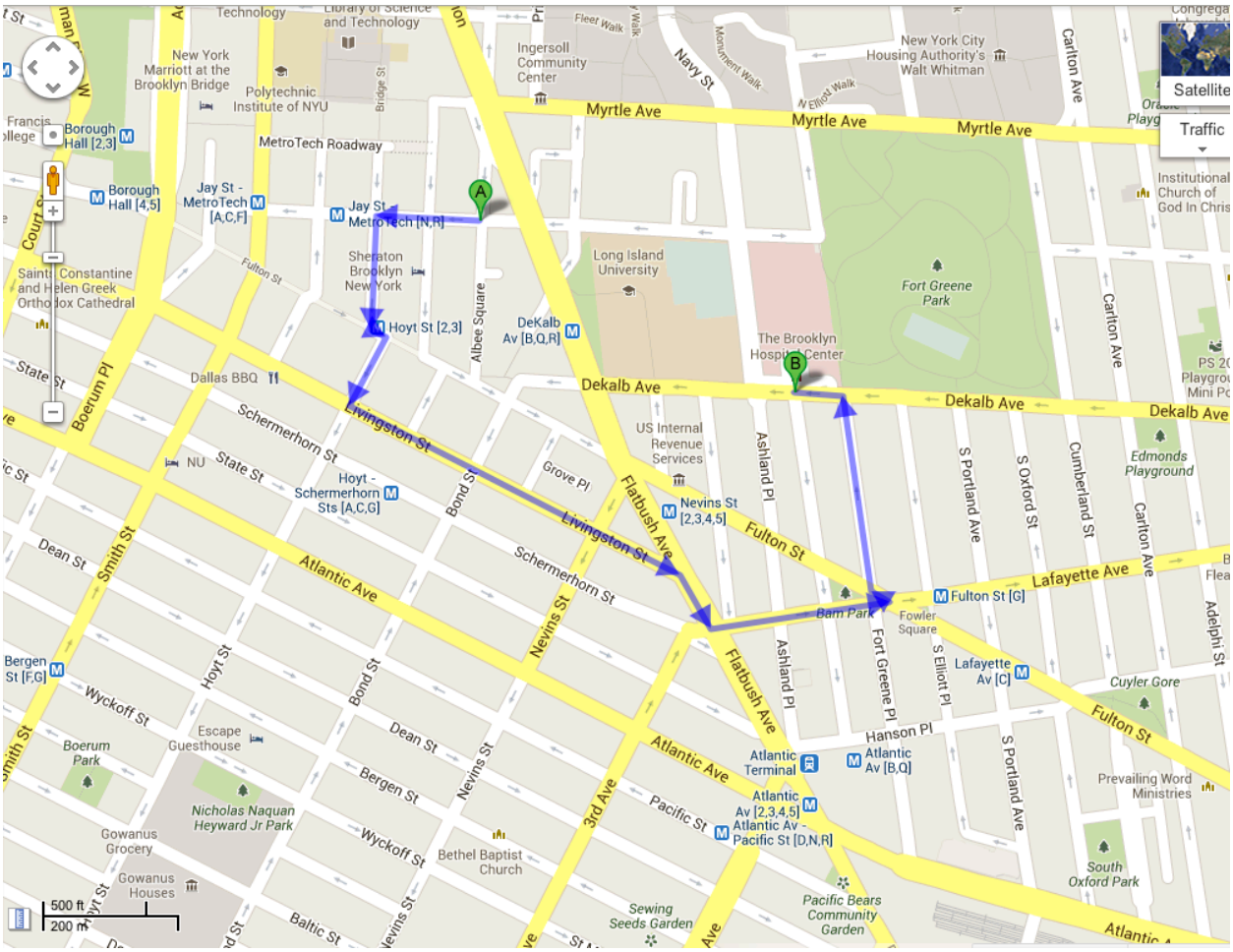
To protect the health and safety of the field personnel, all field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance.

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the HSO.
- Workers must wash their hands and face thoroughly on leaving the work area and before eating, drinking, or any other such activity. The workers should shower as soon as possible after leaving the site.
- Removal of potential contamination from PPE and equipment by blowing, shaking or any means that may disperse materials into the air is prohibited.
- Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat stress.
- Personnel will be cautioned to inform each other of symptoms of chemical exposure such as headache, dizziness, nausea, and irritation of the respiratory tract and heat stress.
- No excessive facial hair that interferes with a satisfactory fit of the face-piece of the respirator to the face will be allowed on personnel required to wear respiratory protective equipment.
- On-site personnel will be thoroughly briefed about the anticipated hazards, equipment requirements, safety practices, emergency procedures, and communications methods.

11.0 EMERGENCY PROCEDURES

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the HSO will determine the nature of the emergency and will have someone call for an ambulance, if needed. If the nature of the injury is not serious—i.e., the person can be moved without expert emergency medical personnel—on-site personnel should drive him to a hospital. **The nearest emergency room is at Brooklyn Hospital Center Downtown Campus.** The route to the hospital is shown and detailed on the next page.

11.1 Route to Hospital – The Brooklyn hospital Center Downtown Campus – 121 DeKalb Avenue (emergency room entrance on ground floor of main hospital building)



Directions to Hospital:

1. Head west on Willoughby Street toward Duffield Street
2. Take the 2nd left onto Bridge Street
3. Take the 1st left onto Fulton Street/Fulton Mall
4. Take the 1st right onto Hoyt Street
5. Take the 1st left onto Livingston Street
6. Make a slight right onto Flatbush Avenue
7. Take the 1st left onto Lafayette Avenue
8. Make a sharp left onto Fulton Street
9. Take the 1st right onto Fort Greene Place
10. Turn left onto DeKalb Avenue – the Hospital is on the right

The emergency room entrance is on the floor of the main hospital building on DeKalb Avenue.

11.2 Emergency Contacts

There will be an on-site field phone. Emergency and contact telephone numbers are listed below:

Table 1 – Emergency Contacts

Ambulance	911
Emergency Room	(718) 250-8075
NYSDEC Spill Hotline	(800) 457-7362
Tenen Project Manager, Mohamed Ahmed	(917) 612-6018 (mobile)
HSO, Matthew Carroll	(646) 827-1061 (mobile)
Client, Nada Ivkovic	(516) 644-1046 (mobile)

12.0 TRAINING

All personnel performing the field activities described in this CHASP will have received the initial safety training required by 29 CFR, 1910.120. Current refresher training status also will be required for all personnel engaged in field activities.

All those who enter the work area while intrusive activities are being performed must recognize and understand the potential hazards to health and safety. All field personnel must attend a training program covering the following areas:

- potential hazards that may be encountered;
- the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- the purpose and limitations of safety equipment; and
- protocols to enable field personnel to safely avoid or escape from emergencies.

Each member of the field crew will be instructed in the above objectives before he/she goes onto the site. The HSO will be responsible for conducting the training program.

13.0 MEDICAL SURVEILLANCE

All Tenen and subcontractor personnel performing field work involving drilling or other subsurface disturbance at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). The medical examination for Tenen employees will, at a minimum, be provided annually and upon termination of hazardous waste site work.

Appendix A
Acknowledgement of CHASP

ACKNOWLEDGMENT OF CHASP

Below is an affidavit that must be signed by all Tenen Environmental employees who enter the site. A copy of the CHASP must be on-site at all times and will be kept by the HSO.

AFFIDAVIT

I have read the Construction Health and Safety Plan (CHASP) for the Willoughby Square Site. I agree to conduct all on-site work in accordance with the requirements set forth in this CHASP and understand that failure to comply with this CHASP could lead to my removal from the site.

Signature: _____ Date: _____
Signature: _____ Date: _____
Signature: _____ Date: _____
Signature: _____ Date: _____
Signature: _____ Date: _____

Appendix B

Injury Reporting Form (OSHA Form 300)

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20__ __

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name _____

City _____ State _____

Identify the person			Describe the case			Classify the case — CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
								Remained at Work									
(A) Case no.	(B) Employee's name	(C) Job title (*e.g., Welder*)	(D) Date of injury or onset of illness	(E) Where the event occurred (*e.g., Loading dock north end*)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (*e.g., Second degree burns on right forearm from acetylene torch*)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other recordable cases (J)	Away from work (K)	On job transfer or restriction (L)	(M) Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
____	_____	_____	___/___ month/day	_____	_____	☐	☐	☐	☐	____ days	____ days	☐	☐	☐	☐	☐	☐
					Page totals ➤	____	____	____	____	____	____	____	____	____	____	____	____
												Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Appendix C

Material Safety Data Sheets (MSDS)

P.O. Box 864 • 135 Redstone Street
Southington, CT 06489 U.S.A

Toll Free: (800)-4-midsun (U.S.A. only)
(860) 378-0100 • (860) 378-0103 (Fax)
www.midsungroup.com

Acetone Material Safety Data Sheet (MSDS)

MANUFACTURER'S CONTACT INFORMATION:

Sunoco, Inc. (R&M)
1735 Market Street LL
Philadelphia, Pennsylvania 19103-7583

EMERGENCY
Sunoco: (800) 964-8861
Chemtrec: (800) 424-9300
Product Safety: (610) 859-1120

I. Product Identification	
Trade Name	Acetone
Product Use	Chemical Intermediate

II. Hazardous Ingredients of Material			
Components	**Amount (Vol. %)**	**CAS No.**	**ACGIH TLV**
Acetone	100	67-64-1	–
Exposure Limits (See Section VI for additional Exposure Limits)			
Governing Body	**CAS No.**		**Exposure Limits**
ACGIH	67-64-1		STEL 750 ppm
ACGIH	67-64-1		TWA 500 ppm
OSHA	67-64-1		TWA 1,000 ppm

Emergency Overview:
Danger! Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Harmful if inhaled. Vapor concentrations may cause drowsiness. Causes skin and eye irritation. Harmful if swallowed. May cause target organ or system damage to the following: Eye, skin, respiratory system, central nervous system.

HAZARD RATINGS

Key: 0 = Least 1 = Slight 2 = Moderate 3 = High 4 = Extreme

	Health	Fire	Reactivity	PPI
NFPA	1	3	0	
HMIS	1	3	0	X

III. Physical/Chemical Data	
Appearance & Odor	Colorless liquid
Boiling Point	133° F
Melting Point	-137.2° F
Specific Gravity	0.79
Molecular Weight g/mole	58.08
pH	7
Odor	Sweet, pungent
Odor Threshold	62 ppm
Vapor Pressure (mm Hg @20° C)	181
Solubility in Water	Complete
Volatile (wt %)	100%

IV. Fire and Explosion Data	
Flash Point	1.4
Flammable Limits in Air (% By Volume)	
Lower	2.5%
Upper	12.8%
Auto Ignition Temperature	869º F
Unusual Fire & Explosion Hazards	Use water spray. Use water spray to cool fire exposed tanks and containers. Acetone/water solutions that contain more than 2.5% acetone have flash points. When the acetone concentration is greater than 8% (by weight) in a closed container, it would be within flammable range and cause fire or explosion if a source of ignition were introduced.
Fire Extinguishing Media	Water spray, alcohol resistant foam, dry chemical or carbon dioxide.

V. Reactivity Data	
Stability	Stable
Conditions to Avoid	Avoid heat, sparks and open flame.
Incompatibility	Acetone may form explosive mixtures with chromic anhydride, chromyl alcohol, hexacholromelamine, hydrogen peroxide, permonosulfuric acid, potassium terbutoxide and thioglycol. Strong oxidizers.
Hazardous Decomposition	May produce carbon dioxide, carbon monoxide and other asphyxiants.
Hazardous Polymerization	Will not occur.

VI. Health Hazard and Toxicological Data	
Pre-existing Medical Conditions: The following diseases or disorders may be aggravated by exposure to this product. Skin, eye, lung (asthma-like conditions).	
Chronic Exposure	**Effects of Exposure**
Eyes	Contact with the eye may cause moderate to severe irritation.
Skin	Moderately irritating to the skin. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash). LD50 mg/kg Rabbit, 20,000 Draize Skin Score: no data Out of 8.0
Inhalation	High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headache, paralysis and loss of consciousness and even death).High vapor concentrations are irritating to the eyes, nose, throat and lungs. LC50 (mg/1) no data LC50 (mg/m^3) Rat 8 hrs. 50,000 LC50 (ppm) no data
Ingestion	Product may be harmful or fatal if swallowed. Pulmonary aspiration hazard. After ingestion, may enter lungs and produce damage. May produce central nervous system effects, which may include dizziness, loss of balance and coordination, unconsciousness, coma and even death. LD50 (g/kg) Rat 5.8

VII. First Aid Procedures	
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen and continue to monitor. Get immediate medical attention.
Eye Contact	Flush eye(s) with water for 15 minutes. Get medical attention.
Skin Contact	Immediately flush skin with plenty of water. Remove clothing. Get medical attention immediately. Wash clothes separately before reuse.
Ingestion	If swallowed, DO NOT INDUCE VOMITING. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. Get medical attention immediately. See Section X for additional first aid information.

VIII. Preventive Measures **Consult with a Health and Safety Professional for Specific Selections**	
A. PERSONAL PROTECTIVE EQUIPMENT	
Respiratory Protection	Concentrations in air determines the level of respiratory protection needed. Use only NIOSH certified respiratory equipment. Half-mask air purifying respirator with organic vapor cartridges is acceptable for exposure to ten (10) times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable for exposures to fifty (50) times the exposure limit. Exposure should not exceed the cartridge limit of 1000 ppm. Protection by air purifying respirators is limited. Use a positive pressure-demand full-face supplied air respirator or SCBA for exposures greater than fifty (50) times the exposure limit. If exposure is above the IDLH (Immediately Dangerous to Life and Health) or there is a possibility of an uncontrolled release, or exposure levels are unknown, then use a positive pressure-demand full-face air respirator with escape bottle or SCBA. Wear a NIOSH-approved (or equivalent) full-face piece airline respirator in the positive pressure mode with emergency escape provisions.
Eye/Face Protection	Splash proof chemical goggles or full-face shield recommended to protect against splash of product.
Clothing/Gloves	The glove(s) list below may provide protection against permeation. Gloves or other chemically resistant materials may not provide adequate protection. Protective gloves are recommended to protect against contact with product. Neoprene, Natural rubber.
Engineering Controls	Use with adequate ventilation. Ventilation is normally required when handling or using this product to keep exposure to airborne contaminants below the exposure limit. Use explosion-proof ventilation equipment.
Other	The following materials are acceptable for use as protective clothing; Neoprene, Natural rubber. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Remove contaminated clothing and wash before reuse.
B. STORAGE AND HANDLING	
Storage Conditions	Keep away from heat, sparks and flame. Store in a cool, dry place. Keep container closed when not in use.
Handling Procedure	Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid breathing (dust, vapor, mist, gas). Avoid contact with this material. Wash thoroughly after handling. Do not use air pressure to unload containers.

Continued on Next Page

VIII. Preventive Measures (Continued)	
C. ENVIRONMENTAL PROTECTION	
Spill and Leak Procedure	Prevent ignition, stop leak and ventilate the area. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Use appropriate personal protective equipment as stated in Section VIII of this MSDS. Advise the Environmental Protection Agency (EPA) and appropriate state agencies, if required. U.S. regulations require reporting spills of this material could that reach any surface waters. The toll-free number for the U.S. Coast Guard National Response Center is (800) 424-8802. After removal, flush contaminated area thoroughly with water.
Waste Disposal	Follow federal, state and local regulations. In Canada, follow federal, provincial and local regulations. This material is a RCRA hazardous waste. DO NOT flush material to drain or storm sewer. Contract to authorized disposal service.
Ecological Information	This product is not expected to persist in the environment.
D. TRANSPORTATION INFORMATION	
Governing Body	U.S. DOT
Proper Shipping Name	Acetone
Mode	Ground
Hazard Class	3 (Flammable Liquid)
UN/NA Number	UN1090

IX. Regulatory Information/Classifications		
Regulatory List	**Component**	**CAS Number**
ACGIH – Occupational Exposure Limits – Carcinogens	Acetone	67-64-1
ACGIH – Occupational Exposure Limits – TWAs	Acetone	67-64-1
ACGIH – Short Term Exposure Limits	Acetone	67-64-1
CAA (Clean Air Act) – HON Rule – SOCMI Chemicals	Acetone	67-64-1
Canada – WHMIS – Ingredient Disclosure	Acetone	67-64-1
CERCLA/SARA – Hazardous Substances and their RQs	Acetone	67-64-1
CERCLA/SARA – Hazardous Substances and their RQs	Acetone	67-64-1
CERCLA/SARA – Hazardous Substances and their RQs	Acetone	67-64-1
Inventory – Australia – (AICS)	Acetone	67-64-1
Inventory – Canada – Domestic Substances List	Acetone	67-64-1
Inventory – China	Acetone	67-64-1
Inventory – European – EINECS Inventory	Acetone	67-64-1
Inventory – Japan – (ENCS)	Acetone	67-64-1
Inventory – Korea – Existing and Evaluated	Acetone	67-64-1
Inventory – Philippines – (PICCS)	Acetone	67-64-1
Inventory – TSCA – Section 8(b) Inventory	Acetone	67-64-1
Massachusetts – Right to Know List	Acetone	67-64-1
New Jersey – Department of Health RTK List	Acetone	67-64-1
New Jersey – Special Hazardous Substances	Acetone	67-64-1
OSHA – Final PELs – Time Weighed Averages	Acetone	67-64-1
Pennsylvania – Right to Know List	Acetone	67-64-1
TSCA – Section 12(b) – Export Notification	Acetone	67-64-1
TSCA – Section 4 – Chemical Test Rules	Acetone	67-64-1

Continued on Next Page

IX. Regulatory Information/Classifications - Continued

Regulatory Information/Classifications Title III, Sections 311, 312

Acute	Chronic	Fire	Reactivity	Sudden Release of Pressure
YES	NO	YES	NO	NO

X. Other Information

If swallowed, acetone should be removed by emesis and/or gastric lavage. Mechanical assisted ventilation may be necessary. In severe cases, an initial period of hypoglycemia may require correction by intravenous solutions of dextrose. In some cases, an initial period of hyperglycemia has occurred during the recovery phase and has lasted for a few days. Treatment with insulin may be beneficial but should be used cautiously. Empty containers retain product residue (liquid and/or vapor) and can be dangerous. DO NOT pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner or properly disposed of. This product is subject to the Chemical Division and Trafficking Act of 1988 and subject to specific record keeping requirements. WHMIS Classification: Class B, Division 2 – Flammable Liquids.

The information contained in this Material Safety Data Sheet is furnished without warranty of any kind, express or implied, and relates only to the specific material designated herein. User assumes responsibility for use or reliance on this data and assumes liability for damages related to the use or misuse of this product. The user is responsible for determining the conditions of safe use of this product and for complying with all Federal, State and Local governmental laws and regulations.

Material Safety Data Sheet

Version 4.0
Revision Date 03/12/2010
Print Date 11/10/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	4,4'-DDD PESTANAL,250 MG (2,2-BIS(4-CHL&
Product Number	:	35486
Brand	:	Fluka
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane
4,4′-DDD
TDE

Formula : $C_{14}H_{10}Cl_4$
Molecular Weight : 320.04 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane			
72-54-8	200-783-0	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	94.0 - 96.0 °C (201.2 - 204.8 °F)
Boiling point	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)
Density	1.38 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.02

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg
Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg
Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg
Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex).

LD50 Dermal - rabbit - 1,200 mg/kg
Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: KI0700000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - other fish - 1.18 - 9 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
Indication of bioaccumulation.

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: No

IATA
UN-Number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

OSHA Hazards
Toxic by ingestion, Harmful by skin absorption., Possible carcinogen.

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	

16. OTHER INFORMATION

Further information
Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 02/02/2011
Print Date 11/10/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene
Product Number	:	35487
Brand	:	Fluka
Product Use	:	For laboratory research purposes.
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Manufacturer	:	Sigma-Aldrich Corporation 3050 Spruce St. St. Louis, Missouri 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Harmful by ingestion.

GHS Classification
Acute toxicity, Oral (Category 4)
Carcinogenicity (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.
P281	Use personal protective equipment as required.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	1

Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin Harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{14}H_8Cl_4$
Molecular Weight : 318.03 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene			
72-55-9	200-784-6	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting/freezing point	88.0 - 90.0 °C (190.4 - 194.0 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg)
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 6.51
Relative vapour density	no data available

Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents, Strong bases

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 880.0 mg/kg

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 0.2 - 0.3 mg/l - 96.0 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.03 - 0.04 mg/l - 96.0 h
	LC50 - Salmo salar (Atlantic salmon) - 0.05 - 0.18 mg/l - 96.0 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Gambusia affinis (Mosquito fish) - 33 d Bioconcentration factor (BCF): 12,037

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:
Poison Inhalation Hazard: No

IMDG
UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)
Marine pollutant: Marine pollutant

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Harmful by ingestion.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	72-55-9	

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. 2,2-bis(p-Chlorophenyl)-1,1-dichloroethylene	CAS-No. 72-55-9	Revision Date

16. OTHER INFORMATION

Further information

Copyright 2011 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

4,4'-DDT

sc-238975

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
4,4'-DDT

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA

SUPPLIER
Company: Santa Cruz Biotechnology, Inc.
Address:
2145 Delaware Ave
Santa Cruz, CA 95060
Telephone: 800.457.3801 or 831.457.3800
Emergency Tel: CHEMWATCH: From within the US and Canada: 877-715-9305
Emergency Tel: From outside the US and Canada: +800 2436 2255 (1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE
Insecticide for tobacco and cotton, pesticide (tussock moth). Intermediate

SYNONYMS
C14-H9-Cl5, "1, 1' -(2, 2, 2-trichloroethylidene) bis [4-chlorobenzene]", "1, 1' -(2, 2, 2-trichloroethylidene) bis [4-chlorobenzene]", "1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)ethane", "1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)ethane", "ethane, 1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)", "ethane, 1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)", "benzene, 1, 1' -(, 2, 2-trichloroethylidene)bis(4-chloro)-", "benzene, 1, 1' -(, 2, 2-trichloroethylidene)bis(4-chloro)-", "alpha, alpha-bis(p-chlorophenyl)-beta, beta, beta-trichloroethane", "1, 1-bis-(p-chlorophenyl)-2, 2, 2-trichloroethane", "1, 1-bis-(p-chlorophenyl)-2, 2, 2-trichloroethane", "2, 2-bis(p-chlorophenyl)-1, 1, 1-trichloroethane", "2, 2-bis(p-chlorophenyl)-1, 1, 1-trichloroethane", "p, p' -DDT", "p, p' -DDT", "diphenyl trichloroethane", dichlorodiphenyltrichloroethane, "p, p-dichlorodiphenyltrichloroethane", "p, p-dichlorodiphenyltrichloroethane", "4, 4' -dichlorodiphenyltrichloroethane", "4, 4' -dichlorodiphenyltrichloroethane", Agritan, Anofex, Arkotine, Azotox, "Bosan supra", Bovidermal, Chlorophenothane, Chlorophenotoxum, Citox, Clofenotane, Dedelo, Deoval, Ditoxan, Dibovan, Dicophane, Didigam, Didimac, Dodat, Dykol, Estonate, Genitox, Gesafid, Gesapon, Gesarex, Gesarol, Guesapon, Guesarol, Gyron, Havero-extra, Hildit, Ivoran, Ixodex, Kopsal, Mutoxin, Neocid, OMS-16, Parachlorodicum, Peb1, Pentachlorin, Zeidane, Zerdane, insecticide

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW
RISK
Limited evidence of a carcinogenic effect.

Toxic: danger of serious damage to health by prolonged exposure if swallowed.
Toxic in contact with skin and if swallowed.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.
■ Organochlorine pesticides excite the central nervous system, causing shortness of breath, cough, narrowing of airways and throat spasms. In the muscles it can cause twitches, spastic movements and seizures. Headache, dizziness and confusion may result as well as a feeling of warmth. Other symptoms include nausea, vomiting, diarrhea and difficulty in urination. There may be alterations in blood pressure or irregularities in heart rhythm. Delayed poisoning may occur after 30 minutes to several hours. Symptoms may include diarrhea, stomach pain, headache, dizziness, inco-ordination, "pins and needles", restlessness, irritability, confusion and tremors, progressing to stupor, coma and epilepsy-like or spastic seizures with frothing at the mouth, a contorted face, violent convulsions and limb stiffness. Tremors may spread from the face to the torso and limbs. Severe poisoning may cause continuous convulsion, fever, unconsciousness, labored breathing, rapid heartbeat and general depression; this is followed by lack of oxygen, collapse of breathing, and death. Kidney damage and inflammation and anemia has also been reported.
■ Earliest symptom of exposure to DDT is a prickling or tingling sensation in the mouth, tongue and lower face. This is followed by dizziness, abdominal pain, headache, nausea, vomiting, diarrhoea, mental confusion, a sense of apprehension, weakness, loss of muscle control and tremors. Higher exposures can cause severe convulsions followed by death.
Symptoms may occur within 30 minutes to 6 hours after exposure, depending upon the severity of the exposure. DDT and its analogues may cause gastrointestinal effects.

EYE

■ Although the material is not thought to be an irritant, direct contact with the eye may cause transient discomfort characterized by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals.

SKIN

■ Skin contact with the material may produce toxic effects; systemic effectsmay result following absorption.
■ The material is not thought to be a skin irritant (as classified using animal models). Abrasive damage however, may result from prolonged exposures. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of dusts, or fume, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
■ Inhalation of dusts, generated by the material during the course of normal handling, may be damaging to the health of the individual.
■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

CHRONIC HEALTH EFFECTS

■ There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.
There is some evidence to provide a presumption that human exposure to the material may result in impaired fertility on the basis of: some evidence in animal studies of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects but which is not a secondary non-specific consequence of other toxic effects.
The following chronic health effects can occur some time after exposure to DDT and can last for months or years. There is some evidence that it causes cancer in humans and it has been shown to cause liver cancer in animals.
DDT may damage the liver and kidneys, damage the developing fetus and decrease fertility in males and females, and cause central nervous system degeneration.
High doses of o,p'-DDT fed to immature female rats exert clear oestrogenic effects. Males fed 1 ppm o,p'-DDT from birth had significantly heavier bodies, testes and seminal vesicles at day 112. In a another study adult male rats treated with o,p'-DDT showed decreased corticosterone formed from progesterone in the adrenals and lowered unchanged progesterone. In brain metabolism, treatment with o,p'-DDT increased dihydrotestosterone from testosterone while androstenediol decreased. The authors concluded that the effects of o,p'-DDT administration are a decrease in plasma testosterone and in androgen biosynthesis, and an increase in plasma oestradiol.
Exposure to organochlorine pesticides for long periods can cause multiple nervous system infections and disorders involving the brain and autonomic nerves with headache, dizziness, "pins and needles", tremor in the limbs, disturbances in nerves supplying blood vessels, pain in the bowel and stiffening of the bile duct, rapid heartbeat, hollow heart sounds and a tight pain in the chest. There can be blood problems with loss of platelets and white blood cells, change in blood cell distribution, anemia, loss of appetite and weight. There may be disturbed behavior. Some organochlorines may have female sex hormone-like effects, causing withering of the testicles, reduced fertility and disturbed sexual activity.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max
Flammability:	1		

Toxicity:	3	
Body Contact:	3	
Reactivity:	1	
Chronic:	3	

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

NAME	CAS RN	%
DDT	50-29-3	>99
(dichlorodiphenyltrichloroethane)		

Section 4 - FIRST AID MEASURES

SWALLOWED

■

- Give a slurry of activated charcoal in water to drink. NEVER GIVE AN UNCONSCIOUS PATIENT WATER TO DRINK.
- At least 3 tablespoons in a glass of water should be given.
- Although induction of vomiting may be recommended (IN CONSCIOUS PERSONS ONLY), such a first aid measure is dissuaded because to the risk of aspiration of stomach contents. (i) It is better to take the patient to a doctor who can decide on the necessity and method of emptying the stomach. (ii) Special circumstances may however exist; these include non- availability of charcoal and the ready availability of the doctor.

NOTE: If vomiting is induced, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear protective gloves when inducing vomiting.

- REFER FOR MEDICAL ATTENTION WITHOUT DELAY.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

(ICSC20305/20307).

EYE

■ If this product comes in contact with the eyes:

- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Center or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

■ If skin or hair contact occurs:

- Quickly but gently, wipe material off skin with a dry, clean cloth.
- Immediately remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Center.
- Transport to hospital, or doctor.

INHALED

■

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

NOTES TO PHYSICIAN

■ Organochlorines are well absorbed from the lungs, gastrointestinal tract and skin.

- Intoxication from acute oral exposures generally begins within 45 minutes to several hours.
- Diazepam is the anticonvulsant of choice. [Phenobarbitone, sodium phenobarbitone or in repeated convulsions sodium pentothal (2.5% solution) may also be given - calcium gluconate may also be helpful] (Manufacturers; David Gray and Hoechst)
- Usual methods of decontamination (Ipecac / lavage / charcoal / cathartics) are recommended within the first several hours following exposure.
- Dialysis, diuresis and hemoperfusion are ineffective because of extensive tissue binding and large volumes of distribution.
- There is no antidote.

[Ellenhorn and Barceloux: Medical Toxicology].

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Not applicable
Upper Explosive Limit (%):	Not Available
Specific Gravity (water=1):	Not available
Lower Explosive Limit (%):	Not Available

EXTINGUISHING MEDIA

■

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

FIRE FIGHTING

■

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO_2), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.
May emit poisonous fumes.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids,chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

■

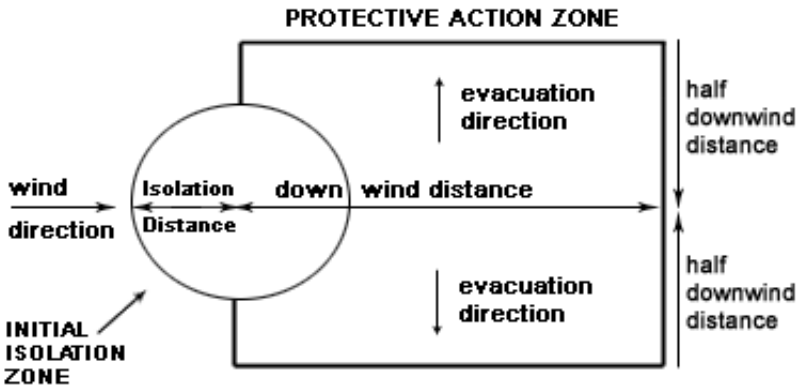
- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
- Dampen with water to prevent dusting before sweeping.
- Place in suitable containers for disposal.

MAJOR SPILLS

■

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labeled containers for recycling.
- Neutralize/decontaminate residue.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)	
Isolation Distance	25 meters
Downwind Protection Distance	250 meters

FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
5 Guide 151 is taken from the US DOT emergency response guide book.
6 IERG information is derived from CANUTEC - Transport Canada.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

■

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

RECOMMENDED STORAGE METHODS

■

- Lined metal can, Lined metal pail/drum
- Plastic pail
- Polyliner drum
- Packing as recommended by manufacturer.
- Check all containers are clearly labeled and free from leaks.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):

- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages * . - In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *. - * unless the outer packaging is a close fitting molded plastic box and the substances are not incompatible with the plastic.

STORAGE REQUIREMENTS

■

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X + X X +

X: Must not be stored together
O: May be stored together with specific preventions
+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - California Permissible Exposure Limits for Chemical Contaminants	DDT (DDT; 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane)		1						
Canada - Ontario Occupational Exposure Limits	DDT (1,1,1-Trichloro-2,2-bis-(p-chlorophenyl)ethane)		1						
US - Minnesota Permissible Exposure Limits (PELs)	DDT (Dichlorodiphenyltrichloroethane (DDT))		1						
US - Idaho - Limits for Air Contaminants	DDT (Dichlorodiphenyltrichloroethane (DDT))		1						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	DDT (Dichlorodiphenyltri-chloroethane (DDT))		1						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	DDT (Dichlorodiphenyltrichloroethane (DDT))		1						
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	DDT (Dichlorodiphenyltri-chloroethane (DDT))		1						
US - Alaska Limits for Air Contaminants	DDT (Dichlorodiphenyl-trichloroethane (DDT))		1						
US - Michigan Exposure Limits for Air Contaminants	DDT (Dichlorodiphenyltri-chloroethane(DDT))		1						
US - Hawaii Air Contaminant Limits	DDT (DDT (Dichlorodiphenyl-trichloroethane))		1		3				
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	DDT (DDT (Dichlorodiphenyl-trichloroethane))	-	1	-	3				
US - Washington Permissible exposure limits of air contaminants	DDT (DDT (Dichlorodiphenyltri-chloroethane))		1		3				
Canada - Northwest Territories									

Canada - Northwest Territories Occupational Exposure Limits (English)	DDT (DDT (Dichlorodiphenyltrichloroethane))	1	3	
US ACGIH Threshold Limit Values (TLV)	DDT (DDT [Dichlorodiphenyltrichloroethane])	1		TLV Basis: liver damage
US NIOSH Recommended Exposure Limits (RELs)	DDT	0.5		
US OSHA Permissible Exposure Levels (PELs) - Table Z1	DDT (Dichlorodiphenyltrichloroethane (DDT))	1		
Canada - Nova Scotia Occupational Exposure Limits	DDT (DDT [Dichlorodiphenyltrichloroethane])	1		TLV Basis: liver damage
Canada - Prince Edward Island Occupational Exposure Limits	DDT (DDT [Dichlorodiphenyltrichloroethane])	1		TLV Basis: liver damage
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	DDT (Diesel fuel as total hydrocarbons, (vapour))	100	150	Skin
Canada - Alberta Occupational Exposure Limits	DDT (Diesel fuel, as total hydrocarbons)	100		
Canada - Alberta Occupational Exposure Limits	DDT (Kerosene/Jet fuels, as total hydrocarbon vapour)	200		
Canada - Alberta Occupational Exposure Limits	DDT (DDT (Dichlorodiphenyl trichloroethane))	1		
Canada - British Columbia Occupational Exposure Limits	DDT (DDT (Dichloro-diphenyltrichloroethane))	1		2B
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	DDT (DDT (Dichlorodiphenyltrichloro-ethane))	1	3	T20
US - Oregon Permissible Exposure Limits (Z1)	DDT (Dichlorodiphenyltrichloroethane (DDT))	1		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	DDT (DDT (Dichlorodiphenyltrichloroethane))	1		
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	DDT (Dichlorodiphenyltri-chloroethane (DDT))	1		
Canada - British Columbia Occupational Exposure Limits	DDT (Diesel fuel, as total hydrocarbons, Inhalable)	100 (V)		Skin

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
DDT	500	

MATERIAL DATA

DDT:

■ for DDT:

The TLV-TWA is thought to provide a wide margin of safety in the prevention of acute poisoning and also is thought to be protective against the significant risk of accumulation in body stores.

Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

PERSONAL PROTECTION

Consult your EHS staff for recommendations

EYE

■
- Safety glasses with side shields
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

HANDS/FEET

■ Wear chemical protective gloves, eg. PVC.
Wear safety footwear or safety gumboots, eg. Rubber.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).
- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

■
- Overalls.
- Eyewash unit.
- Barrier cream.
- Skin cleansing cream.

■
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

RESPIRATOR

■

Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
10 x PEL	P1	-	PAPR-P1
	Air-line*	-	-
50 x PEL	Air-line**	P2	PAPR-P2
100 x PEL	-	P3	-
		Air-line*	-
100+ x PEL	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow
Explanation of Respirator Codes:
Class 1 low to medium absorption capacity filters.
Class 2 medium absorption capacity filters.
Class 3 high absorption capacity filters.
PAPR Powered Air Purifying Respirator (positive pressure) cartridge.
Type A for use against certain organic gases and vapors.
Type AX for use against low boiling point organic compounds (less than 65ºC).
Type B for use against certain inorganic gases and other acid gases and vapors.
Type E for use against sulfur dioxide and other acid gases and vapors.
Type K for use against ammonia and organic ammonia derivatives
Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.
Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.
Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.
The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

■
- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:

(a): particle dust respirators, if necessary, combined with an absorption cartridge;
(b): filter respirators with absorption cartridge or canister of the right type;
(c): fresh-air hoods or masks
- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.

- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Does not mix with water.

State	Divided solid	Molecular Weight	354.48
Melting Range (°F)	227.3	Viscosity	Not Applicable
Boiling Range (°F)	Not available	Solubility in water (g/L)	Immiscible
Flash Point (°F)	Not Available	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapour Pressure (mmHG)	Not applicable
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	Not available
Lower Explosive Limit (%)	Not Available	Relative Vapor Density (air=1)	Not Applicable
Volatile Component (%vol)	Not applicable	Evaporation Rate	Not applicable
Gas group	IIA		

APPEARANCE

Colourless crystals or white to slightly off-white powder. Odourless or with slight aromatic odour. Insoluble in water; soluble in acetone, benzene, carbon tetrachloride, ether, kerosene, dioxane and pyridine. Since DDT is not biodegradable and is ecologically damaging, its agricultural use in the USA was prohibited in 1973.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

■

- Avoid strong bases.

Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

DDT

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 87 mg/kg	Nil Reported

Oral (human infant) LDLo: 150 mg/kg
Oral (man) TDLo: 6 mg/kg
Oral (human) TDLo: 16 mg/kg
Oral (human) LDLo: 500 mg/kg
Oral (human) TDLo: 5 mg/kg
Dermal (rat) LD50: 1931 mg/kg
Dermal (rabbit) LD50: 300 mg/kg

■ For DDT:

DDT is moderately to slightly toxic to studied mammalian species via the oral route. Toxicity will vary according to formulation . DDT is readily absorbed through the gastrointestinal tract, with increased absorption in the presence of fats .

One-time administration of DDT to rats at doses of 50 mg/kg led to decreased thyroid function and a single dose of 150 mg/kg led to increased blood levels of liver-produced enzymes and changes in the cellular chemistry in the central nervous system of monkeys. Single doses of 50-160 mg/kg produced tremors in rats, and single doses of 160 mg/kg produced hind leg paralysis in guinea pigs. Mice suffered convulsions following a one-time oral dose of 200 mg/kg. Single administrations of low doses to developing 10- day old mice are reported to have caused subtle effects on their neurological development .

DDT is slightly to practically non-toxic to test animals via the dermal route. It is not readily absorbed through the skin unless it is in solution.

It is thought that inhalation exposure to DDT will not result in significant absorption through the lung alveoli (tiny gas-exchange sacs) but rather that it is probably trapped in mucous secretions and swallowed by exposed individuals following the tracheo-bronchial clearance of secretions by the cilia.

Acute effects likely in humans due to low to moderate exposure may include nausea, diarrhoea, increased liver enzyme activity, irritation (of the eyes, nose or throat), disturbed gait, malaise and excitability; at higher doses, tremors and convulsions are possible. While adults appear to tolerate moderate to high ingested doses of up to 280 mg/kg, a case of fatal poisoning was seen in a child who ingested one ounce of a 5% DDT:kerosene solution.

Chronic toxicity: DDT has caused chronic effects on the nervous system, liver, kidneys,and immune systems in experimental animals. Effects on the nervous system observed in test animals include: tremors in rats at doses of 16-32 mg/kg/day over 26 weeks; tremors in mice at doses of 6.5-13mg/kg/day over 80-140 weeks; changes in cellular chemistry in the central nervous system of monkeys at doses of 10 mg/kg/day over 100 days, and loss of equilibrium in monkeys at doses of 50 mg/kg/day for up to 6 months.

The main effect on the liver seen in animal studies was localized liver damage. This effect was seen in rats given 3.75 mg/kg/day over 36 weeks, rats exposed to 5 mg/kg/day over 2 years and dogs at doses of 80 mg/kg/day over the course of 39 months. In many cases lower doses produced subtle changes in liver cell physiology, and in some cases higher doses produced more severe effects. In mice doses of 8.33 mg/kg/day over 28 days caused increased liver weight and increased liver enzyme activity . Liver enzymes are commonly involved in detoxification of foreign compounds, so it is unclear whether increased liver enzyme activity in itself would constitute an adverse effect. In some species (monkeys and hamsters), doses as high as 8-20 mg/kg/day caused no observed adverse effects over exposure periods as long as 3.5-7 years .

Kidney effects observed in animal studies include adrenal gland hemorrhage in dogs at doses of 138.5 mg/kg/day over 10 days and adrenal gland damage at 50 mg/kg day over 150 days in dogs. Kidney damage was also seen in rats at doses of 10 mg/kg/day over 27 months.

Immunological effects observed in test animals include: reduced antibody formation in mice following administration of 13 mg/kg/day for 3-12 weeks and reduced levels of immune cells in rats at doses of 1 mg/kg/day. No immune system effects were observed in mice at doses of 6.5 mg/kg/day for 3-12 weeks.

Dose levels at which effects were observed in test animals are very much higher than those which may be typically encountered by humans. Due to the persistence of DDT and its metabolites in the environment, very low levels may continue to be detected in foodstuffs grown in some areas of prior use. It has been suggested that, depending on patterns of international DDT use and trade, it is possible that dietary exposure levels may actually increase over time. Persons eating fish contaminated with DDT or metabolites may also be exposed via bioaccumulation of the compound in fish.

Even though current dietary levels are quite low, past and current exposures may result in measurable body burdens due to its persistence in the body. More information on the metabolism and storage of DDT and its metabolites in mammalian systems is provided below (Fate in Humans and Animals).

Adverse effects on the liver, kidney and immune system due to DDT exposure have not been demonstrated in humans in any of the studies which have been conducted to date .

Reproductive Effects: There is evidence that DDT causes reproductive effects in test animals. No reproductive effects were observed in rats at doses of 38 mg/kg/day administered at days 15-19 of gestation. In another study in rats, oral doses of 7.5 mg/kg/day for 36 weeks resulted in sterility . In rabbits, doses of 1 mg/kg/day administered on gestation days 4-7 resulted in decreased fetal weights and 10 mg/kg/day on days 7-9 of gestation resulted in increased resorptions. In mice, doses of 1.67 mg/kg/day resulted in decreased embryo implantation and irregularities in the estrus cycle over 28 weeks. It is thought that many of these observed effects may be the result of disruptions in the endocrine (hormonal) system.

Available epidemiological evidence from two studies does not indicate that reproductive effects have occurred in humans as a result of DDT exposure. No associations between maternal blood levels of DDT and miscarriage nor premature rupture of fetal membranes were observed in two separate studies. One study did report a significant association between maternal DDT blood levels and miscarriage, but the presence of other organochlorine chemicals (e.g., PCBs) in maternal blood which may have accounted for the effect make it impossible to attribute the effect to DDT and its metabolites.

Teratogenic Effects: There is evidence that DDT causes teratogenic effects in test animals as well. In mice, maternal doses of 26 mg/kg/day DDT from gestation through lactation resulted in impaired learning performance in maze tests. In a two-generational study of rats, 10 mg/kg/day resulted in abnormal tail development. Epidemiological evidence regarding the occurrence of teratogenic effects as a result of DDT exposure are unavailable. It seems unlikely that teratogenic effects will occur in humans due to DDT at likely exposure levels.

Mutagenic Effects: The evidence for mutagenicity and genotoxicity is contradictory. In only 1 out of 11 mutagenicity assays in various cell cultures and organisms did DDT show positive results . Results of in vitro and in vivo genotoxicity assays for chromosomal aberrations indicated that DDT was genotoxic in 8 out of 12 cases, and weakly genotoxic in 1 case .

In humans, blood cell cultures of men occupationally exposed to DDT showed an increase in chromosomal damage. In a separate study, significant increases in chromosomal damage were reported in workers who had direct and indirect occupational exposure to DDT . Thus it appears that DDT may have the potential to cause genotoxic effects in humans, but does not appear to be strongly mutagenic. It is unclear whether these effects may occur at exposure levels likely to be encountered by most people.

Carcinogenic Effects: The evidence regarding the carcinogenicity of DDT is equivocal. It has been shown to cause increased tumor production (mainly in the liver and lung) in test animals such as rats, mice and hamsters in some studies but not in others. In rats, liver tumors were induced in three separate studies at doses of 12.5 mg/kg/day over periods of 78 weeks to life, and thyroid tumors were induced at doses of 85 mg/kg/day over 78 weeks. In mice, lifetime doses of 0.4 mg/kg/day resulted in lung tumors in the second generation and leukemia in the third generation; liver tumors were induced at oral doses of 0.26 mg/kg/day in two separate studies over several generations. In hamsters, significant increases in adrenal gland tumors were

seen at doses of 83 mg/kg/day in females (but not males) , and in males (but not females) at doses of 40 mg/kg/day.
In other studies, however, no carcinogenic activity was observed in rats at doses less than 25 mg/kg/day; no carcinogenic activity was seen in mice with at doses of 3-23 mg/kg/day over an unspecified period, and in other hamster studies there have been no indications of carcinogenic effects.
The available epidemiological evidence regarding DDT's carcinogenicity in humans, when taken as a whole, does not suggest that DDT and its metabolites are carcinogenic in humans at likely dose levels. In several epidemiological studies, no significant associations were seen between DDT exposure and disease, but in one other study, a weak association was observed. In this latter study, which found a significant association between long-term, high DDT exposures and pancreatic cancers in chemical workers, there were questions raised as to the reliability of the medical records of a large proportion of the cancer cases.
Organ Toxicity: Acute human exposure data and animal studies reveal that DDT can affect the nervous system, liver, kidney. Increased tumor production in the liver and lung has been observed in test animals. An association with pancreatic cancer was suggested in humans in one study.
Fate in Humans & Animals: DDT is very slowly transformed in animal systems. Initial degradates in mammalian systems are 1,1-dichloro-2,2-bis(p-dichlorodiphenyl)ethylene (DDE) and 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane (DDD), which are very readily stored in fatty tissues. These compounds in turn are ultimately transformed into bis(dichlorodiphenyl) acetic acid (DDA) via other metabolites at a very slow rate. DDA, or conjugates of DDA, are readily excreted via the urine.
Levels of DDT or metabolites may occur in fatty tissues (e.g. fat cells, the brain, etc.) at levels of up to several hundred times that seen in the blood. DDT or metabolites may also be eliminated via mother's milk by lactating women.
WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.
ADI: 0.002 mg/kg/day
NOEL: 0.25 mg/kg/day

CARCINOGEN

DDT [p,p'-DDT]	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2B
Non-arsenical insecticides (occupational exposures in spraying and application of)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2A
p,p'-Dichlorodiphenyltrichloroethane (DDT)	US EPA Carcinogens Listing	Carcinogenicity	B2
p,p'-Dichlorodiphenyltrichloroethane (DDT)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	B2
DDT [Dichlorodiphenyltrichloroethane]	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A3
DDT	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
DDT (TOTAL)	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65-MC
DDT	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
DDT (TOTAL)	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC
DDT [Dichlorodiphenyltrichloroethane]	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca

SKIN

DDT	Canada - Ontario Occupational Exposure Limits - Skin	Notes	Skin
DDT	US AIHA Workplace Environmental Exposure Levels (WEELs) - Skin	Notes	Skin
DDT	Canada - Quebec Permissible Exposure Values for Airborne Contaminants - Skin (French)	Notes	Skin
DDT	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin	Skin Designation	X
DDT	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants - Skin	Skin Designation	X
DDT	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants - Skin	Skin Designation	X
DDT	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
DDT	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin
DDT	US - Minnesota Permissible Exposure Limits (PELs) - Skin	Skin Designation	X
DDT	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
DDT	ND	Skin Designation	X
DDT	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X
DDT	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	X
DDT	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	S
DDT	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
DDT:

■ Daphnia magna EC50 (48hr.) (mg/l):	0.002- 0.00
■ Half- life Soil - High (hours):	1.40E+05
■ Half- life Soil - Low (hours):	17520

■ Half- life Air - High (hours):	177
■ Half- life Air - Low (hours):	17.7
■ Half- life Surface water - High (hours):	8400
■ Half- life Surface water - Low (hours):	168
■ Half- life Ground water - High (hours):	2.70E+05
■ Half- life Ground water - Low (hours):	384
■ Aqueous biodegradation - Aerobic - High (hours):	1.37E+05
■ Aqueous biodegradation - Aerobic - Low (hours):	17520
■ Aqueous biodegradation - Anaerobic - High (hours):	2400
■ Aqueous biodegradation - Anaerobic - Low (hours):	384
■ Aqueous biodegradation - Removal secondary treatment - High (hours):	100%
■ Photolysis maximum light absorption - High (nano- m):	<282
■ Photooxidation half- life water - High (hours):	8400
■ Photooxidation half- life water - Low (hours):	168
■ Photooxidation half- life air - High (hours):	177
■ Photooxidation half- life air - Low (hours):	17.7
■ First order hydrolysis half- life (hours):	1.94E+05

■ Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
■ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
■ For DDT
log Kow : 6.19
Half-life (hr) air: 170
Half-life (hr) H2O surface water: 5500
Half-life (hr) soil: 17000
BCF : 12000-40000
Environmental fate:
Breakdown in Soil and Groundwater: DDT is very highly persistent in the environment, with a reported half life of between 2-15 years and is immobile in most soils. Routes of loss and degradation include runoff, volatilization, photolysis and biodegradation (aerobic and anaerobic). These processes generally occur only very slowly. Breakdown products in the soil environment are DDE and DDD, which are also highly persistent and have similar chemical and physical properties.
Due to its extremely low solubility in water, DDT will be retained to a greater degree by soils and soil fractions with higher proportions of soil organic matter. It may accumulate in the top soil layer in situations where heavy applications are (or were) made annually; e.g., for apples. Generally DDT is tightly sorbed by soil organic matter, but it (along with its metabolites) has been detected in many locations in soil and groundwater where it may be available to organisms. This is probably due to its high persistence; although it is immobile or only very slightly mobile, over very long periods of time it may be able to eventually leach into groundwater, especially in soils with little soil organic matter.
Residues at the surface of the soil are much more likely to be broken down or otherwise dissipated than those below several inches. Studies in Arizona have shown that volatilization losses may be significant and rapid in soils with very low organic matter content (desert soils) and high irradiance of sunlight, with volatilization losses reported as high as 50% in 5 months . In other soils (Hood River and Medford) this rate may be as low as 17- 18% over 5 years . Volatilisation loss will vary with the amount of DDT applied, proportion of soil organic matter, proximity to soil-air interface and the amount of sunlight .
Breakdown of Chemical in Surface Water: DDT may reach surface waters primarily by runoff, atmospheric transport, drift, or by direct application (e.g. to control mosquito-borne malaria). The reported half-life for DDT in the water environment is 56 days in lake water and approximately 28 days in river water . The main pathways for loss are volatilization, photodegradation, adsorption to water-borne particulates and sedimentation. Aquatic organisms, as noted above, also readily take up and store DDT and its metabolites. Field and laboratory studies in the United Kingdom demonstrated that very little breakdown of DDT occurred in estuary sediments over the course of 46 days .
Breakdown of Chemical in Vegetation: DDT does not appear to be taken up or stored by plants to a great extent. It was not translocated into alfalfa or soybean plants, and only trace amounts of DDT or its metabolites were observed in carrots, radishes and turnips all grown in DDT-treated soils . Some accumulation was reported in grain, maize and rice-plants, but little translocation occurred and residues were located primarily in the roots
Ecotoxicity:
Effects on Birds:
Bird dietary LD50: mallard duck 2240 mg/kg, Japanese quail 841 mg/kg, pheasant 1334 mg/kg
Reported dietary LD50s in such species as bobwhite quail, California quail, red-winged blackbird, cardinal, house sparrow, blue jay, sandhill crane and clapper rail also indicate slight toxicity both in acute 5-day trials and over longer periods of up to 100 days In birds, exposure to DDT occurs mainly through the food web through predation on aquatic and/or terrestrial species having body burdens of DDT, such as fish, earthworms and other birds .
There has been much concern over chronic exposure of bird species to DDT and effects on reproduction, especially eggshell thinning and embryo deaths . The mechanisms of eggshell thinning are not fully understood. It is thought that this may occur from the major metabolite, DDE, and that predator species of birds are the most sensitive to these effects . Laboratory studies on bird reproduction have demonstrated the potential of DDT and DDE to cause subtle effects on courtship behavior, delays in pairing and egg laying and decreases in egg weight in ring doves and Bengalese finches . The implications of these for long-term survival and reproduction of wild bird species is unclear.
There is evidence that synergism may be possible between DDT's metabolites and organophosphate (cholinesterase-inhibiting) pesticides to produce greater toxicity to the nervous system and higher mortality Aroclor (polychlorinated biphenyls, or PCBs) may result in additive effects on eggshell thinning .
Effects on Aquatic Species
Fish LC50 (96 h): coho salmon 4 ug/l, rainbow trout 8.7 ug/l, northern pike 2.7 ug/l, black bullhead 4.8 ug/l, bluegill sunfish 8.6 ug/l, largemouth bass 1.5 ug/l, walleye 2.9 ug/l, fathead minnow 21.5 ug/l, channel catfish 12.2 ug/l, largemouth bass 1.5 ug/l, guppy 56 ug/l
DDT is very highly toxic to many aquatic invertebrate species. Reported 96-hour LC50s in various aquatic invertebrates (e.g., stoneflies, midges, crayfish, sow bugs) range from 0.18 ug/L to 7.0 ug/L, and 48-hour LC50s are 4.7 ug/L for daphnids and 15 ug/L for sea shrimp . Other reported 96-hour LC50s for various aquatic invertebrate species are from 1.8 ug/L to 54 ug/L . Early developmental stages are more susceptible than adults to DDT's effects . The reversibility of some effects, as well as the

development of some resistance, may be possible in some aquatic invertebrates .
DDT is very highly toxic to fish species as well. . Observed toxicity in coho and chinook salmon was greater in smaller fish than in larger . It is reported that DDT levels of 1 ng/L were sufficient to affect the hatching of coho salmon eggs DDT may be moderately toxic to some amphibian species and larval stages are probably more susceptible than adults
In addition to acute toxic effects, DDT may bioaccumulate significantly in fish and other aquatic species, leading to long-term exposure. This occurs mainly through uptake from sediment and water into aquatic flora and fauna, and also fish . Fish uptake of DDT from the water will be size-dependent with smaller fish taking up relatively more than larger fish . A half- time for elimination of DDT from rainbow trout was estimated to be 160 days .
The reported bioconcentration factor for DDT is 1,000 to 1,000,000 in various aquatic species, and bioaccumulation may occur in some species at very low environmental concentrations . Bioaccumulation may also result in exposure to species which prey on fish or other aquatic organisms (e.g., birds of prey).
Effects on Other Animals (Nontarget species)
Earthworms are not susceptible to acute effects of DDT and its metabolites at levels higher than those likely to be found in the environment, but they may serve as an exposure source to species that feed on them. DDT is non-toxic to bees; the reported topical LD50 for DDT in honeybees is 27 ug/bee . Laboratory studies indicate that bats may be affected by DDT released from stored body fat during long migratory periods.
■ Outbreaks of poisoning from food contaminated with organochlorines are characterized by headache, nausea, vomiting, restlessness, irritability, vertigo, muscle twitching, confusion, stupor, coma and convulsions.
The organochlorine pesticides are highly soluble in lipids and most organic solvents but have low water solubilities and low vapor pressure.
Adsorption in various soils depends strongly on the presence of soil organic matter. Once adsorbed they do not readily desorb. Such compounds do not as a consequence leach or diffuse in soils and transport to the hydrosphere from contaminated soils will be largely as a result of the erosion of soil particles or sediments, rather than by desorption and dissolution.
When organochlorines are poorly adsorbed, as in sandy soils, vaporization losses are significant. Volatilization from water or soil may also occur.
The actual evaporation rate depends on factors such as temperature, soil properties, soil water content and other physicochemical properties such as water solubility and degree of adsorption. The importance of soil moisture in volatilization led to the use of the term "co-distillation".
The effect observed in soil however is more accurately described as displacement of the sorbed pesticides by water molecules. As a result compounds which otherwise possess low water solubility are quite volatile from water.
Degradation of the organochlorines is slow compared to other classes of insecticide and in soil and water is due mainly to the action of micro- organisms. Pathways include dechlorination and dehydrochlorination. Oxidation is only moderately important. Epoxidations and rearrangements are common amongst the cyclodiene pesticides. These rearrangement reactions produce complicated "cage-like" structures that are toxic.
Bioaccumulation of the some organochlorines (notably DDT and dieldrin) are higher in aquatic ecosystems than in terrestrial ecosystems. Physicochemical properties such as high lipid solubility, low water solubility and chemical stability are the most significant factors behind such bioaccumulation.
The effects of bioaccumulation are manifest at the top of the food chain where, for example, predatory fish and birds, suffer from acute and chronic toxicity and reproductive failures. Effects may range from obvious toxicity to subtle behavioral changes. Evidence exists that the population effects are reversible with time.
■ DO NOT discharge into sewer or waterways.
■ The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l
* Classification of Substances as Ecotoxic (Dangerous to the Environment)
Appendix 8, Table 1
Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993 Commission of the European Communities.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
DDT	HIGH	HIGH	HIGH	LOW

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

B. Component Waste Numbers
When DDT is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U061 (waste code T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.
¦ Puncture containers to prevent re-use and bury at an authorized landfill.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

DOT:

Symbols:	None	Hazard class or Division:	6.1
Identification Numbers:	UN2761	PG:	III
Label Codes:	6.1	Special provisions:	IB8, IP3, T1, TP33
Packaging: Exceptions:	153	Packaging: Non-bulk:	213
Packaging: Exceptions:	153	Quantity limitations: Passenger aircraft/rail:	100 kg
Quantity Limitations: Cargo aircraft only:	200 kg	Vessel stowage: Location:	A
Vessel stowage: Other:	40	S.M.P.:	Severe

Hazardous materials descriptions and proper shipping names:
Organochlorine pesticides, solid, toxic

Air Transport IATA:

ICAO/IATA Class:	6.1	ICAO/IATA Subrisk:	None
UN/ID Number:	2761	Packing Group:	III
Special provisions:	A3		

Shipping Name: ORGANOCHLORINE PESTICIDE, SOLID, TOXIC *(CONTAINS DDT)

Maritime Transport IMDG:

IMDG Class:	6.1	IMDG Subrisk:	None
UN Number:	2761	Packing Group:	III
EMS Number:	F-A,S-A	Special provisions:	61 223 274 944
Limited Quantities:	5 kg		

Shipping Name: ORGANOCHLORINE PESTICIDE, SOLID, TOXIC(contains DDT)

Section 15 - REGULATORY INFORMATION

DDT (CAS: 50-29-3) is found on the following regulatory lists;

"Canada - Northwest Territories Occupational Exposure Limits (English)","Canada - Nova Scotia Occupational Exposure Limits","Canada - Ontario Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Domestic Substances List (DSL)","Canada Environmental Protection Act (CEPA) 1999 - Schedule 1 Toxic Substances List","Canada Environmental Protection Act (CEPA) 1999 - Schedule 3 Export Control List - Part 2 Substances Subject to Notification or Consent","Canada Environmental Quality Guidelines (EQGs) Water: Aquatic life","Canada Prohibited Toxic Substances (English)","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","OECD Representative List of High Production Volume (HPV) Chemicals","OSPAR List of Substances of Possible Concern","United Nations List of Prior Informed Consent Chemicals - French","United Nations List of Prior Informed Consent Chemicals - Spanish","United Nations List of Prior Informed Consent Chemicals (English)","US - Alaska Limits for Air Contaminants","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which production, use or other presence must be reported","US - California Environmental Health Standards for the Management of Hazardous Waste - List of Organic Persistent and Bioaccumulative Toxic Substances and Their STLC & TTLC Values","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity","US - California Proposition 65 - Reproductive Toxicity","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Massachusetts Oil & Hazardous Material List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Hazardous Constituents","US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Class A toxic air pollutants: Known and Probable Carcinogens","US - Washington Dangerous waste constituents list","US - Washington Discarded Chemical Products List - ""U"" Chemical Products","US - Washington Permissible exposure limits of air contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances","US CERCLA Top 20 Priority List of Hazardous Substances","US CWA (Clean Water Act) - List of Hazardous Substances","US CWA (Clean Water Act) - Priority Pollutants","US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Carcinogens Listing","US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks","US National Toxicology Program (NTP) 11th Report Part B. Reasonably Anticipated to be a Human Carcinogen","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes","US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements","US

TSCA Section 5(a)(2) - Significant New Use Rules (SNURs)","WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

■ Inhalation may produce health damage*.
■ May affect fertility*.
* (limited evidence).

REPRODUCTIVE HEALTH GUIDELINES

■ Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
DDT	0.01 mg/m3	1000	R	3	-

■ These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise. CR = Cancer Risk/10000; UF = Uncertainty factor: TLV believed to be adequate to protect reproductive health: LOD: Limit of detection Toxic endpoints have also been identified as: D = Developmental; R = Reproductive; TC = Transplacental carcinogen Jankovic J., Drake F.: A Screening Method for Occupational Reproductive Health Risk: American Industrial Hygiene Association Journal 57: 641-649 (1996).

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

This document is copyright. Apart from any fair dealing for the purposes of private study, research, review or criticism, as permitted under the Copyright Act, no part may be reproduced by any process without written permission from CHEMWATCH. TEL (+61 3) 9572 4700.

Issue Date: Apr-27-2009

Print Date:Apr-22-2010

Material Safety Data Sheet

Version 4.2
Revision Date 10/29/2012
Print Date 02/25/2014

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Barium
Product Number	:	237094
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Water Reactive, Irritant

GHS Classification
Substances, which in contact with water, emit flammable gases (Category 2)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Specific target organ toxicity - single exposure (Category 3)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H261	In contact with water releases flammable gases.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

Precautionary statement(s)

P231 + P232	Handle under inert gas. Protect from moisture.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P422	Store contents under inert gas.

HMIS Classification

Health hazard:	2
Flammability:	3
Physical hazards:	1

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	1
Special hazard.:	W

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula	:	Ba
Molecular Weight	:	137.33 g/mol

Component		Concentration
Barium		
CAS-No.	7440-39-3	-
EC-No.	231-149-1	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Suitable extinguishing media
Dry powder Carbon dioxide (CO_2)

Extinguishing media which shall not be used for safety reasons
Water

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Barium oxide

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Barium	7440-39-3	TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Eye, skin, & Gastrointestinal irritation Muscular stimulation Not classifiable as a human carcinogen			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	Rods
Colour	grey

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 725 °C (1,337 °F) - lit.
Boiling point	1,640 °C (2,984 °F) - lit.
Flash point	not applicable
Ignition temperature	no data available

Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	3.6 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Reacts violently with water.

Conditions to avoid
Exposure to moisture.

Materials to avoid
Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO_2), Halogens, Halogenated hydrocarbon, Alcohols, Sulphur compounds, Hydrogen sulfide gas

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Barium oxide
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.

Synergistic effects
no data available

Additional Information
RTECS: CQ8370000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1400 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: BARIUM
Marine pollutant: No

IATA
UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium

15. REGULATORY INFORMATION

OSHA Hazards
Water Reactive, Irritant

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

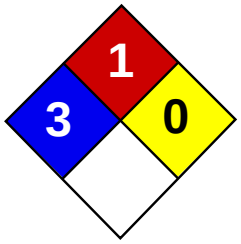
California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

Copyright 2012 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.



Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:29 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

MSDS - COPPER

---

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: COPPER
FORMULA: CU
FORMULA WT: 63.55
CAS NO.: 07440-50-8
NIOSH/RTECS NO.: GL5325000
COMMON SYNONYMS: BRONZE POWDER; C.I. 77400; ARWOOD COPPER
PRODUCT CODES: 1732,1736,1720,1714,1728
EFFECTIVE: 06/25/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	1	SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION
MAY CAUSE IRRITATION

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

---

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
COPPER	90-100	07440-50-8

---

3 - PHYSICAL DATA

BOILING POINT: 2595 C (4703 F)
VAPOR PRESSURE(MM HG): N/A

MELTING POINT: 1083 C (1981 F)
VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 8.92 (H2O=1)
EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %)
% VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: REDDISH, LUSTROUS, MALLEABLE METAL.

---

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

TOXIC GASES PRODUCED
COPPER FUMES

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 1.0 MG/M3 (PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
DUST MAY CAUSE SNEEZING AND COUGHING.
DUST MAY IRRITATE SKIN OR EYES.
PROLONGED EXPOSURE MAY CAUSE DERMATITIS.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION.
NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON INHALATION DUST, MIST OR FUME EMISSIONS THAT ARE POSSIBLE DURING MANUFACTURING OR CHEMICAL REACTIONS.

TARGET ORGANS
NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES
INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.
INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED PERSON TO FRESH AIR. GET MEDICAL ATTENTION.
EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.
SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: STRONG ACIDS, ACTIVE HALOGEN COMPOUNDS, CHLORINE, FLUORINE, IODINE, BROMINE, AMMONIA

DECOMPOSITION PRODUCTS: COPPER FUMES

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION:	USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION:	NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.
EYE/SKIN PROTECTION:	SAFETY GLASSES WITH SIDESHIELDS, PROPER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	COPPER, HEAVY FOIL
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	CHEMICALS, N.O.S. (NON-REGULATED)

TCI AMERICA

Material Safety Data Sheet

HAZARD WARNINGS	RISK PHRASES	PROTECTIVE CLOTHING
	Toxic compound, do not ingest or inhale. Avoid all contact with this material.	

Section I. Chemical Product and Company Identification

Chemical Name **Dieldrin**

Catalog Number	H0059
Synonym	Alvit 55
Chemical Formula	$C_{12}H_8Cl_6O$
CAS Number	60-57-1

Supplier: TCI America, 9211 N. Harborgate St., Portland OR, 1-800-423-8616

In case of Emergency Call: **Chemtrec® (800) 424-9300 (U.S.) (703) 527-3887 (International)**

Section II. Composition and Information on Ingredients

Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data
Dieldrin	60-57-1	---------	Not available.	Rat LD_{50} (oral) 383 mg/kg

Section III. Hazards Identification

Acute Health Effects

Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Chronic Health Effects

CARCINOGENIC EFFECTS : Not available.
MUTAGENIC EFFECTS : Not available.
TERATOGENIC EFFECTS : Not available.
DEVELOPMENTAL TOXICITY: Not available.
Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section IV. First Aid Measures

Eye Contact

Check for and remove any contact lenses. DO NOT use an eye ointment. Flush eyes with running water for a minimum of 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical attention. Treat symptomatically and supportively.

Skin Contact

If the chemical gets spilled on a clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical touches the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. Seek medical attention. Treat symptomatically and supportively. Wash any contaminated clothing before reusing.

Inhalation

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform artificial respiration. WARNING: It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention and, if possible, show the chemical label. Treat symptomatically and supportively.

Ingestion

INDUCE VOMITING by sticking finger in throat. Lower the head so that the vomit will not reenter the mouth and throat. Loosen tight clothing such as a collar, tie, belt, or waistband. If the victim is not breathing, administer artificial respiration. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Seek immediate medical attention and, if possible, show the chemical label. Treat symptomatically and supportively.

Section V. Fire and Explosion Data

Flammability	Combustible.	Auto-Ignition	Not available.
Flash Points	Not available.	Flammable Limits	Not available.

Combustion Products

These products are toxic carbon oxides (CO, CO_2), halogenated compounds.
WARNING: Highly toxic HCl gas is produced during combustion.

Fire Hazards

No specific information is available regarding the flammability of this compound in the presence of various materials.

Explosion Hazards

Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
No additional information is available regarding the risks of explosion.

Continued on Next Page

Emergency phone number (800) 424-9300

Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemicals, CO_2, water spray or foam. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.

Section VI. Accidental Release Measures

Spill Cleanup Instructions	Toxic solid. Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Consult federal, state, and/or local authorities for assistance on disposal. Consult federal, state, and/or local authorities for assistance on disposal.

Section VII. Handling and Storage

Handling and Storage Information	TOXIC. Handle with caution and minimize exposure. Keep away from heat and sources of ignition. Mechanical exhaust required. When not in use, tightly seal the container and store in a dry, cool place. Avoid excessive heat and light. DO NOT ingest. DO NOT breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Treat symptomatically and supportively. Avoid contact with skin and eyes. Always store away from incompatible compounds such as oxidizing agents.

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal Protection	Splash goggles. Lab coat. Dust respirator. Boots. Gloves. A MSHA/NIOSH approved respirator must be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.
Exposure Limits	Not available.

Section IX. Physical and Chemical Properties

Physical state @ 20°C	Orange-tan powder.	Solubility	Not available.
Specific Gravity	Not available.		
Molecular Weight	380.91	Partition Coefficient	Not available.
Boiling Point	Not available.	Vapor Pressure	Not available.
Melting Point	143 to 144°C (289.4 to 291.2°F)	Vapor Density	13.2 (Air = 1)
Refractive Index	Not available.	Volatility	Not available.
Critical Temperature	Not available.	Odor	Not available.
Viscosity	Not available.	Taste	Not available.

Section X. Stability and Reactivity Data

Stability	This material is stable if stored under proper conditions. (See Section VII for instructions)
Conditions of Instability	Avoid excessive heat and light.
Incompatibilities	Highly reactive with oxidizing agents.

Section XI. Toxicological Information

RTECS Number	IO1750000
Routes of Exposure	Eye contact. Inhalation. Ingestion.
Toxicity Data	Rat LD_{50} (oral) 383 mg/kg
Chronic Toxic Effects	**CARCINOGENIC EFFECTS** : Not available. **MUTAGENIC EFFECTS** : Not available. **TERATOGENIC EFFECTS** : Not available. **DEVELOPMENTAL TOXICITY**: Not available. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.
Acute Toxic Effects	Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Continued on Next Page

Section XII. Ecological Information

Ecotoxicity	Not available.
Environmental Fate	Not available.

Section XIII. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local or regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state, and local regulations when disposing of this substance.

Section XIV. Transport Information

DOT Classification	DOT CLASS 6.1: Toxic material.
PIN Number	UN2761
Proper Shipping Name	Organochlorine pesticides, solid, toxic
Packing Group (PG)	II
DOT Pictograms	

Section XV. Other Regulatory Information and Pictograms

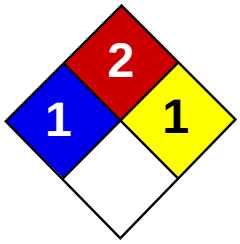
TSCA Chemical Inventory (EPA)	This product is **NOT** on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list: (i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec. (ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on an MSDS sheet.
WHMIS Classification (Canada)	WHMIS CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
EINECS Number (EEC)	200-484-5
EEC Risk Statements	R25- Toxic if swallowed. R27/28- Very toxic in contact with skin and if swallowed.
Japanese Regulatory Data	Not available.

Section XVI. Other Information

Version 1.0
Validated on 5/28/1997.
Printed 2/24/2005.

Notice to Reader

TCI laboratory chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our MSDS sheets are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated MSDS sheets for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, facial mask, fume hood). For proper handling and disposal, always comply with federal, state, and local regulations.



Health	1
Fire	2
Reactivity	1
Personal Protection	E

Material Safety Data Sheet
Iron Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Iron Metal

Catalog Codes: SLI2047, SLI1996

CAS#: 7439-89-6

RTECS: NO4565500

TSCA: TSCA 8(b) inventory: Iron Metal

CI#: Not applicable.

Synonym:

Chemical Name: Iron

Chemical Formula: Fe

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Iron Metal, powder	7439-89-6	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to liver, cardiovascular system, upper respiratory tract, pancreas. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Chlorine Trifluoride reacts with iron with incandescence. Powdered iron reacts with fluorine below redness with incandescence. Reduced iron decomposes with nitrogen dioxide @ ordinary temperature with incandescence. Reacting mass formed by mixture of phosphorus and iron can become incandescent when heated. This material is flammable in powder form only.

Special Remarks on Explosion Hazards: Material in powdered form can explode when exposed to heat or flame

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Tasteless.

Molecular Weight: 55.85 g/mole

Color: Black to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 3000°C (5432°F)

Melting Point: 1535°C (2795°F)

Critical Temperature: Not available.

Specific Gravity: Density: 7.86 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, incompatible materials, water/moisture, air, dust generation.

Incompatibility with various substances:
Reactive with oxidizing agents, acids. Slightly reactive to reactive with moisture.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Hot iron(wire) burns in Chlorine gas. Violent decompositon of hydrogen peroxide (53% by weight or greater) may be caused by contact with iron. Readily oxidizes in moist air forming rust. Reactive with halogens. Incompatible with acetaldehyde, ammonium peroxodisulfate, chloroformamidinum, chloric acid, ammonium nitrate, dinitorgen tetroxide, nitryl fluoride, polystyrene, sodium acetylide, potassium dichromate, peroxyformic acid, sulfuric acid, sodium carbide. Readily attacked by dilute mineral acids and or attacked or dissolved by organic acids. Not appreciably attacked by cold sulfuric acid, or nitric acid, but is attacked by hot acids.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 30000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: liver, cardiovascular system, upper respiratory tract, pancreas.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Iron metal filings or dust: May cause skin irritation by mechanical action. Iron metal wire: Not likely to cause skin irritation Eyes: Iron metal filings or dust: Can irritate eyes by mechanical action. Iron metal wire: No hazard. Will not cause eye irritation. Inhalation: Iron dust: Can irritate the respiratory tract by mechanical action. Iron metal wire or filings: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Iron metal wire: Not an ingestion hazard: Iron metal filings or dust: The amount of ingested iron which constitutes a toxic dose is not well defined. Proposed toxic doses of elemental iron are 20 mg/kg for gastrointestinal irritation to greater than 60 mg/kg for systemic toxicity. Gastrointestinal effects are the first signs to appear, with hemorrhagic vomiting and diarrhea, hematochezia, abdominal pain, lethargy, metabolic acidosis, coagulaopathy, shock, coma and convulsions developing from 0 to 6 hours after ingestion. Leukocytosis may also occur. An asymptomatic phase may ensue at 6 to 12 hours postingestion, followed by hypoglycemia or hyperglycemia, hepatic and renal failure, severe acidosis, cyanosis, fever, CNS depression (lethargy, restlessness and/or confusion seizures), hypotension, and cardiovascular collapse/cardiac failure in 12 to 48 hours. Hepatic cirrhosis, gastrointestinal scarring and/or strictures may arise in 2 to 6 weeks. It may also cause an anaphylactoid reaction. Non-cardiogenic pulmonary edema also develop in severe cases of iron intoxication. Chronic Potential Health Effects: Inhalation: Chronic inhalation of iron dust can lead to accumulation in the lungs and a characteristic stippled appearance on X-rays. This condition, called SIDEROSIS, is considered benign in that it does not interfere with lung function and does not predispose to other disease. Chronic inhalation of iron dust may also cause fibrosis in the lungs. Ingestion: Clinical signs of iron overload appear when the total body iron is 5 to 10 times higher than normal. Neurobehavioral defects including depression, decreased activity, habituation, reflex startle, and conditioned avoidance response performance may occur. However, similiar effects were also seen in iron defficiency. It is therefore likely that these behavioral effects are secondary to general toxicity. High serum iron levels may be associated with an increased risk of fatal acute myocardial infarction (MI). Skin: Prolonged or repeated contact may cause hypersensivity.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Metal powder, flammable, n.o.s. (Iron metal powder) UNNA: 3089 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California Director's List of Hazardous Substances: Iron Metal TSCA 8(b) inventory: Iron Metal

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS B-4: Flammable solid.

DSCL (EEC):
R11- Highly flammable. S16- Keep away from sources of ignition - No smoking. S22- Do not breathe dust.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 2

Reactivity: 1

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 2

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

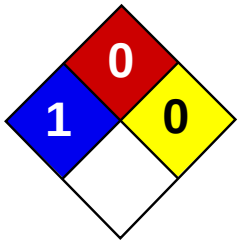
References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:52 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

pH (1% soln/water): Not applicable.

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

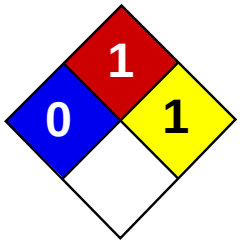
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of acids, of moisture. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air. Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Very slightly soluble in hot water. Insoluble in cold water. Insoluble in chromium trioxides, and mineral acids, alkalies. Slightly soluble with decomposition in hot water. Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents. Reacts with water to create hydrogen gas and heat. Must be kept dry. Reacts with acids to form hydrogen gas which is highly flammable and explosive. Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing. Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing. Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect. Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium Rhode Island RTK hazardous substances: Magnesium Pennsylvania RTK: Magnesium Massachusetts RTK: Magnesium Massachusetts spill list: Magnesium New Jersey: Magnesium TSCA 8(b) inventory: Magnesium

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable. R15- Contact with water liberates extremely flammable gases. S7/8- Keep container tightly closed and dry. S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:00 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Material Safety Data Sheet

Mercury

MSDS# 14020

Section 1 - Chemical Product and Company Identification

MSDS Name:	Mercury
Catalog Numbers:	13-410, 13-411, 13-480, 13-481, 13-482, 13-485, 13501, M139-1LB, M139-5LB, M140-14LB, M140-1LB, M140-5LB, M141-1LB, M141-6LB
Synonyms:	Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver.

Company Identification:	Fisher Scientific One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	201-796-7100
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#:	7439-97-6
Chemical Name:	Mercury
%:	100
EINECS#:	231-106-7

Hazard Symbols: T+ N

Risk Phrases: 61 26 48/23 50/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! Corrosive. This substance has caused adverse reproductive and fetal effects in animals. May be absorbed through intact skin. May cause central nervous system effects. May cause liver and kidney damage. Inhalation of fumes may cause metal-fume fever. Possible sensitizer. Toxic if inhaled. Causes irritation and possible burns by all routes of exposure. Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects

Eye:	Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.
Skin:	May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.
Ingestion:	May cause severe and permanent damage to the digestive tract. May cause perforation of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.
Inhalation:	Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause respiratory sensitization.
	May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic

Chronic: exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).

Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.

Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Autoignition Temperature: Not applicable.

Flash Point: Not applicable.

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: health: 3; flammability: 0; instability: 0;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.

Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store protected from azides.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3; Skin - potential significant contribution to	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	0.1 mg/m3 Ceiling

	overall exposure by the cutaneous r oute			

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Personal Protective Equipment

Eyes:	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:	Wear appropriate protective gloves to prevent skin exposure.
Clothing:	Wear appropriate protective clothing to prevent skin exposure.
Respirators:	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State:	Liquid
Color:	silver
Odor:	odorless
pH:	Not available
Vapor Pressure:	0.002 mm Hg @ 25C
Vapor Density:	7.0
Evaporation Rate:	Not available
Viscosity:	15.5 mP @ 25 deg C
Boiling Point:	356.72 deg C (674.10°F)
Freezing/Melting Point:	-38.87 deg C (-37.97°F)
Decomposition Temperature:	Not available
Solubility in water:	Insoluble
Specific Gravity/Density:	13.59 (water=1)
Molecular Formula:	Hg
Molecular Weight:	200.59

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	High temperatures, incompatible materials.
Incompatibilities with Other Materials	Metals, aluminum, ammonia, chlorates, copper, copper alloys, ethylene oxide, halogens, iron, nitrates, sulfur, sulfuric acid, oxygen, acetylene, lithium, rubidium, sodium carbide, lead, nitromethane, peroxyformic acid, calcium, chlorine dioxide, metal oxides, azides, 3-bromopropyne, methylsilane + oxygen, tetracarbonylnickel + oxygen, boron diiodophosphide.
Hazardous Decomposition Products	Mercury/mercury oxides.
Hazardous Polymerization	Will not occur.

Section 11 - Toxicological Information

RTECS#:	CAS# 7439-97-6: OV4550000
LD50/LC50:	RTECS: Not available. Other:
Carcinogenicity:	Mercury - IARC: Group 3 (not classifiable)
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity:
Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; Unspecified
Fish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; Unspecified
Fish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; Unspecified
Water flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified

Other: Harmful to aquatic life in very low concentrations.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: MERCURY
Hazard Class: 8
UN Number: UN2809
Packing Group: III
Canada TDG
Shipping Name: MERCURY
Hazard Class: 8
UN Number: UN2809
Packing Group: III

USA RQ: CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T+ N

Risk Phrases:

R 61 May cause harm to the unborn child.

R 26 Very toxic by inhalation.

R 48/23 Toxic : danger of serious damage to health by prolonged exposure through inhalation.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 7439-97-6: 3

Canada

CAS# 7439-97-6 is listed on Canada's DSL List

Canadian WHMIS Classifications: D2A, E

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 7439-97-6 is listed on Canada's Ingredient Disclosure List

US Federal

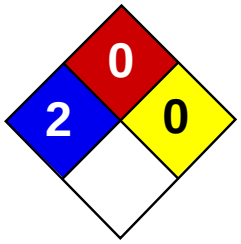
TSCA

CAS# 7439-97-6 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 6/15/1999

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantibility or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.



Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Nickel metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel metal

Catalog Codes: SLN2296, SLN1342, SLN1954

CAS#: 7440-02-0

RTECS: QR5950000

TSCA: TSCA 8(b) inventory: Nickel metal

CI#: Not applicable.

Synonym: Nickel Metal shot; Nickel metal foil.

Chemical Name: Nickel

Chemical Formula: Ni

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel metal	7440-02-0	100

Toxicological Data on Ingredients: Nickel metal LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer), of ingestion, of inhalation (lung sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to skin. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion. This material is flammable in powder form only.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating a dust explosion. Mixtures containing Potassium Perchlorate with Nickel & Titanium powders & infusorial earth can explode. Adding 2 or 3 drops of approximately 90% peroxyformic acid to powdered nickel will result in explosion. Powdered nickel reacts explosively upon contact with fused ammonium nitrate at temperatures below 200 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation Respirable. TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 1 (mg/m3) from OSHA (PEL) [United States] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid. Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 58.71 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 2730°C (4946°F)

Melting Point: 1455°C (2651°F)

Critical Temperature: Not available.

Specific Gravity: Density: 8.908 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Insoluble in Ammonia. Soluble in dilute Nitric Acid. Slightly soluble in Hydrochloric Acid, Sulfuric Acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong acids, selenium, sulfur, wood and other combustibles, nickel nitrate, aluminum, aluminum trichloride, ethylene, p-dioxan, hydrogen, methanol, non-metals, oxidants, sulfur compounds, aniline, hydrogen sulfide, flammable solvents, hydrazine, and metal powders (especially zinc, aluminum, and magnesium), ammonium nitrate, nitryl fluoride, bromine pentafluoride, potassium perchlorate + titanium powder + indusorial earth.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. Causes damage to the following organs: skin. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose/Conc: LDL [Rat] - Route: Oral; Dose: 5000 mg/kg LDL [Guinea Pig] - Route: Oral; Dose: 5000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Nickel dust and fume can irritate skin. Eyes: Nickel dust and fume can irritate eyes. Inhalation: Inhalation of dust or fume may cause respiratory tract irritation with non-productive cough, hoarseness, sore throat, headache, vertigo, weakness, chest pain, followed by delayed effects, including tachypnea, dyspnea, and ARDS. Death due to ARDS has been reported following inhalation of high concentrations of respirable metallic nickel dust. Later effects may include pulmonary edema and fibrosis. Ingestion: Metallic nickel is generally considered not to be acutely toxic if ingested. Ingestion may cause nausea, vomiting, abdominal , and diarrhea. Nickel may damage the kidneys(proteinuria), and may affect liver function. It may also affect behavior (somnolence), and cardiovascular system (increased cornary artery resistance, decreased myocardial contractility, myocardial damage, regional or general arteriolar or venus dilation). Chronic Potential Health Effects: Skin: May cause skin allergy. Nickel and nickel compounds are among the most common sensitizers inducing allergic contact dermatitis. Inhalation: Chronic inhalation nickel dust or fume can cause chronic hypertrophic rhinitis, sinusitis, nasal polyps, perforation of the nasal septum, chronic pulmonary irritation, fibrosis, pulmonary edema, pulmonary eosinophilia, Pneumoconiosis, allergies (asthma-like allergy), and cancer of the nasal sinus cavities, lungs, and possibly other organs. Future exposures can cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness. Chronic inhalation of nickel dust or fume may also affect the liver (impaired liver function tests), and blood (changes in red blood cell count). Ingestion: Prolonged or repeated ingestion of nickel can be a source chronic urticaria and other signs of allergy.

Chronic ingestion of NIckel may also affect respiration and cause pneumoconiosis or fibrosis. Note: In the general population, sensitization occurs from exposure to nickel-containing coins, jewelry, watches,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Nickel metal California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel metal Connecticut hazardous material survey.: Nickel metal Illinois toxic substances disclosure to employee act: Nickel metal Illinois chemical safety act: Nickel metal New York release reporting list: Nickel metal Rhode Island RTK hazardous substances: Nickel metal Pennsylvania RTK: Nickel metal Michigan critical material: Nickel metal Massachusetts RTK: Nickel metal Massachusetts spill list: Nickel metal New Jersey: Nickel metal New Jersey spill list: Nickel metal Louisiana spill reporting: Nickel metal California Director's List of Hazardous Substances: Nickel metal TSCA 8(b) inventory: Nickel metal

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R43- May cause sensitization by skin contact. S22- Do not breathe dust. S36- Wear suitable protective clothing.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:42 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

Polyaromatic Hydrocarbons

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION	
IDENTITY Decanter Tank Tar Sludge Polyaromatic Hydrocarbons (TDG name - Toxic Solid, organic NOS (Waste) (Pyrene)	**DATE PREPARED** February 7, 2007
SYNONYMS, CHEMICAL NAMES, COMMON NAMES Aromatics, PAH, Yellow Sludge	**USE:** Waste Sludge
MANUFACTURER'S NAME Cancarb Ltd.	**EMERGENCY TELEPHONE NUMBER (Health)** (403) 502-6614
ADDRESS P.O. Box 1000, Station M Calgary, Alberta Canada, T2P 4K5	**TELEPHONE NUMBER – TECHNICALINFORMATION** (403)-527-1121

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS			
HAZARDOUS COMPONENTS	**OSHA PEL**	**ACGIH TLV**	**%/wt**
Variable blend of Polynuclear Aromatic Hydrocarbons (PAHs) plus inert solids in water. Concentrations will vary depending upon the extent of product dryness. Hazardous ingredients may include:			
Pyrene (CAS# 129-00-0)	0.2 mg m^{3*}	None established	<7%
Benzo (g,h,i) Fluoroanthrene (CAS# 203-12-3)	None established	None established	<6%
Fluoroanthene (CAS# 206-44-0)	None established	None established	<4%
Phenanthrene (CAS# 85-01-8)	0.2 mg/m^{3*}	None established	<2%
Cyclopenta(d,e,f)Phenanthrene (CAS#203-64-5)	None established	None established	<2%
Anthracene (CAS# 120-12-7)	0.2 mg/m^{3*}	None established	<1%
Benzo(a)Pyrene (CAS# 50-32-8)		None established	<0.1%
Benzo(a)Anthracene (CAS# 56-55-3)	0.2 mg/m^{3*}	None established	<0.1%
Benzo(b)Fluoroanthene CAS # 205-99-2)	None established	None established	<0.1%
Benzo(j)Fluoroanthene (CAS# 205-82-3)	None established	None established	<0.1%
Benzo(k)Fluoroanthene (CAS# 207-08-9)	None established	None established	<0.1%
Indeno(1,2,3)Pyrene (CAS# 193-39-5)	None established None established	None established	<0.1%
*Coal Tar Pitch Volatile. Remaining components are not hazardous.			

EMERGENCY OVERVIEW
Black, brown or yellow aqueous sludge May cause skin and eye irritation Suspected carcinogenic components.

SECTION 3 -HAZARDS IDENTIFICATION

PRIMARY ROUTE(s) OF EXPOSURE: Skin; Eyes. Inhalation if Sludge is Dry

IRRITATION DATA: May cause irritation to skin and eyes and burns to skin with sunlight..

INHALATION:

ACUTE: Not a likely route of exposure in sludge state. Mist may cause respiratory irritation.

CHRONIC: Repeated and prolonged exposure may cause toxicity to the liver and blood. Suspected carcinogenicity .

SKIN CONTACT:

ACUTE: Prolonged and repeated contact may cause irritation. Contact in the presence of sunlight may enhance irritant effects leading to skin burns..

CHRONIC: Systemic toxicity. Suspected carcinogenicity.

EYE CONTACT:

ACUTE: May be irritating, resulting in tearing, reddening, and swelling.

CHRONIC: None known.

INGESTION:

ACUTE: May cause gastric irritation and disturbance.

CHRONIC: Chronic effects of phenanthrene ingestion include liver effects; chronic effects of pyrene ingestion include muscle contraction or spasticity and blood changes; effects of chronic fluoranthene ingestion include kidney, urethra, and bladder effects.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

Persons with pre-existing skin disorders may be at increased risk from exposure.

SECTION 4 - EMERGENCY AND FIRST AID PROCEDURES

INHALATION: Remove from exposure to fresh air immediately. If breathing has stopped, give artificial respiration. Oxygen may be given if breathing is difficult. Get medical attention.

SKIN CONTACT: Remove contaminated clothing and shoes immediately. Wash affected area with soap and water until no evidence of the chemical remains. Get medical attention if irritation develops.

EYE CONTACT: Flush thoroughly with water for at least 15 minutes, occasionally lifting the upper and lower lids, until no evidence of the chemical remains. Get medical attention if irritation develops.

INGESTION: Do not induce vomiting. Treat symptomatically and supportively. Get medical attention if irritation develops.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: None	**FLAMMABLE LIMITS:**	**LEL:** Not applicable	**UEL:** Not applicable

AUTOIGNITION TEMPERATURE: Will not ignite as aqueous solution. If dried, will support combustion.

EXTINGUISHING MEDIA

Water spray, foam, or dry chemical powder. Carbon dioxide may be ineffective on large fires.

SPECIAL FIRE FIGHTING PROCEDURES

Firefighters should wear full protective NIOSH approved self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None Known.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Stop discharge and control spill to avoid discharge to the environment. Use wet vacuum to limit spreading and place in suitable container for further handling and disposal. For dry material avoid generation of dust, use limited wetting to prevent spreading and use wet vacuum. Place in metal drum for disposal.

SECTION 7 - HANDLING AND STORAGE

Handling: KEEP WET. Do not allow to dry. Place wet vacuum discharge in metal drum. Empty drum into settling pond tanks. Avoid prolonged or repeated skin contact. Observe good personal and industrial hygiene practices.

Storage: Do not freeze.

SECTION 8 – EXPOSURE CONTROLS, PERSONAL PROTECTION

RESPIRATORY PROTECTION

Where airborne concentrations may exceed guidelines for permissible air concentrations, choose a respirator in accordance with OSHA Respirator Standard 29 CFR 1910.134. (i.e. organic vapor and P100 cartridges, powered air hoods.

VENTILATION

Use general dilution or local exhaust ventilation to maintain exposure below the exposure limits.

PROTECTIVE GLOVES

Choose appropriate gloves in accordance with OSHA Personal Protective Equipment Standard 29 CFR 1910.132.

EYE PROTECTION:

Safety glasses with side shields or choose in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

Appropriate protective clothing to minimize repeated and prolonged skin contact. (i.e. Sarnex or Coated Sarnex).

RECOMMENDED EXPOSURE LIMITS

OH&S, OSHA and ACGIH have not set exposure limits for this waste mixture.
See Section 2 for exposure guidelines for the components of this waste.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES			
BOILING POINT	100° C	**SPECIFIC GRAVITY**	> 1
pH	Not available	**FREEZING POINT**	0° C
VAPOR PRESSURE (mm Hg)	Same as Water	**SOFTENING POINT**	Not applicable
VAPOR DENSITY (Air = 1)	Not available	**EVAPORATION RATE**	Not applicable
SOLUBILITY IN WATER	PAHs low solubility		
SOLUBILITY	Dry material soluble in hydrocarbon solvents		
COEFFICIENT OF WATER/OIL DISTRIBUTION:	Not available .		
APPEARANCE AND ODOR:	Black, Brown or Yellow Sludge.		

SECTION 10 - STABILITY AND REACTIVITY			
STABILITY	**Unstable**		**Conditions to Avoid**
	Stable	X	None Known. Stable under normal temperature and pressure.
INCOMPATIBILITY (Materials to Avoid) Strong oxidizing agents.			
HAZARDOUS DECOMPOSITION PRODUCTS Thermal decomposition may release toxic and/or hazardous gases from dried sludge.			
HAZARDOUS POLYMERIZATION	**May Occur**		**Conditions to Avoid**
	Will Not Occur	X	None known.

SECTION 11 - TOXICOLOGICAL INFORMATION

This waste sludge has not been tested for acute or chronic toxicity. The following data is for its components >1%:

Pyrene	Oral LD_{50} (mouse): 800 mg/kg Inhalation LC_{50} (rat): 170 mg/m^3
Fluoranthene	Oral LD_{50} (rat): 2 gm/kg Dermal LD_{50}(rabbit): 3180 mg/kg
Phenanthrene	Oral LD_{50} (mouse): 700 mg/kg

TARGET ORGANS: Skin and eyes

CARCINOGENICITY: Some low level PAH components have been identified as suspected carcinogens by IARC and ACGIH. These include benzo(a)anthracene, benzo(a)pyrene, benz(b,j&k)fluoranthene, and indeno(1,2,3-cd) pyrene.

TUMORIGENIC DATA (RTECS): Phenanthrene, Clclopenta (def) phenanthrene, Benzo fluoranthrene, Pyrene, and fluoranthene.

MUTAGEN DATA (RTECS): Phenanthrene, Cyclopenta (def) phenanthrene, Pyrene, Benzo fluoroanthrene, Fluoranthene, Benzo (ghi) fluoranthene.

OTHER EFFECTS:

PAHs contained in the sludge have the property of photoallergenicity. In the presence of sunlight, these materials have the capacity to irritate the skin to a much greater degree, possibility leading to skin burns, than exposure without sunlight.

SECTION 12 - ECOLOGICAL INFORMATION

Sludge has not been tested for ecotoxicity.

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable federal, provincial, and local environmental regulations. Residual solids may be present in any containers used to handle this sludge. Do not reuse for food, clothing or products for human or animal consumption.

SECTION 14 - TRANSPORT INFORMATION

PROPER SHIPPING NAME	TDG CLASSIFICATION	TDG UN/NA
Waste Type 97 Decantar Tank Tar Sludge	6.1 PG II	UN 9397

SECTION 15 - REGULATORY INFORMATION

OSHA: This material is classified as hazardous under OSHA regulations.

WHMS: This material is considered a D2A, D2B Controlled Product.
This material has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

IDL: The following components are on the Canadian Ingredient Disclosure List:

Pyrene
Fluoranthene
Benzanthracene
Phenanthrene
Indeno (1,2,3-cd) pyrene
Benzopyrene
Naphthalene
Anthacene

SARA Title III - Toxic chemicals list 40 CFR 372.65:

Pyrene
Naphthalene
Anthracene

CERCLA Toxic Chemicals List 40 CFR 302:

Pyrene	RQ: 5000 pounds
Fluoranthene	RQ: 100 pounds
Benzanthrcene	RQ: 10 pounds
Phenanthrene	RQ: 5000 pounds
Indeno (1,2,3-cd) pyrene	RQ: 100 pounds
Benzopyrene	RQ: 1 pound
Naphthalene	RQ: 100 pounds
Anthracene	RQ: 5000 pounds

RCRA Hazardous Waste Codes 40 CFR 261.24, 261.33 :

Fluoranthene	U120
Benzanthracene	U108
Indeno(1,2,3-cd)pyrene	U137
Benzopyrene	U022
Naphthalene	U165

SECTION 16 - OTHER INFORMATION

HMIS Ratings:

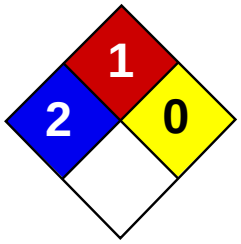
Health	2*
Flammability	1
Reactivity	0

where 0=minimal, 1=slight, 2=moderate, 3=serious, 4=severe

This MSDS was prepared by: CANCARB Health, Safety & Environment Department
Telephone Number (403) 527-1121

R: 45; 36/37/38
S: 36/37/39

The information and recommendations set forth herein are made in good faith and are believed to be accurate as of the date of preparation. CANCARB makes no warranty, either express or implied, with respect to this information and disclaims all liability from reliance thereon.



Health	2
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Silver MSDS

Section 1: Chemical Product and Company Identification

Product Name: Silver

Catalog Codes: SLS4222, SLS2005, SLS3427, SLS1210, SLS2632, SLS4054, SLS1837

CAS#: 7440-22-4

RTECS: VW3500000

TSCA: TSCA 8(b) inventory: Silver

CI#: Not applicable.

Synonym:

Chemical Formula: Ag

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Silver	7440-22-4	100

Toxicological Data on Ingredients: Silver: ORAL (LD50): Acute: 100 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion, of inhalation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact: No known effect on skin contact, rinse with water for a few minutes.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Splash goggles. Lab coat.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (mg/m3) from OSHA (PEL) TWA: 0.01 (mg/m3) from OSHA NIOSH Australia: TWA: 0.1 (mg/m3)Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 107.87 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 2212°C (4013.6°F)

Melting Point: 961°C (1761.8°F)

Critical Temperature: Not available.

Specific Gravity: 10.4 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 100 mg/kg [Mouse].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Very hazardous in case of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Silver Pennsylvania RTK: Silver Minnesota: Silver Massachusetts RTK: Silver New Jersey: Silver TSCA 8(b) inventory: Silver TSCA 8(a) PAIR: Silver TSCA 8(d) H and S data reporting: Silver SARA 313 toxic chemical notification and release reporting: Silver: 1% CERCLA: Hazardous substances.: Silver: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC): R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Not applicable. Lab coat. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

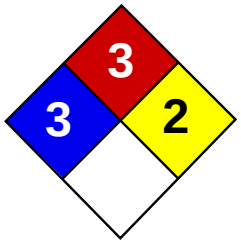
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:26 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	3
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Sodium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium

Catalog Codes: SLS3505

CAS#: 7440-23-5

RTECS: VY0686000

TSCA: TSCA 8(b) inventory: Sodium

CI#: Not applicable.

Synonym: Natrium

Chemical Name: Sodium

Chemical Formula: Na

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium	7440-23-5	100

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 115°C (239°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 22.99 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 881.4°C (1618.5°F)

Melting Point: 97.8°C (208°F)

Critical Temperature: Not available.

Specific Gravity: 0.97 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Sodium : UN1428 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 06:28 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

ZINC METAL
MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Zinc Metal

NOTE: In the form in which it is sold this product is not regulated. This Material Safety Data Sheet is provided for information purposes only.

Manufacturer:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
Teck Metals Ltd.
1500-120 Adelaide Street, W.
Toronto, Ontario
M5H 1T1

MSDS Preparer:
Teck Metals Ltd.
3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Revision/Edit: June 1, 2009.

Product Use: Zinc metal is used to coat steel for corrosion protection (galvanizing, electroplating, electrogalvanizing), as an alloying element in bronze, brass, aluminum and other metal alloys, for zinc die casting alloys, for zinc dry cell and zinc/air batteries, for the production of zinc sheet for architectural and coinage applications, as a reducing agent in organic chemistry and for other chemical applications.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	Approximate Percent by Weight	CAS Number	Occupational Exposure Limits (OELs)		LD_{50} / LC_{50} Species and Route
Zinc	99+%	7440-66-6	OSHA PEL	None established	No Data
			ACGIH TLV	None established	
			NIOSH REL	None established	

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA - Occupational Safety and Health Administration. ACGIH - American Conference of Governmental Industrial Hygienists. NIOSH - National Institute for Occupational Safety and Health. OEL – Occupational Exposure Limit. PEL – Permissible Exposure Limit. TLV – Threshold Limit Value. REL – Recommended Exposure Limit.

NOTE: While there is no established OEL for zinc as such, there are OELs for zinc oxide which may be formed during burning, welding or other fuming processes.

The OSHA PEL final rule limits for zinc oxide dust are 10 mg/m³ (total) and 5 mg/m³ (respirable); the OSHA PEL final rule limit for zinc oxide fume is 5 mg/m³. Note that the OSHA PEL final rule limits are currently non-enforceable due to a court decision. The OSHA PEL transitional limits therefore remain in force at present. They are 15 mg/m³ (total) and 5 mg/m³ (respirable) while the transitional PEL for zinc oxide fume is 5 mg/m³. The ACGIH TLV for zinc oxide is 2 mg/m³ (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/m³ (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m³ 10 hr TWA with a 15 mg/m³ ceiling limit (15 minute sample) for zinc oxide dust and a 10 mg/m³ STEL for zinc oxide fume (15 minute sample).

Trade Names and Synonyms: High Grade Zinc; Special High Grade Zinc; TADANAC® Zinc; C-CAST® Zinc; Zn

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A lustrous bluish-silver metal that does not burn but may form explosive mixtures if dispersed in air as a fine powder. Contact with acids or alkalis generates flammable hydrogen gas which can accumulate in poorly-ventilated areas. Do NOT use water or foam in fire fighting. Apply dry chemical, sand or special powder extinguishing media. Zinc is relatively non-toxic and poses little immediate health hazard to personnel or the environment in an emergency situation.

Potential Health Effects: Pure zinc dust is relatively non-toxic to humans by inhalation. However, acute over-exposure to zinc oxide fume may cause metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting. Ingestion of soluble salts may cause abdominal irritation resulting in nausea and vomiting. In most cases, dermal exposure to zinc or zinc compounds does not result in any noticeable toxic effects. Zinc is not listed as a carcinogen by OSHA, NTP, IARC, ACGIH or the EU. (see Toxicological Information, Section 11)

Potential Environmental Effects: In the form in which the product is sold, zinc metal does not represent a significant threat to the environment. However, extended exposure in the aquatic or terrestrial environments may lead to the release of zinc in a bioavailable form. (see Ecological Information, Section 12)

EU Risk Phrase(s): Not applicable - zinc is not listed as a dangerous substance.

SECTION 4. FIRST AID MEASURES

Eye Contact: Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, obtain medical attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water for 5 minutes. If irritation persists, obtain medical advice. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: If symptoms are experienced remove source of contamination or move victim to fresh air. Obtain medical advice. NOTE: Metal fume fever may develop 3-10 hours after exposure. If symptoms of metal fume fever (flu-like symptoms) develop, obtain medical attention.

Ingestion: If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if irritation or discomfort occurs, obtain medical advice.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not considered a fire or explosion hazard. However, finely divided metallic dust or powder may form flammable or explosive dust clouds when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Bulk dust in a damp state may heat spontaneously and ignite on exposure to air. Contact with acids and alkali hydroxides results in evolution of hydrogen gas which is potentially explosive. Mixtures with potassium chlorate or ammonium nitrate may explode on impact.

Extinguishing Media: Apply dry chemical, dry sand, or special powder extinguishing media. Do NOT use water, carbon dioxide or foam on molten metals. Water may be ineffective for extinguishing a fire but should be used to keep fire-exposed containers cool.

Fire Fighting: If possible, move material from fire area and cool material exposed to flame. Apply dry chemical, sand, or special powder extinguishing media. Zinc oxide fumes may evolve in fires. Fire fighters should be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Lower Flammable Limit (Zinc Dust): 500 g/m^3; Upper Flammable Limit: Not Applicable.

Autoignition Temperature: Approximately 680ºC (dust cloud in air), 460ºC (dust layer).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Solid metal is recyclable. Vacuuming recommended for accumulated metal dust. Molten metal should be allowed to solidify prior to clean-up. Return uncontaminated spilled material to the process if possible. Place contaminated and non-recyclable material in suitable labeled containers for later disposal. Treat or dispose of waste material in accordance with all local, regional and national requirements, as applicable.

Personal Precautions: Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with zinc dust or powder. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash.

Environmental Precautions: Zinc in the metallic form has limited bioavailability and poses no immediate ecological risk. However, contamination of water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store zinc in a DRY covered area, separate from incompatible materials. Zinc ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Ingots may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate designated areas. No special packaging materials are required.

EU Safety Phrase(s): Not applicable - zinc in ingot form is not listed as a dangerous substance.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when zinc is processed. Eye protection should be worn where fume or dust is generated. Respiratory protection may be required where zinc oxide fume is generated. Where hot or molten metal is handled, heat resistant gloves, face shield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

Ventilation: Use adequate local or general ventilation to maintain the concentration of zinc oxide fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Where metallic dust particles of zinc metal are being collected and transported by a ventilation system, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Locate dust collectors and fans outdoors if possible and provide dust collectors with explosion vents or blow out panels.

Respirators: Where zinc oxide dust or fumes are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Bluish-silver lustrous metal	**Odour:** None	**Physical State:** Solid	**pH**: Not Applicable
Vapour Pressure: 1 mm at 487ºC Negligible at 20ºC	**Vapour Density:** Not Applicable	**Boiling Point/Range:** 908º C	**Freezing/Melting Point/Range:** 420º C
Specific Gravity: 7.1	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Odour Threshold:** None
Solubility: Insoluble in Water			

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable under normal temperatures and pressures. It slowly becomes covered with a white coating of a hydrated basic zinc carbonate on exposure to moist air. Fine, condensed zinc dust or powder may heat spontaneously and ignite on exposure to air when damp. Zinc metal will react with acids and strong alkalis to generate hydrogen gas. A violent, explosive reaction may occur when powdered zinc is heated with sulphur. Powdered zinc will become incandescent or ignite in the presence of fluorine, chlorine or bromine. Powdered zinc can also react explosively with halogenated hydrocarbons if heated. Mixtures with potassium chlorate or ammonium nitrate may explode on impact.

Incompatibilities: Contact with acids and alkalis will generate highly flammable hydrogen gas. Contact with acidic solutions of arsenic and antimony compounds may evolve highly toxic ARSINE or STIBINE gas. Incompatible with strong oxidizing agents such as chlorine, fluorine, bromine, sodium potassium or barium peroxide, sodium or potassium chlorate, chromium trioxide and fused ammonium nitrate. Also incompatible with elemental sulphur dust, halogenated hydrocarbons or chlorinated solvents and chlorinated rubber.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding or overheating a molten bath will generate zinc oxide fume which, on inhalation in sufficient quantity, can produce metal fume fever, a transient influenza-like illness.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Zinc, especially in the metal form, is relatively non-toxic. However, it can react with other materials, such as oxygen or acids, to form compounds that can be potentially toxic. The primary route of exposure would be through the generation and inhalation of zinc oxide fume from welding or burning or overheated melting pots.

Acute:
Skin/Eye: In most cases, dermal exposure to zinc or zinc compounds does not result in any noticeable toxic effects. Zinc metal is not chemically irritating to the eyes.

Inhalation: If excessive quantities of zinc oxide fume are inhaled, it can result in the condition called metal fume fever. The symptoms of metal fume fever will occur within 3 to 10 hours, and include immediate dryness and irritation of the throat, tightness of the chest and coughing, which may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. The symptoms are temporary and generally disappear, without medical intervention, within 24 to 48 hours of onset. There are no recognized complications, after affects, or chronic affects that result from this condition.

Ingestion: When ingested in excessive quantities, zinc can irritate the stomach resulting in nausea and vomiting.

Chronic: There is no chronic form of metal fume fever but in rare instances an acute incident may be followed by complaints such as bronchitis or pneumonia. Some workers may develop a short-term immunity (resistance) so that repeated exposure to zinc oxide fumes does not cause metal fume fever. This immunity (resistance) however is quickly lost after short absences from work (weekends or vacations). Workers exposed to finely-divided metallic zinc for up to 35 years revealed no acute or chronic illnesses attributable to zinc. Prolonged or repeated skin contact with zinc dust or powder may cause dryness, irritation and cracking (dermatitis) since zinc is astringent and may tend to draw moisture from the skin. Zinc dust is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

SECTION 12. ECOLOGICAL INFORMATION

Zinc in the metallic form has limited bioavailability and poses no immediate ecological risk. However, its processing or extended exposure in the environment may result in the formation of bioavailable zinc compounds. In aquatic systems, zinc bioaccumulates in both plants and animals. In terrestrial systems, the mobility of zinc in soil is dependent on soil conditions, such as cation exchange capacity, pH, redox potential, and chemical species present in the soil. Zinc also bioaccumulates in terrestrial plants, vertebrates, and mammals, with plant uptake from soil dependent on the plant species, soil pH, and soil composition.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME ..... Not applicable – not regulated.
U.S. DOT AND TRANSPORT CANADA HAZARD CLASSIFICATION .... Not applicable
U.S. DOT AND TRANSPORT CANADA PID..... Not applicable
MARINE POLLUTANT ..... No
IMO CLASSIFICATION ..... Not regulated

SECTION 15. REGULATORY INFORMATION

U.S.
INGREDIENT LISTED ON TSCA INVENTORY ..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... No

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Zinc ..... Yes.....RQ: 1,000 lb. (454 kg.)*
* reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No

EPCRA SECTION 311/312 HAZARD CATEGORIES ..... No Hazard Categories Apply

EPCRA SECTION 313 Toxic Release Inventory: ..... This product does not contain any toxic chemicals subject to the Toxic Release reporting requirements. However, potential by-products from working with this product - "Zinc (Fume or Dust)" CAS 7440-66-6 are reportable.

CANADIAN:

INGREDIENTS LISTED ON DOMESTIC SUBSTANCES LIST..... Yes

WHMIS CLASSIFICATION:..... Not applicable. Zinc is not a Controlled Product under CPR.

EUROPEAN UNION:

LISTED ON THE EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS)..... Yes

EU CLASSIFICATION: ..... Not applicable. Zinc in ingot form is not listed as a dangerous substance.

SECTION 16. OTHER INFORMATION

The information in this Material Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition.
- American Conference of Governmental Industrial Hygienists, 2006, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2005, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed), 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) Hamilton, Ontario, CHEMINFO Record No. 239 – Zinc (Last Revision 2006-01).
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, SOR/88-66, Controlled Products Regulations, as amended.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, 2003, Hazardous Substance Data Bank. (on-line version).
- Oak Ridge National Laboratory, Oak Ridge, Tennessee – Toxicity Summary for Zinc and Zinc Compounds, April 1992.
- Patty's Toxicology, Fifth Edition, 2001 E. Bingham, B. Cohrssen & CH Powell (Eds.).
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition (September 2005).
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, August 2005, Toxicological Profile for Zinc.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Metals Ltd. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This material safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations; therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

APPENDIX 5

PROPOSED DEVELOPMENT PLANS

DRAWING INDEX

S-001.00	STRUCTURAL NOTES
F-100.00	CELLAR FLOOR & FOUNDATION PLAN
F-101.00	FOUNDATION SECTIONS
F-102.00	FOUNDATION SECTIONS
F-103.00	FOUNDATION SECTIONS
S-101.00	CONVENTIONAL LEVEL FRAMING PLAN
S-102.00	ROOF FRAMING PLAN
S-103.00	PARTIAL FRAMING PLANS
S-401.00	TYPICAL DETAILS & SECTIONS
S-402.00	TYPICAL DETAILS & SECTIONS
S-403.00	TYPICAL DETAILS & SECTIONS
S-500.00	COLUMN SCHEDULE
S-501.00	COLUMN SCHEDULE
SOE-100.00	SUPPORT OF EXCAVATION PLAN-RAKERS UPPER LEVEL
SOE-101.00	SUPPORT OF EXCAVATION PLAN-RAKERS MIDDLE LEVEL
SOE-102.00	SUPPORT OF EXCAVATION PLAN-RAKERS LOWER LEVEL
SOE-103.00	SUPPORT OF EXCAVATION-SECTIONS
SOE-104.00	SUPPORT OF EXCAVATION-ELEVATIONS
S-600.00	NYCT STRUCTURAL NOTES
S-601.00	NYCT ROOF PLAN
S-602.00	NYCT SECTIONS

GENERAL NOTES

1. ALL WORK PERTAINING TO SHEETING, BRACING, SUPPORT OF ADJOINING LOTS AND SIDEWALKS, PLACEMENT OF FOUNDATION CONCRETE ON SOIL SUBGRADE IS SUBJECT TO CONTROLLED INSPECTION. DESIGN FOR SHEETING & BRACING SHALL BE DONE BY ENGINEER IN CHARGE OF CONTROLLED INSPECTION & PAID BY THE CONTRACTOR.
2. PROPER NOTICES SHALL BE GIVEN FOR PERFORMANCE OF THE CONTROLLED INSPECTION IN ACCORDANCE WITH THE REQUIREMENTS OF THE NYC BLDG CODE: "BEFORE ANY WORK IS COMMENCED ON AN ITEM OF CONSTRUCTION REQUIRING CONTROLLED INSPECTION, ALL PERSONS RESPONSIBLE FOR SUCH CONTROLLED INSPECTION SHALL BE NOTIFIED IN WRITING AT LEAST 72 HOURS PRIOR TO SUCH COMMENCEMENT."
3. NOTICE SHALL BE PROVIDED BY THE PROJECTS OWNER TO ADJOINING PROPERTY OWNERS IN ACCORDANCE WITH THE NYC BLDG CODE: "NO FOUNDATION OF EARTHWORK PERMIT SHALL BE ISSUED UNLESS AND UNTIL AT LEAST FIVE DAYS PRIOR WRITTEN NOTICE OF THE PERMIT APPLICATION SHALL HAVE BEEN GIVEN BY THE APPLICANT TO THE OWNERS OF ALL ADJOINING LOTS, BUILDINGS AND SERVICE FACILITIES WHICH MAY BE AFFECTED BY THE PROPOSED FOUNDATION WORK OR EARTHWORK OPERATIONS."
4. NOTICE SHALL BE PROVIDED BY THE PROJECTS OWNER TO ADJOINING PROPERTY OWNERS IN ACCORDANCE WITH THE NYC BLDG CODE: "AT LEAST 24 HOURS WRITTEN NOTICE SHALL BE GIVEN TO COMMISSIONER BEFORE THE COMMENCEMENT OF ANY WORK FOR WHICH A PERMIT HAS BEEN ISSUED."
5. ALL WORK PERFORMED IN CONNECTION WITH SHEETING, BRACING, UNDERPINNING, EXCAVATION SHALL ADHERE TO THE APPLICABLE PROVISIONS OF THE NEW YORK CITY BUILDING CODE, THE NEW YORK STATE CODE, REGULATIONS OF THE NEW YORK STATE DEPARTMENT OF LABOR AND OSHA.
6. PRIOR TO COMMENCEMENT OF MASS EXCAVATION, THE ADJOINING PROPERTIES, AND STREETS SHALL BE VISUALLY SURVEYED BY THE CONTRACTOR, SUITABLY MARKED WITH PERMANENT MONITORING POINTS TO BE MEASURED DURING CONSTRUCTION FOR THE PURPOSES OF DETERMINING CONSTRUCTION-RELATED EFFECTS. REPORT WITH PHOTOGRAPHS SHALL BE PROVIDED TO ARCHITECT IN TRIPLICATE COPIES. A PRECONSTRUCTION DAMAGE CONDITION SURVEY OF THE ADJOINING PROPERTIES SHALL BE MADE IN WRITTEN AND PICTORIAL FORM, AND TWO COPIES SHALL BE FURNISHED TO THE OWNER'S REPRESENTATIVE.
7. ANY WATER INFLOW INTO THE EXCAVATION SHALL BE CONTROLLED BY SUMPING OR OTHER SUITABLE METHODS. DISPOSAL OF WATER SHALL BE MADE OUT OF THE EXCAVATED AREA IN ACCORDANCE WITH LOCAL REGULATION. THE ELEVATION OF THE WATER LEVELS BEYOND THE LIMITS OF THE PROJECT SITE SHALL NOT BE LOWERED SO AS TO PREVENT DISTRESS TO ADJOINING STRUCTURES.
8. A COMPETENT REPRESENTATIVE OF THE CONTRACTOR SHALL INSPECT THE SUBGRADE OF THE EXCAVATION, ANY AND ALL BRACING AND BLOCKING, AT THE COMMENCEMENT OF EACH SHIFT, TO ASSURE INTEGRITY, PRIOR TO PERMITTING WORKMEN TO WORK WITHIN ANY EXCAVATED AREA.
9. THE CONTRACTOR SHALL PROVIDE ANY TEMPORARY EXCAVATION RESTRAINT REQUIRED FOR THE CONSTRUCTION OF THE PROJECT. IF A SHEETING OR BRACING SYSTEM IS TO BE UTILIZED, THE DETAILS OF A SHOP DRAWINGS AND SUBMITTED FOR REVIEW AND APPROVAL BY THE ARCHITECT BEFORE COMMENCEMENT OF WORK.
10. THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE SUBGRADE CONDITIONS PRIOR TO START OF WORK. THESE DRAWINGS DISCOUNT UNDERGROUND WATER CONDITIONS.

MISCELLANEOUS

THESE GENERAL NOTES SUPPLEMENT THE PROJECT SPECIFICATIONS. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

STRUCTURAL DRAWINGS ARE INTENDED TO BE USED WITH ARCHITECTURAL AND MECHANICAL DRAWINGS

CONTRACTOR IS RESPONSIBLE FOR COORDINATING SUCH REQUIREMENTS INTO THEIR SHOP DRAWINGS AND WORK.

NO OPENINGS SHALL BE MADE IN ANY STRUCTURAL MEMBER WITHOUT THE WRITTEN APPROVAL OF THE PROJECT MANAGER

NO CHANGE IN SIZE OR DIMENSION OF STRUCTURAL MEMBERS SHALL BE MADE WITHOUT THE WRITTEN APPROVAL OF THE PROJECT MANAGER.

OPENING 1'-4" AND LESS ON A SIDE ARE GENERALLY NOT SHOWN ON THE STRUCTURAL DRAWINGS. REFER TO ARCHITECTURAL AND MECHANICAL DRAWINGS FOR SUCH OPENINGS.

THE CONTRACTOR IS RESPONSIBLE FOR LIMITING THE AMOUNT OF CONSTRUCTION LOAD IMPOSED UPON STRUCTURAL FRAMING. CONSTRUCTION LOADS SHALL NOT EXCEED THE DESIGN CAPACITY OF THE FRAMING AT THE TIME THE LOADS ARE IMPOSED.

THE STRUCTURE IS DESIGNED TO FUNCTION AS UNIT UPON COMPLETION. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL TEMPORARY BRACING AND/OR SUPPORT THAT MAY BE REQUIRED AS THE RESULT OF THE CONTRACTOR'S CONSTRUCTION METHODS AND/OR SEQUENCES.

DO NOT SCALE THESE DRAWINGS, USE DIMENSIONS.

CONTRACTOR'S CONSTRUCTION AND/OR ERECTION SEQUENCES SHALL RECOGNIZE AND CONSIDER THE EFFECTS OF THERMAL MOVEMENTS OF STRUCTURAL ELEMENTS DURING THE CONSTRUCTION PERIOD.

IN CASES WHERE MATERIAL SHOWN OR SPECIFIED IS NOT READILY AVAILABLE, THE CONTRACTOR MAY PROPOSE THE USE OF ALTERNATE MEMBERS FOR REVIEW BY THE PROJECT MANAGER. THE ALTERNATE MEMBERS PROPOSED MUST PROVIDE THE SAME STRENGTH AND STIFFNESS AS THE ORIGINAL DESIGN. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT SUBSTITUTIONS DO NOT INTERFERE WITH ARCHITECTURAL, PLUMBING, MECHANICAL, ELECTRICAL, ETC. REQUIREMENTS OF ANY ADDITIONAL COSTS ASSOCIATED WITH THE PROPOSED SUBSTITUTION SHALL BE BORNE BY THE CONTRACTOR.

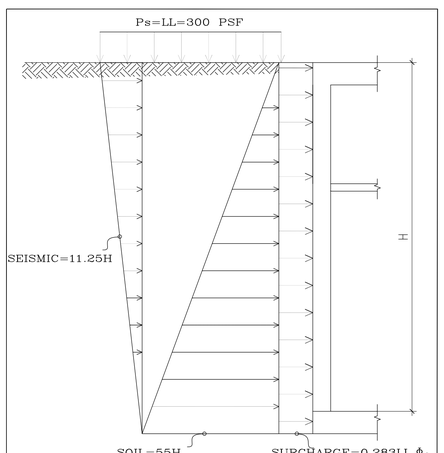
THE CONTRACTOR SHALL INFORM THE PROJECT MANAGER IN WRITING OF ANY DEVIATION FROM THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL NOT BE RELIEVED OF THE RESPONSIBILITY OF SUCH DEVIATION BY THE PROJECT MANAGER'S REVIEW OF SHOP DRAWINGS, PRODUCT DATA, ETC. UNLESS THE CONTRACTOR HAS SPECIFICALLY INFORMED THE PROJECT MANAGER OF SUCH DEVIATION AT THE TIME OF SUBMISSION, AND THE PROJECT MANAGER HAS GIVEN WRITTEN APPROVAL THE SPECIFIC DEVIATION.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL WORK SHALL CONFORM WITH AISC SPECIFICATIONS FOR STRUCTURAL STEEL FOR BUILDINGS, LATEST EDITION (LRFD), AS AMENDED TO DATE.
2. ALL STEEL TO BE ASTM-572 (Fy=50 KSI), BASE PL'S CONNECTIONS, ETC. TO BE ASTM A36, Fy=36 KSI. COLUMNS & GIRDERS STIFFENER PLATES – ASTM A572 Fy = 50 KSI.
3. SHOP CONNECTIONS-WELDED OR HIGH STRENGTH BOLTED. FIELD CONNECTIONS HIGH STRENGTH BOLTED UNLESS OTHERWISE SHOWN. ALL WELDED CONNECTIONS SHELL DEVELOP THE FULL STRENGTH OF THE MEMBERS, UNLESS OTHERWISE NOTED.
4. BOLT STEEL SHALL CONFORM TO THE FOLLOWING ASTM DESIGNATION LATEST EDITION: HIGH STRENGTH BOLTS A-325 FRICTION TYP. WELDING ELECTRODES: AMERICAN WELDING SOCIETY A 5.1 E-70 SERIES.
5. ALL BOLTS SHALL BE MINIMUM 3/4" DIA. A 325-F. OPEN HOLES 13/16" DIA. UNLESS OTHERWISE SHOWN OR NOTED. NO SLOTTED HOLES PERMITTED.
6. CONNECTION DESIGN: SHEAR CONNECTIONS: FOR NON-COMPOSITE BEAMS USE THE REACTIONS CAUSED BY THE UNIFORM LOAD REQUIRED TO STRESS THE OUTER FIBERS TO 0.75 Fy, UNLESS OTHERWISE NOTED. FOR COMPOSITE BEAMS USE 2.0 TIMES AFOREMENTIONED REACTION.
7. ALL SHOP AND FIELD WELDS SHALL BE MADE BY APPROVED CERTIFIED WELDERS, AND SHALL CONFORM TO THE AMERICAN WELDING SOCIETY CODE. UNLESS OTHERWISE NOTED, ALL WELDS SHALL DEVELOP THE FULL STRENGTH OF THE MATERIALS BEING WELDED.
8. THE FRAME SHALL BE CARRIED UP TRUE AND PLUMB, AND TEMPORARY BRACING SHALL BE INTRODUCED WHEREVER NECESSARY TO TAKE CARE OF ALL LOADS TO WHICH THE STRUCTURE MAY BE SUBJECTED, INCLUDING EQUIPMENT AND THE OPERATION OF SAME. SUCH BRACING SHALL BE THE RESPONSIBILITY OF THE STEEL CONTRACTOR AND SHALL BE LEFT IN PLACE AS LONG AS REQUIRED FOR SAFETY.
9. PROVIDE ALL REQUIRED PLATES, GUSSETS, STIFFENERS, BOLTS, BEAM FILLER METAL, LINTELS, ETC., WHETHER SHOWN ON THE DRAWINGS OR NOT.
10. THE MINIMUM ANGLE THICKNESS SHALL BE 3/8". THE MINIMUM BOLTS SHALL BE 3/4" DIA., AND THE MINIMUM WELD SHALL BE 1/4".
11. ANCHOR BOLTS, BASE PLATES OR BEARING PLATES SHALL BE LOCATED AND BUILT INTO CONNECTING WORK, PRESET BY TEMPLATES OR SIMILAR METHODS. ALL PLATES SHALL BE SET IN FULL BEDS OR NON-SHRINK GROUT.
12. STRUCTURAL MEMBERS WHICH REQUIRE SPRAY-ON FIRE PROOFING SHALL HAVE THE RATING INDICATED ON THE DRAWINGS OR SPECIFICATIONS.
13. SHOP DRAWINGS SHALL BE SUBMITTED AND APPROVED BEFORE FABRICATING OR ERECTING ANY WORK. ALL IN ACCORDANCE WITH THE SPECIFICATIONS.
14. STRUCTURAL STEEL DETAILS NOT SPECIFICALLY SHOWN SHALL BE SIMILAR TO THOSE FOR MOST SIMILAR SITUATIONS AS DETERMINED BY THE ARCHITECT.
15. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE AISC CODE OF STANDARD PRACTICE (1986), EXCEPT AS MODIFIED IN THESE NOTES AND THE PROJECT SPECIFICATIONS.
16. THE FABRICATOR IS RESPONSIBLE FOR THE DESIGN OF ALL CONNECTIONS. CONNECTIONS SHOWN ON THE STRUCTURAL DRAWINGS ARE SCHEMATIC AND ARE ONLY INTENDED TO SHOW THE RELATIONSHIP OF MEMBERS CONNECTED. CONNECTION DETAILS INDICATED ON THE DRAWINGS SHALL BE INCORPORATED INTO FABRICATOR'S CONNECTION DESIGN. ALL SHOP DRAWINGS SHALL BE SIGNED AND SEALED BY THE FABRICATOR'S ENGINEER WITH THE ENGINEER'S SEAL MAY BE QUALIFIED "FOR DESIGN OF CONNECTIONS ONLY."
17. SPLICING OF STEEL MEMBERS, UNLESS SHOWN ON THE DRAWINGS, IS PROHIBITED WITHOUT WRITTEN APPROVAL OF THE ARCHITECT.
18. UNLESS NOTED OTHERWISE, BEAMS SHALL BEAR 8" MINIMUM ON CONCRETE OR MASONRY
19. ALL EXPOSED STEEL, GALVANIZE + PAINT.

FOUNDATION

1. ALL FOOTINGS ARE TO REST ON SOIL HAVING A MIN. SAFE BEARING CAPACITY OF 5 TONS PER SQUARE FOOT.
2. ISOLATED FOOTINGS SHALL BE LOWERED OR RAISED, AND PIERS SHALL BE ADDED, REDUCED OR INCREASED IN HEIGHT, ALL AS APPROVED BY THE ENGINEER, WHERE UNDISTURBED SOIL OF THE SPECIFIED BEARING CAPACITY IS FOUND AT A LOWER OR HIGHER ELEVATION THAN SHOWN ON THE PLANS.
3. BACKFILLING AGAINST FOUNDATION WALLS SHALL NOT BE DONE UNTIL CONCRETE HAS ATTAINED SUFFICIENT STRENGTH AND WALLS ARE PROPERLY SHORED OR BRACED OBTAIN APPOVAL FROM ENGINEER PRIOR TO
4. EDGES OF FOOTINGS SHALL NOT BE PLACED AT A GREATER THAN 1 (VERTICAL) TO 2 (HORIZONTAL) SLOPE WITH RESPECT TO ANY ADJACENT
5. THE CONTRACTOR SHALL SAFEGUARD AND PROTECT ALL EXCAVATIONS. BACKFILLING
6. THE DESIGN OF THE FOUNDATION IS BASED ON SOIL REPORT DATED NOVEMBER, 18, 2014. PREPARED BY VACHRIS ENGINEERING, P.C. , GARDEN CITY, NY 11530



FOUNDATION WALLS DESIGN PRESSURES
(PER SOIL REPORT)

SPECIAL INSPECTIONS

1. PRIOR TO BEGINNING ANY WORK, THE CONTRACTOR SHALL RETAIN THE SERVICES OF N.WEXLER, P.E., P.C., OR ANOTHER ACCEPTABLE LICENSED PROFESSIONAL ENGINEER WHO SHALL HAVE PROVEN EXPERIENCE ACCEPTABLE TO THE OWNER AND ARCHITECT. MINIMUM REQUIRED QUALIFICATIONS SHALL INCLUDE A PROFESSIONAL LIABILITY INSURANCE COVERAGE OF 1 MILLION DOLLARS AND A MINIMUM PROVEN EXPERIENCE OF 5 YEARS WITH SIMILAR WORK.
2. THE CONTRACTOR'S ENGINEER SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS. HE SHALL PROVIDE SPECIAL INSPECTION SERVICES AS FOLLOWS:
   - A. STRUCTURAL STEEL - WELDING AND HIGH STRENGTH BOLTING.
   - B. STABILITY AND INTEGRITY OF STRUCTURES DURING CONSTRUCTION OPERATIONS.
   - C. SUPPORT OF EXCAVATION.
   - D. SUBGRADE FOR FOOTINGS.
   - E. COMPACT FILL.
   - F. CONCRETE
   - G. PILES
3. THE ENGINEER SHALL PREPARE PLANS, CALCULATIONS, AND NOTES IN THE FORM OF SHOP DRAWINGS, FOR ALL ITEMS OF WORK WHICH DIFFER FROM WHAT IS SHOWN ON THE STRUCTURAL DRAWINGS DUE TO FIELD CONDITIONS. HE SHALL ALSO PREPARE PLANS IN THE FORM OF SHOP DRAWINGS, CALCULATIONS AND NOTES FOR ALL TEMPORARY SHORES AND BRACES AND CLEARLY INDICATE METHOD OF INSTALLATION, SEQUENCE OF OPERATIONS, AND QUALITY CONTROL.
4. THESE SHOP DRAWINGS SHALL BE REVIEWED BY THE ENGINEER OF RECORD AND ARCHITECT PRIOR TO CONSTRUCTION. WORK SHALL BE EXECUTED FROM REVIEWED SHOP DRAWINGS ONLY.
5. COPIES OF SUCH DRAWINGS WHICH INCLUDE THE ARCHITECT'S COMMENTS SHALL BE FILED WITH THE DEPARTMENT OF BUILDINGS (ON AMENDMENT FORMS). ADDITIONALLY, AT COMPLETION OF WORK, FORMS INCLUDING ALL INSPECTION REPORTS PREPARED BY THE CONTRACTOR'S ENGINEER SHALL BE FILED WITH THE DEPARTMENT OF BUILDINGS.
6. THE SPECIAL INSPECTION ENGINEER SHALL DETERMINE THE FREQUENCY OF INSPECTIONS NEEDED AND WHETHER HE OR SHE SHOULD INSPECT THE SITE PERSONALLY OR SEND A PERSON UNDER HIS OR HER DIRECT SUPERVISION. AT A MINIMUM, THE SITE MUST BE INSPECTED TWICE, ONCE AT A PRE-CONSTRUCTION MEETING WITH THE CONTRACTOR AND ONCE DURING CONSTRUCTION OPERATIONS.
7. THE SPECIAL INSPECTION ENGINEER, SHALL MAINTAIN A LOG IN HIS OR HER OFFICE WHICH INCLUDES THE FOLLOWING INFORMATION:
   - (i) ADDRESS OF THE PREMISES, JOB NUMBER, CONTRACTOR NAME AND ADRESS, AND
   - (ii) DATE AND TIME OF EACH INSPECTION INCLUDING
     - (A) NAMES OF PERSONNEL WHO INSPECTED THE SITE, AND
     - (B) ANY SIGNIFICANT OBSERVATIONS OR INSTRUCTIONS GIVEN RELATING TO ANY OF THE FOLLOWING:
       - (1) DEVIATIONS FROM THE CONTRACT DOCUMENTS.
       - (2) ANTICIPATED FIELD CONDITIONS;
       - (3) PROPER EXECUTION OF THE WORK;
       - (4) GOOD ENGINEERING PRACTICE;
       - (5) SAFE JOB-SITE CONDITIONS;
       - (6) PRECAUTIONS TAKEN TO MAINTAIN SAFE CONDITIONS IF WORK IS STOPPED FOR ANY REASON.
   - (iii) THE DATE OF AND PARTICIPANTS IN ANY CONVERSATIONS WITH THE SPECIAL INSPECTION ENGINEER OCCURING OFF-SITE AND RELATING TO ANY SIGNIFICANT OBSERVATIONS OR INSTRUCTIONS.
8. THE SPECIAL INSPECTION ENGINEER SHALL RETAIN A COPY OF THE DOCUMENTS DESCRIBED ABOVE IN HIS OR HER OFFICE AND SHALL PROVIDE A COPY TO THE CONTRACTOR AND/OR OWNER TO BE KEPT AT THE CONSTRUCTION SITE.
9. THE SPECIAL INSPECTION ENGINEER RESPONSIBLE FOR SPECIAL INSPECTION SHALL REPORT UNSAFE CONDITIONS TO THE DEPARTMENT OF BUILDINGS AND/OR ANY OTHER AFFECTED PARTIES OR AGENCIES.
10. UPON REQUEST OF THE DEPARTMENT, THE SPECIAL INSPECTION ENGINEER SHALL MAKE AVAILABLE FOR REVIEW BY THE DEPARTMENT DOCUMENTS AND THE LOG DESCRIBED ABOVE.

CONCRETE

1. UPON AWARD OF CONTRACT, THE CONTRACTOR SHALL RETAIN THE SERVICES OF A LICENSED DETAILER, OR ANOTHER DETAILER WITH A MIN. OF 5 YEARS PROVEN EXPERIENCE AND ACCEPTABLE TO THE OWNER AND ENGINEER TO PRODUCE SHOP DRAWINGS.
2. ALL CONCRETE WORK SHALL CONFORM WITH THE REQUIREMENTS OF THE CONCRETE INSTITUTE (ACI) 318-08.
3. ALL CONCRETE, EXCEPT AS SPECIFICALLY NOTED HEREIN, SHALL BE STONE CONCRETE HAVING AN ULTIMATE COMPRESSIVE STRENGTH OF 5950 PSI AFTER 28 DAYS AND SHALL HAVE A MINIMUM CEMENT CONTENT OF AT LEAST 5-1/2 BAGS PER CUBIC YARD. CONCRETE SHALL BE:

SLAB ON GRADE:	4000 PSI
MAT SLAB, FOOTINGS	4000 PSI
CONCRETE WALLS AND COLUMNS	5950 PSI
CONV. LEVEL AND ROOF LEVEL SLAB	5950 PSI

   - (a) REINFORCING FOR REINFORCED CONCRETE ELEMENTS, UNLESS OTHERWISE SHOWN OR SPECIFIED, SHALL BE DEFORMED IN ACCORDANCE WITH ASTM-A615, GRADE 60 AND SHALL HAVE A MINIMUM YIELD POINT OF 60,000 PSI.
   - (b) REINFORCING FOR COLUMN TIES AND BEAM STIRRUPS SHALL BE DEFORMED IN ACCORDANCE WITH ASTM-A615, GRADE 40 AND SHALL HAVE A MINIMUM YIELD POINT OF 40,000 PSI.
4. WELDED WIRE FABRIC SHALL HAVE A MINIMUM ULTIMATE STRENGTH OF 70,000 PSI.
5. MINIMUM REINFORCEMENT PROTECTION, UNLESS OTHERWISE SHOWN, SHALL BE 3/4" FOR SLABS AND INTERIOR FACES OF WALLS, 1-1/2" FOR BEAMS AND GIRDERS, 2" FOR EXTERIOR FACES OF WALLS, 3" FOR FOOTINGS AND OTHER STRUCTURAL CONCRETE DEPOSITED AGAINST GROUND.
6. NO CONCRETE SHALL BE POURED UVIT THE REQUIRED PRELIMINARY TESTE (PER NYCBC) HAVE BEEN MADE AND APPROVED.
7. ALL STRUCTURAL MEMBERS SHALL BE POURED FOR THEIR FULL DEPTH IN ONE OPERATION. CONSTRUCTION JOINTS, SUCH AS DAYS POUR JOINTS, SHALL BE LOCATED IN THE MIDDLE THIRD OF THE SPAN. MAIN REINFORCING SHALL RUN THROUGH THE JOINT. POUGHEN AND PICK JOINTS TO EXPOSE AGGREGATE FOR CHEMICAL BOND. WET THOROUGHLY AND SLUSH JOINT WITH 1:2 MORTAR, 1/2"THICK, NOT MORE THAN 5 MINUTES BEFORE FRESH CONCRETE IS POURED AGAINST SURFACE.
8. ALL OPENINGS IN FOUNDATION WALLS, UNLESS OTHERWISE SHOWN, SHALL HAVE 2 #6 BARS ADDITIONAL ON ALL SIDES AND SHALL EXTEND 2'-0" BEYOND EDGES OF OPENINGS.
9. THE CONTRACTOR SHALL COOPERATE WITH OTHER TRADES AND WHERE REQUIRED, INSTALL ALL BUILT-IN-WORK, SLEEVES, OPENINGS, INSERTS, ETC. AS REQUIRED FOR A CONCRETE JOB. LOCATION OF SLEEVES AND OPENINGS NOT SHOWN ON PLANS IS SUBJECT TO APPROVAL OF STRUCTURAL ENGINEER.
10. PROVIDE VERTICAL DOVETAIL INSERTS AT 2'-0" O.C. MAXIMUM IN ALL CONCRETE SURFACES FACED WITH 1'-3" OR GREATER HEIGHT OF BRICK OR BLOCK.
11. ALL REBARS IN SLAB TO BE SUPPORTED BY PLASTIC COATED CHAIRS PER ACI CODE.
12. ALL REINFORCING SHALL BE DETAILED, FABRICATED AND PLACED, IN ACCORDANCE WITH ACI DETAILING MANUAL (LATEST EDITION).
13. ALL REINFORCING SHALL BE SUPPORTED IN FORMS, SPACED WITH NECESSARY ACCESSORIES AND SHALL BE SECURELY WIRED TOGETHER, IN ACCORDANCE WITH CRSI "MANUAL OF STANDARD PRACTICE" (LATEST EDITION).
14. SLUMP OF CONCRETE SHALL NOT EXCEED 4" UNLESS A HIGH RANGE WATER-REDUCING ADMIXTURE IS USED. THE SLUMP OF WATER-REDUCING ADMIXTURE SHALL NOT EXCEED 4". THE SLUMP OF CONCRETE CONTAINING A HIGH RANGE WATER-REDUCING ADMIXTURE SHALL NOT EXCEED 8".
15. CONCRETE EXPOSED TO WEATHER SHALL BE AIR-ENTRAINED. AIR CONTENT SHALL BE BETWEEN 4 AND 8 PERCENT.
16. COARSE AGGREGATE SIZE SHALL BE NO. 57 OR LARGER. CONTRACTOR SHALL SUBMIT MIX DESIGNS FOR REVIEW BY THE PROJECT MANAGER WELL IN ADVANCE OF CONCRETE PLACEMENT. CONCRETE MIX DESIGN SHALL INCLUDE ALL STRENGTH DATA NECESSARY TO SHOW COMPLIANCE WITH THE PROJECT SPECIFICATIONS FOR EITHER THE TRIAL BATCH OR FIELD EXPERIENCE METHOD.
17. THE CONCRETE CONTRACTOR SHALL INCLUDE IN HIS PRICE, THE ADDITIONAL COST OF CONCRETE DUE TO THE DEFLECTION OF METAL DECK, STEEL BEAMS AND GIRDERS.

SLABS ON GRADE NOTES

1. FLOOR SLABS ON GROUND SHAL BE POURED TO THE THICKNESS SHOWN ON THE DRAWINGS ON VAPOR BARRIER.
2. VAPOR BARRIER SHALL BE POLYETHYLENE PLASTIC HAVING A MINIMUM THICKNESS OF 8 MILS (.008), FREE OF PINHOLES AND OTHER BLEMISHES AND SHALL BE INSTALLED OVER COMPACTED POROUS FILLING ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS. ALL JOINTS SHALL BE LAPPED 12" AND TAPED.
3. PROVIDE A 6" THICK LAYER OF POROUS FILL BENEATH ALLSLABS ON GROUND. COMPACT FILL TO 95% OF MAXIMUM DENSITY IN COMFORMANCE TO ASTM D1557-66T. MATERIAL SHALL CONSIST OF HARD, DURABLE PARTICLES, FREE OF ORGANIC MATTER, RUBBLE AND ALL DELETERIOUS SUBSTANCWS. MAXIMUM PARTICLE SIZE SHALL BE 2", 10% TO 60% BY WEIGHT RETAINED ON THE #10 SIEVE, LESS THAN 40% BY WEIGHT PASSING THE No.60 SIEVE, AND NOT MORE THAN 10% WEIGHT PASSING THE No.200 SIEVE.
4. SLABS ON GROUND SHALL BE POURED IN CHECKERBOARD FASHION TO MINIMIZE THE SHRINKAGE. THE MAXIMUM AREA OF POUR SHALL BE 1000 SQUARE FEET WITH NO DIMENSION EXCEEDING 35 FEET.
5. MAXIMUM OUTSIDE DIAMETER OF PIPE OR CONDUIT PLACED IN SLABS ON GROUND SHALL BE LIMITED TO ONE-THIRD THE THICKNESS OF THE SLAB. THE MINIMUM CONCRETE COVER TOP AND BOTTOM SHALL BE ONE-THIRD THE THICKNESS OF THE SLAB.
6. PROVIDE A 9" THICKENED SLAB FOR WIDTH OF 6" EACH SIDE OF JOINT AND A 2" x 3" CONTINUOUS KEY AT CONSTRUCTION JOINTS AND CONTINUE MESH THROUGH

SPECIAL NOTES TO OWNER

CONCRETE CRACKS

UNDER NORMAL CONDITIONS, AND FOR CONVENTIONAL BUILDINGS SUCH AS THE SUBJECT MATTER, REINFORCED CONCRETE AS WELL AS CONCRETE BLOCK WALLS DEVELOP CRACKS. THE CRACKS ARE DUE TO INHERENT SHRINKAGE OF CONCRETE, CREEP AND RESTRAINING EFFECTS OF WALLS AND OTHER STRUCTURAL ELEMENTS TO WHICH THE BEAMS/SLABS ARE TIED.

THE CRACKS FORMED ARE NORMALLY COSMETIC.THE SLAB MAINTAINS ITS SERVICEABILITY AND STRENGTH REQUIREMENTS. ITS POSSIBLE THAT A NUMBER OF HAIR CRACKS, WHICH WOULD NORMALLY SPREAD OVER A WIDE AREA, WILL INTEGRATE INTO A SINGLE CRACK WITH A WIDTH EXCEEDING 0.01 INCH. IT IS EMPHASIZED THAT ALTHOUGH SPECIAL EFFORT IS MADE TO REDUCE THE POTENTIAL CAUSES AND NUMBER OF SUCH CRACKS, IT IS NOT PRACTICAL TO PROVIDE TOTAL ARTICULATION BETWEEN THE FLOOR/ROOF SYSTEM AND ITS SUPPORTS AND THEREBY ACHIEVE COMPLETE INHIBITION OF ALL CRACKS.

MOST SUCH CRACKS DEVELOP OVER THE FIRST TWO YEARS OF THE LIFE OF THE FLOOR SYSTEM. CRACKS WHICH ARE WIDER THAN 0.01 INCH MAY NEED TO BE PRESSURE EPOXIED. PROVIDE ALLOWANCE FOR SUCH CRACKS.

THE OBJECT OF THE JOINTS PROVIDED IS TO ALLOW MOVEMENT. MOVEMENTS DUE TO CREEP AND SHRINKAGE MAY BE NOTICEABLE AT JOINTS UP TO TWO YEARS AFTER CONSTRUCTION, BEYOND WHICH MOVEMENTS DUE TO VARIATIONS IN TEMPERATURE WILL PERSIST.

DUE TO THE EXISTING SOIL CONDITIONS WHICH ARE SOFT, SOME FOUNDATION SETTLEMENT IS ANTICIPATED. MOST SETTLEMENT WILL OCCUR INITIALLY, BUT SOME CAN BE EXPECTED TO OCCUR POST CONSTRUCTION. SETTLEMENT CAN MANIFEST ITSELF AS MASONRY AND CONCRETE CRACKS IN THIS BUILDING AND ADJACENT STRUCTURES.

THE OWNER WILL RETAIN THE SERVICES OF A PHOTO-SURVEY CONTRACTOR WHO WILL DOCUMENT ALL PRE- EXISTING CONDITIONS IN ADJACENT BUILDINGS, PRIOR TO START OF CONSTRUCTION. COPIES OF SUCH REPORTS WILL BE KEPT BY THE OWNER.
TO REPAIR THE CRACKS BACK TO ORIGINAL CONDITION, AND PAY FOR SAME.
IN THE EVENT THAT CRACKING OCCURS, THE OWNER WILL INSTRUCT THE CONTRACTOR

PRECONSTRUCTION SURVEY;

THE OWNER WILL RETAIN THE SERVICES OF A PHOTO-SURVEY CONTRACTOR WHO WILL DOCUMENT ALL PRE- EXISTING CONDITIONS IN ADJACENT BUILDINGS, PRIOR TO START OF CONSTRUCTION. COPIES OF SUCH REPORTS WILL BE KEPT BY THE OWNER.

MAINTENANCE NOTES;

THE OWNER SHALL IMPLEMENT A MAINTENANCE PROGRAM FOR ALL EXTERIOR SURFACES. ALL EXTERIOR WALLS, BALCONIES, TERRACES, RAILINGS, PARAPETS, BULKHEADS, COPINGS, GARAGE ETC. SHALL BE INSPECTED PERIODICALLY BY A QUALIFIED PROFESSIONAL AND THEN REPAIRED BY A QUALIFIED CONTRACTOR. THE OWNER SHALL BUDGET MAINTENANCE REPAIRS, AS REQUIRED. FOR CONDOMINIUM PROJECTS, MAINTENANCE REQUIREMENTS SHALL BE INCLUDED IN THE OFFERING PLAN.

CLAIMS;

ANY CLAIMS BY 3rd PARTIES, SUCH AS NEIGHBOURS, CONTRACTORS, ETC., WILL BE COVERED BY THE CLIENT.
ANY CLAIMS COVERING THE EXTERIOR ENVELOPE INCLUDING PARKING STRUCTURES, WILL BE COVERED BY THE CLIENT. ANY CLAIMS RELATED TO SITE WORK WILL BE COVERED BY THE CLIENT.

SPECIAL EXCAVATION NOTES TO THE CONTRACTOR

1. EXCAVATE ON PROPERTY LINES SUCH AS TO MAINTAIN ADJACENT PROPERTIES UNDAMAGED AT ALL TIMES.
2. REPAIR DAMAGE TO ADJACENT PROPERTIES AT NO COST TO THE OWNER.

PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York , NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York , NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

STRUCTURAL NOTES

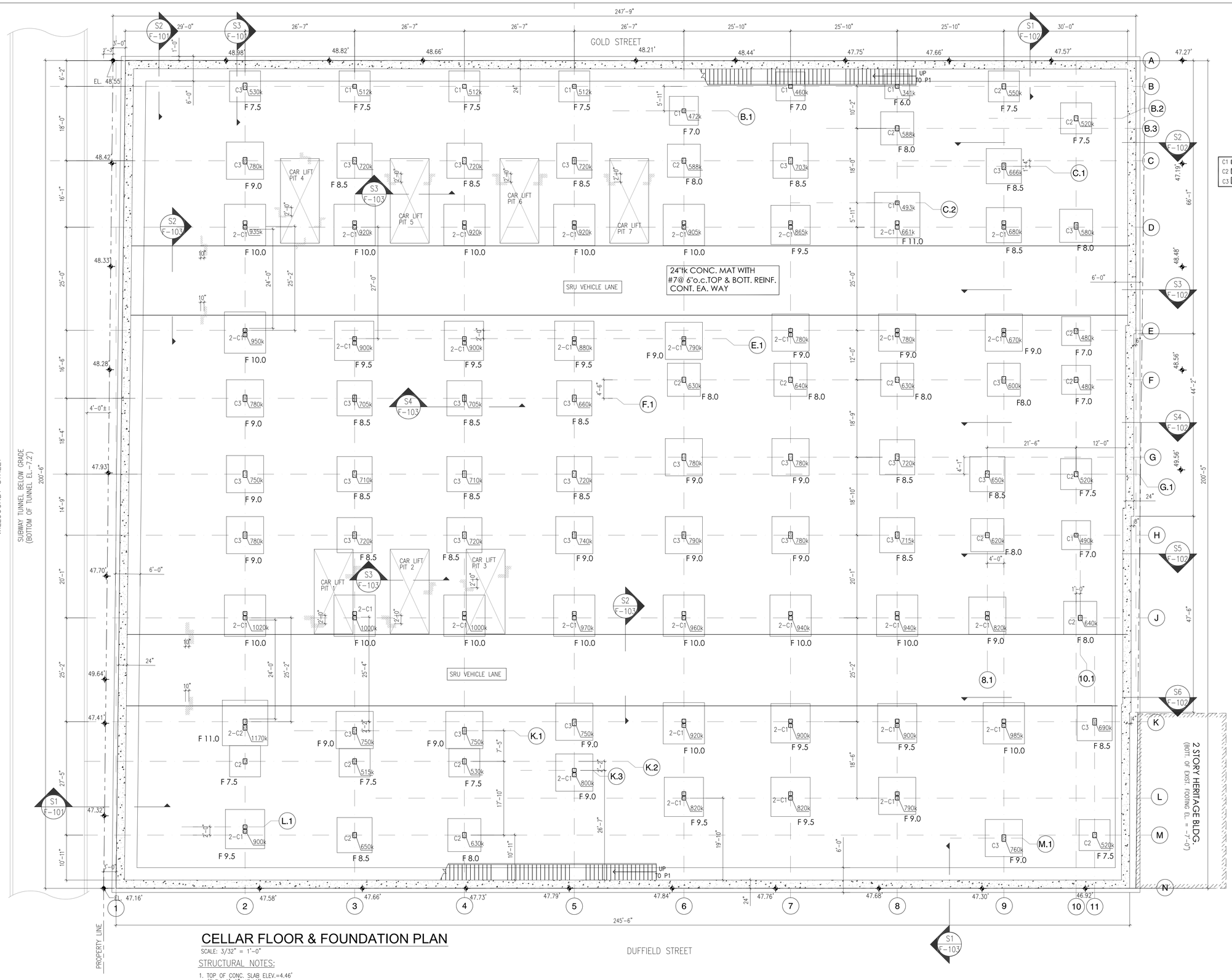
Drawing No.

S-001.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



CELLAR FLOOR & FOUNDATION PLAN

SCALE: 3/32" = 1'-0"

STRUCTURAL NOTES:

1. TOP OF CONC. SLAB ELEV.=4.46' (ELEV. 0'-0"=47.16')
2. CONCRETE MAT – 24"tk REINF. W/#6@6"o.c. TOP & BOTT. EA. WAY.
3. SOIL BEARING CAPACITY= 5 TSF.

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

CELLAR FLOOR & FOUNDATION PLAN

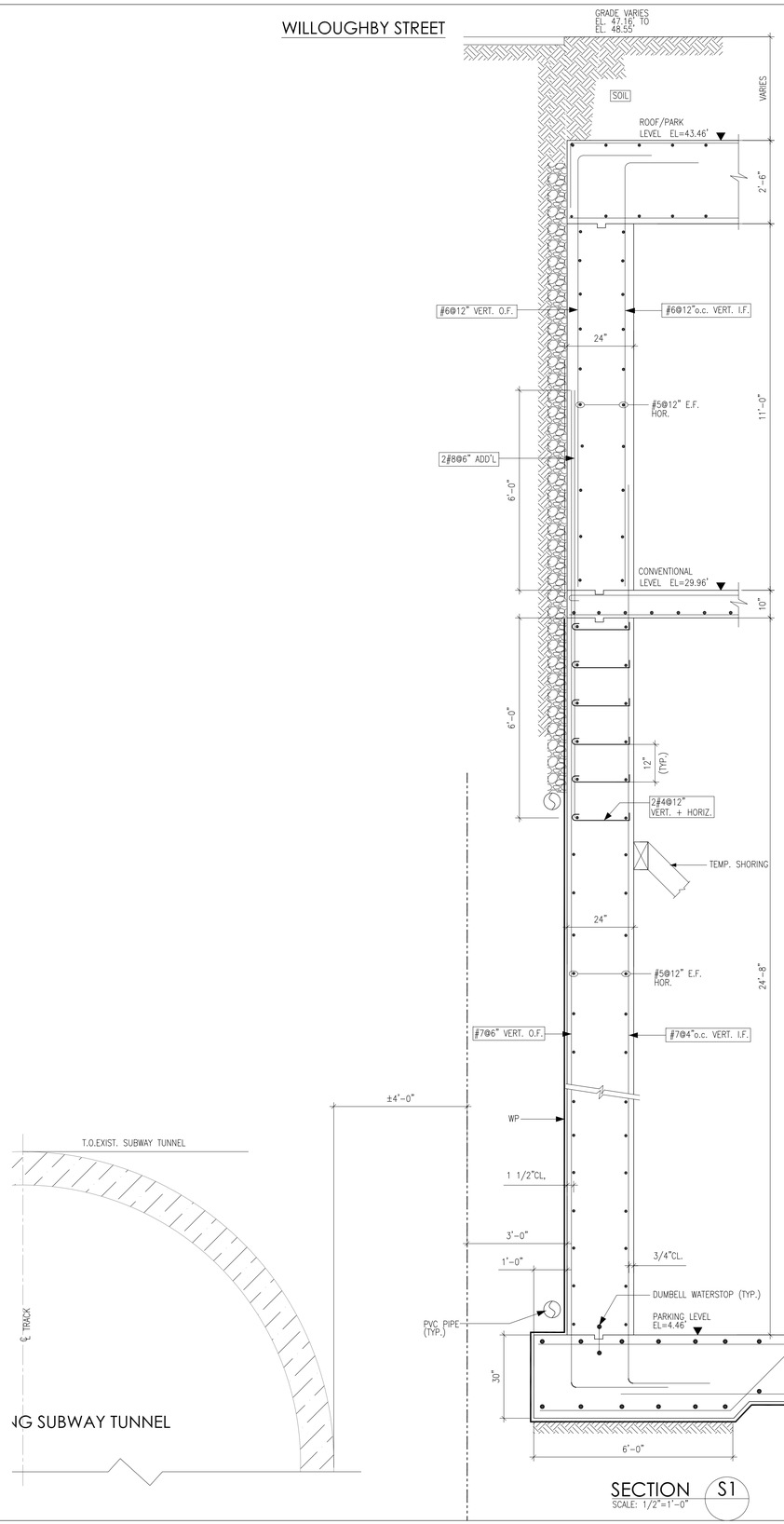
Drawing No.

F -100.00

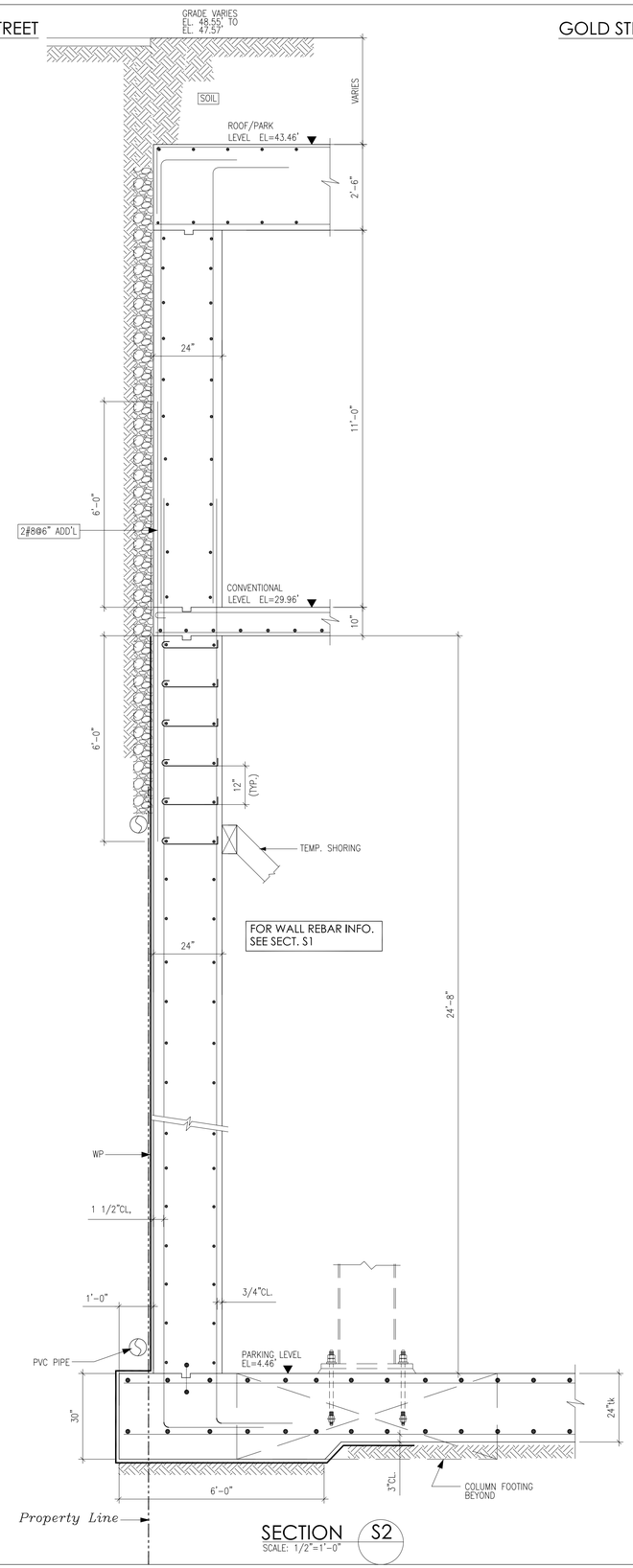
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

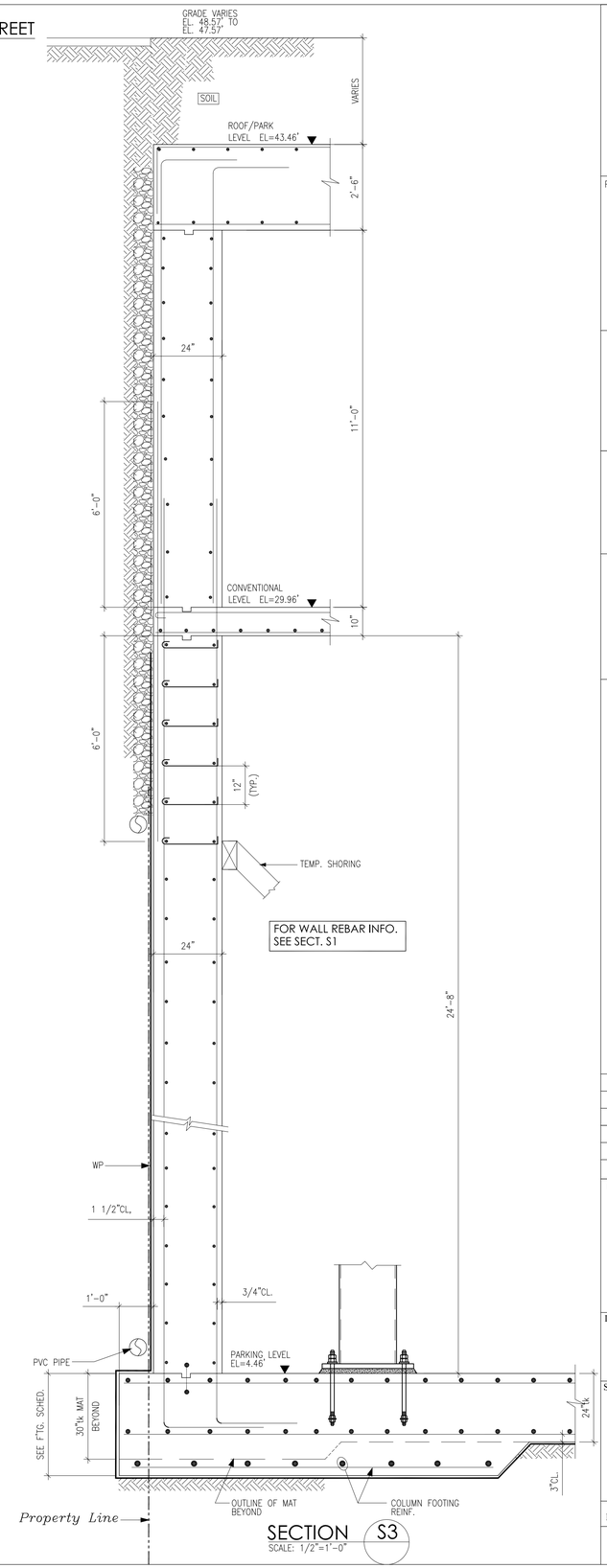
DOB #



SECTION S1
SCALE: 1/2"=1'-0"



SECTION S2
SCALE: 1/2"=1'-0"



SECTION S3
SCALE: 1/2"=1'-0"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

FOUNDATION SECTIONS

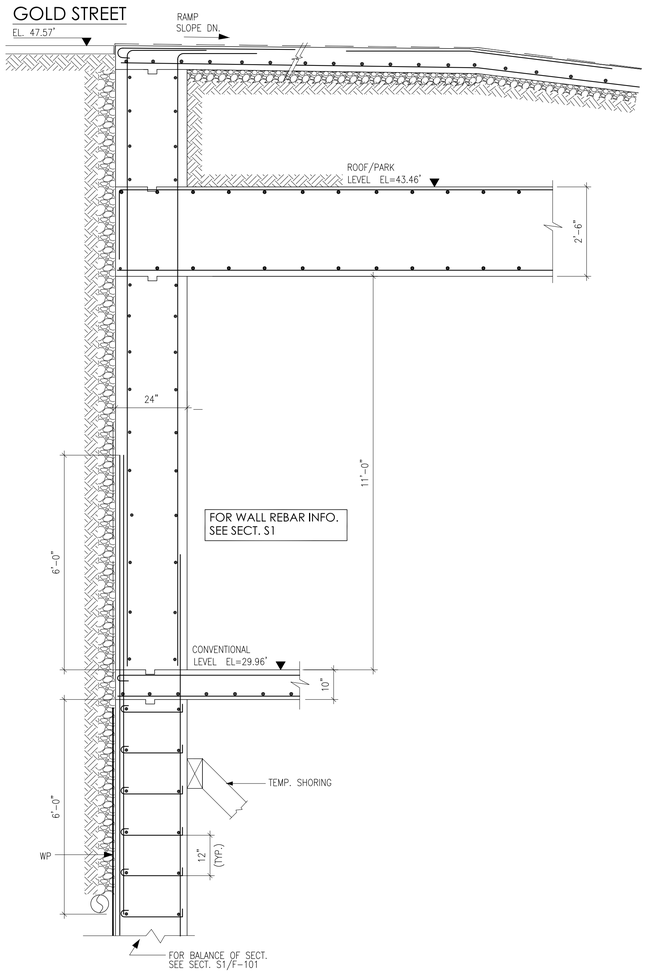
Drawing No.

F-101.00

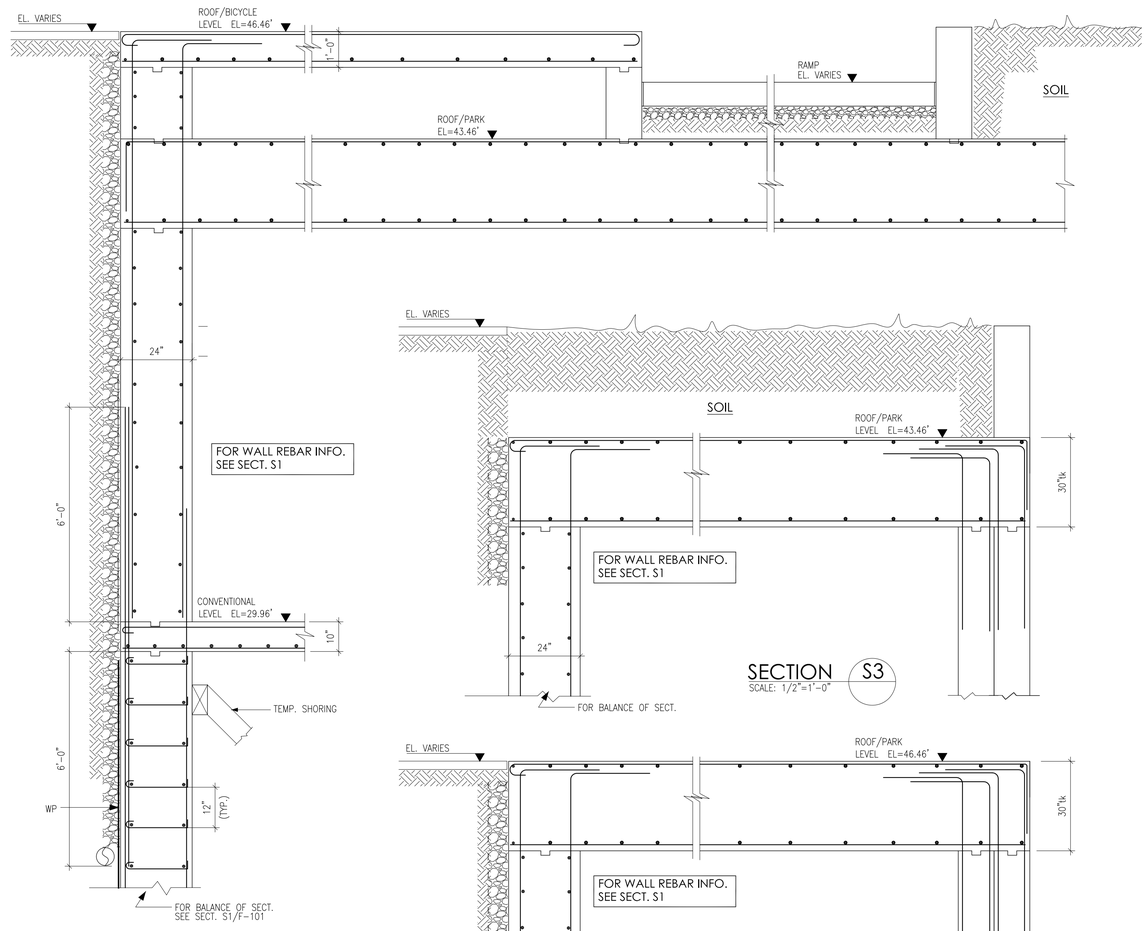
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #

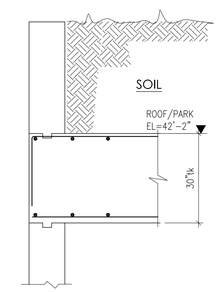


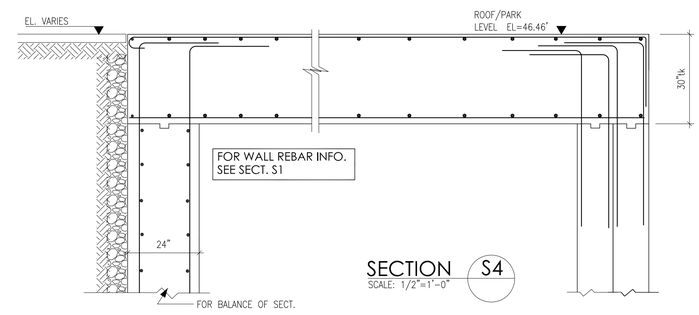
SECTION S1 THRU RAMP ENTRANCE
SCALE: 1/2"=1'-0"



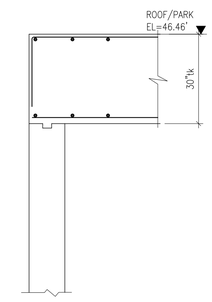
SECTION S2
SCALE: 1/2"=1'-0"

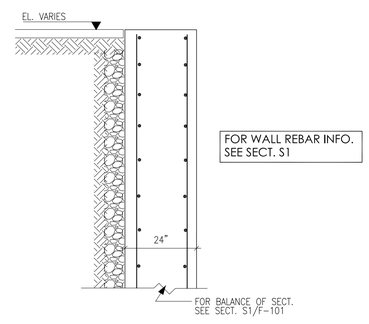
SECTION S3
SCALE: 1/2"=1'-0"



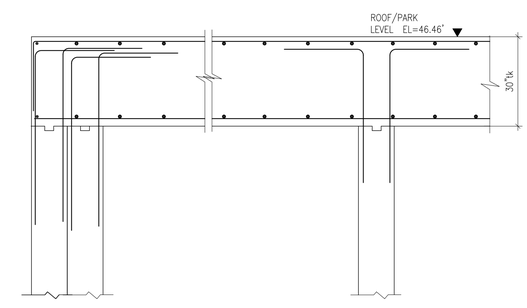


SECTION S4
SCALE: 1/2"=1'-0"





SECTION S5
SCALE: 1/2"=1'-0"



PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

FOUNDATION SECTIONS

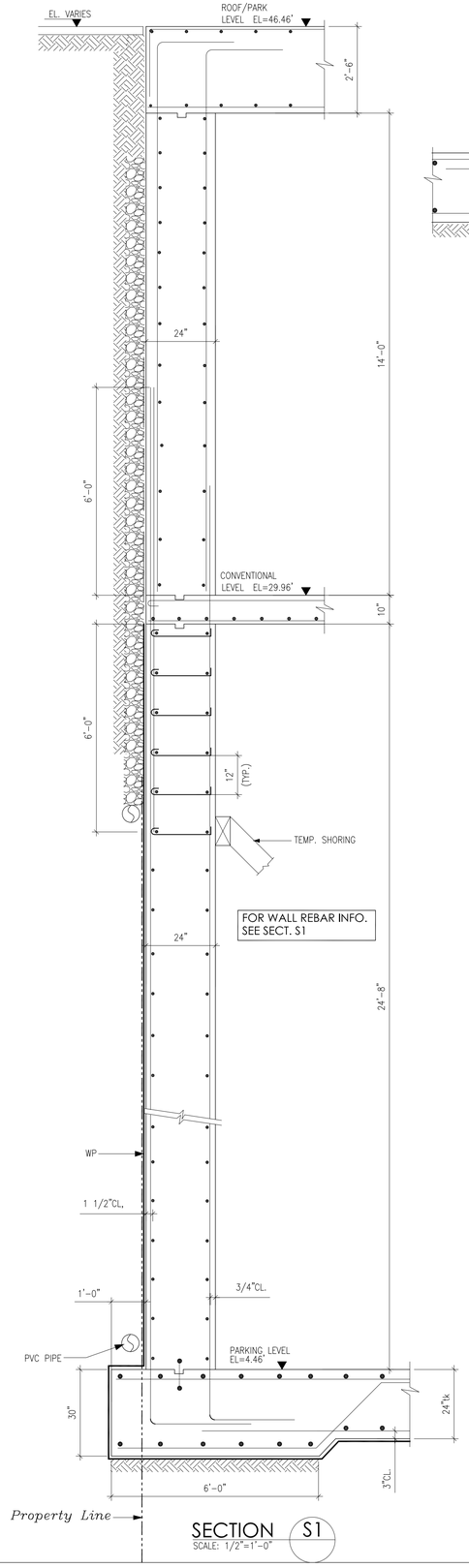
Drawing No.

F-102.00

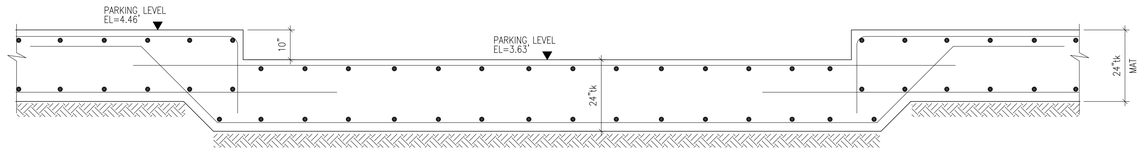
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

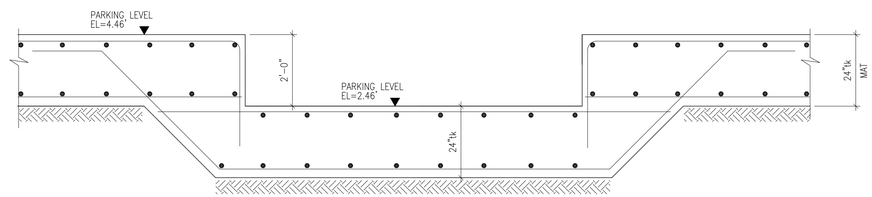
DOB #



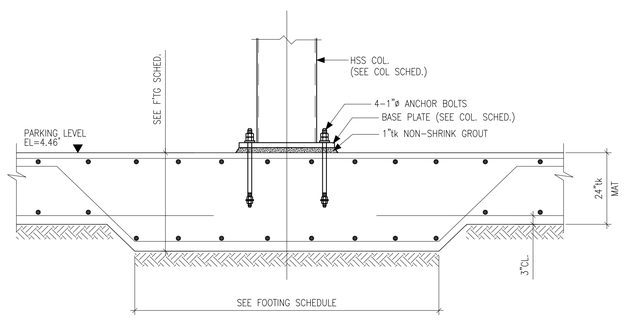
SECTION S1
SCALE: 1/2"=1'-0"



SECTION S2 THRU SRU VEHICLE LANE
SCALE: 1/2"=1'-0"



SECTION S3 THRU CAR LIFT PIT
SCALE: 1/2"=1'-0"



SECTION S4 THRU ISOLATED COLUMNS
SCALE: 1/2"=1'-0"

COLUMN FOOTING SCHEDULE

MARK	SIZE	DEPTH	BOTT.REINF. EA.WAY
F6.0	6'-0"x6'-0"	30"	7#6
F6.5	6'-6"x6'-6"	30"	8#6
F7.0	7'-0"x7'-0"	30"	9#6
F7.5	7'-6"x7'-6"	33"	6#8
F8.0	8'-0"x8'-0"	36"	7#8
F8.5	8'-6"x8'-6"	36"	8#8
F9.0	9'-0"x9'-0"	38"	7#9
F9.5	9'-6"x9'-6"	38"	8#9
F10.0	10'-0"x10'-0"	40"	9#9
F10.5	10'-6"x10'-6"	42"	10#9
F11.0	11'-0"x11'-0"	42"	8#10
F11.5	11'-6"x11'-6"	46"	9#10

SOIL BEARING CAPACITY=5 TSF.

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

FOUNDATION SECTIONS

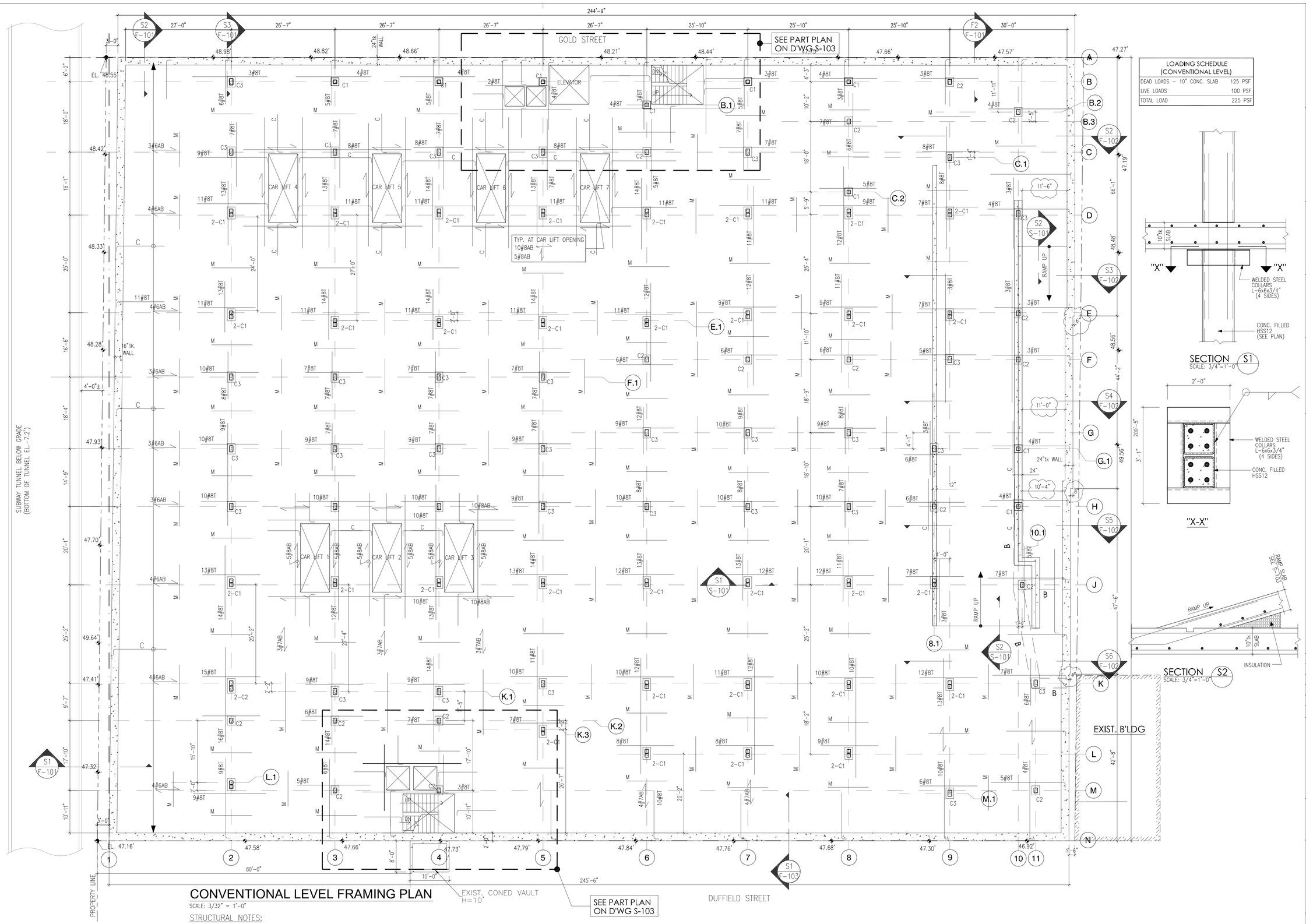
Drawing No.

F-103.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



LOADING SCHEDULE (CONVENTIONAL LEVEL)	
DEAD LOADS – 10" CONC. SLAB	125 PSF
LIVE LOADS	100 PSF
TOTAL LOAD	225 PSF

CONVENTIONAL LEVEL FRAMING PLAN

SCALE: 3/32" = 1'-0"

STRUCTURAL NOTES:

1. TOP OF CONC. SLAB ELEV.=29.96' (ELEV. 0'-0"=47.16')
2. CONCRETE SLAB – 10"tk. REINF. W/#5@9" BOTT. EA. WAY CONT.
3. M – MIDDLE STRIP #5@12" TOP. C – INFILL BARS #5@12" TOP.
4. SLAB – Fc' = 5000 psi @ 28 DAYS.

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

CONVENTIONAL LEVEL FRAMING PLAN

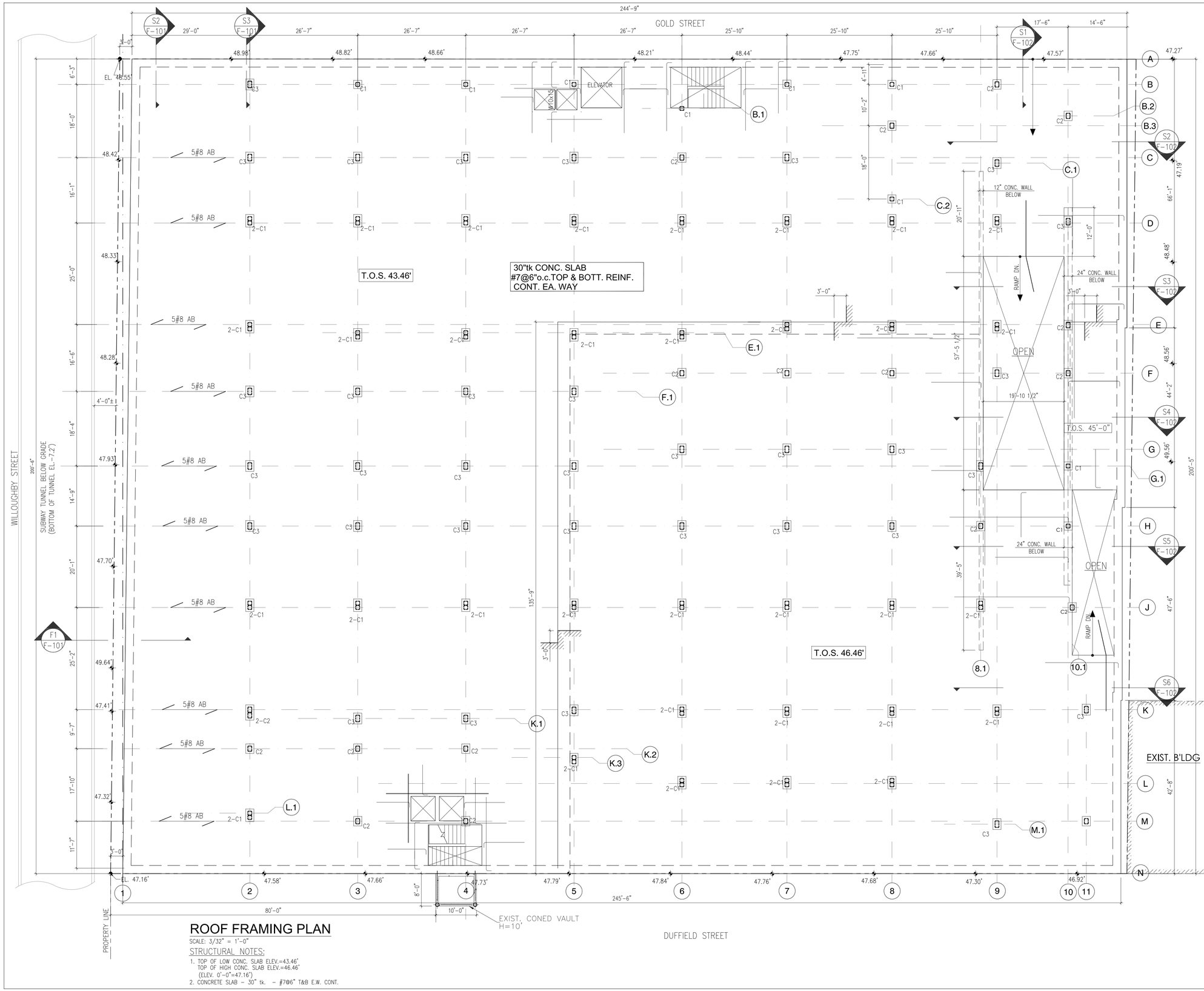
Drawing No.

S-101.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



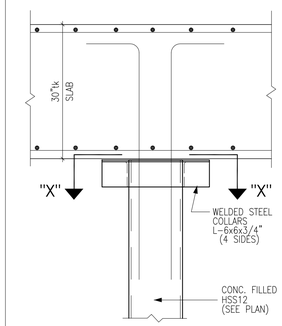
ROOF FRAMING PLAN

SCALE: 3/32" = 1'-0"

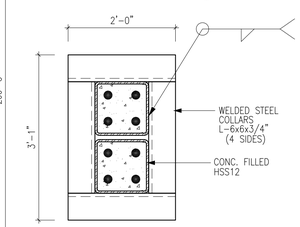
STRUCTURAL NOTES:

1. TOP OF LOW CONC. SLAB ELEV.=43.46'
   TOP OF HIGH CONC. SLAB ELEV.=46.46'
   (ELEV. 0'-0"=47.16')
2. CONCRETE SLAB - 30" tk. - #7@6" T&B E.W. CONT.

LOADING SCHEDULE ROOF - PLAZA	
DEAD LOADS - 30" CONC. SLAB	375 PSF
LIVE LOADS	1000 PSF
TOTAL LOAD	1375 PSF



SECTION S1
SCALE: 3/4"=1'-0"



"X-X"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

ROOF FRAMING PLAN

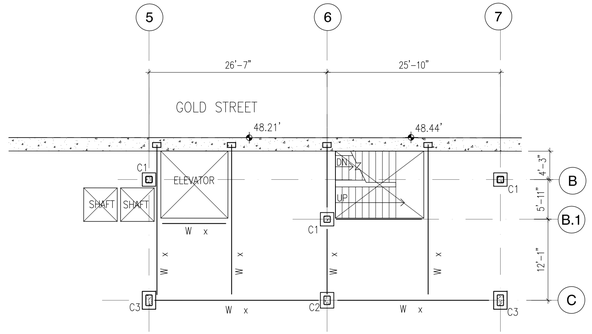
Drawing No.

S-102.00

Seal

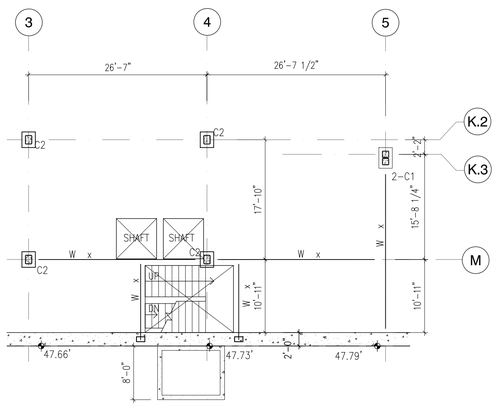
Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



(PART PLAN) STAIR #- & ELEVATOR FRAMING PLAN

SCALE: 3/32" = 1'-0"



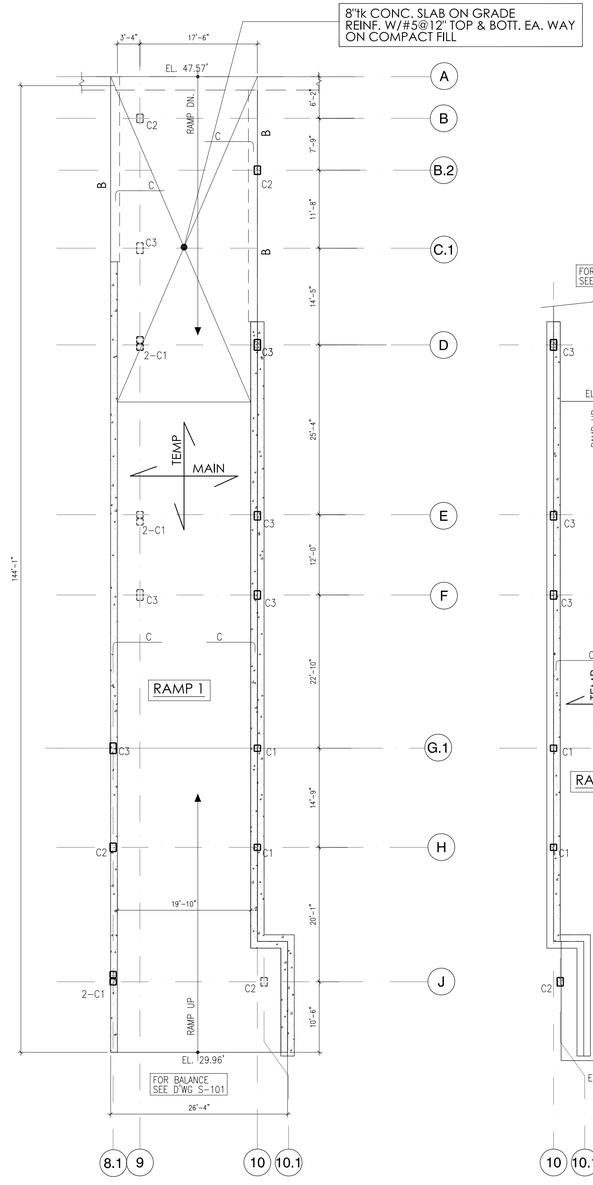
(PART PLAN) STAIR # FRAMING PLAN

SCALE: 3/32" = 1'-0"

MARK	SLAB THICKNESS	BOTT. REINFORCEMENT	
		MAIN	TEMP.
S1	12"tk	#7@12"	#5@12" BOTT.
S2	8"tk	#5@12"	#4@12" BOTT.

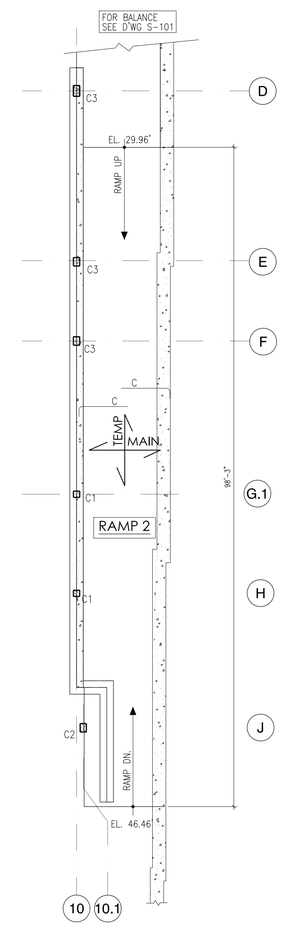
LOADING SCHEDULE RAMP 1	
DEAD LOADS – 12" CONC. SLAB	150 PSF
LIVE LOADS	100 PSF
TOTAL LOAD	250 PSF

LOADING SCHEDULE RAMP 2	
DEAD LOADS – 8" CONC. SLAB	100 PSF
LIVE LOADS	100 PSF
TOTAL LOAD	200 PSF



RAMP FRAMING PLAN

SCALE: 3/32" = 1'-0"



RAMP FRAMING PLAN

SCALE: 3/32" = 1'-0"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

PARTIAL FRAMING PLANS

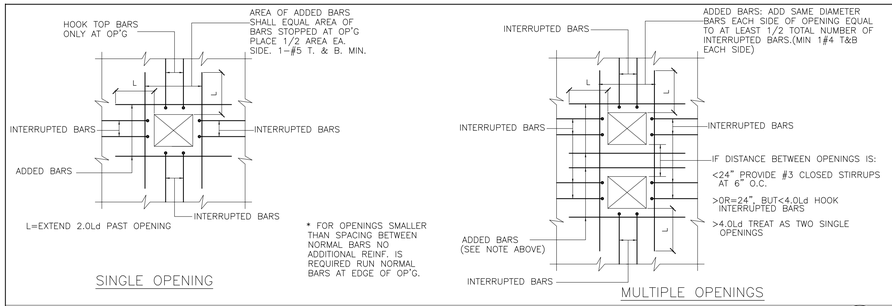
Drawing No.

S-103.00

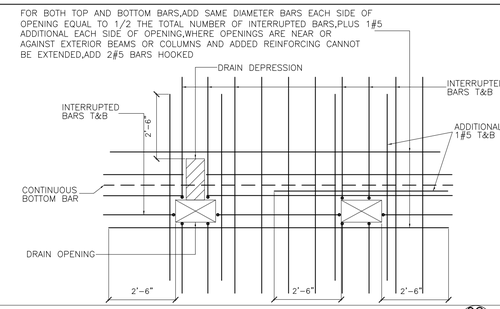
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

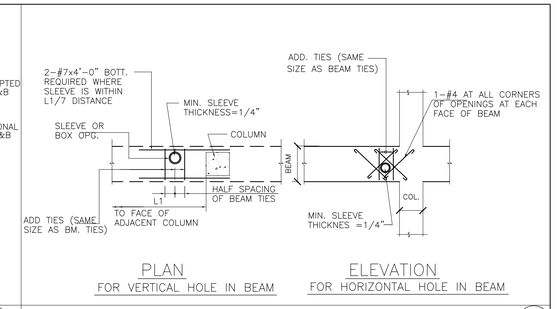
DOB #



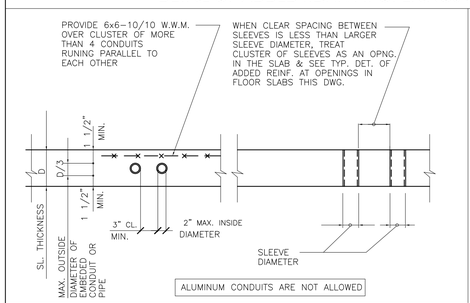
DETAIL OF ADDED REINF. AT OPENINGS IN FLOOR SLAB (S1)



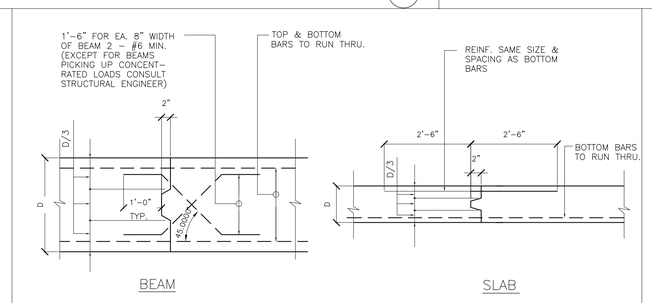
TYPICAL SLAB OPENINGS AT BATHROOMS (S2)



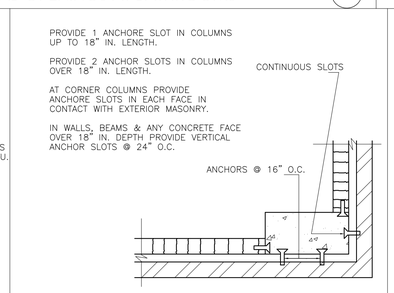
TYPICAL DETAILS OF OPENINGS IN CONCRETE BEAMS (S3)



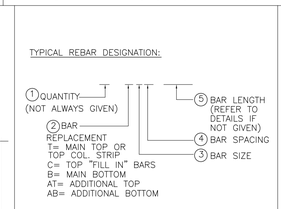
EMBEDMENT OF PIPES & CONDUITS IN SLABS (S4)



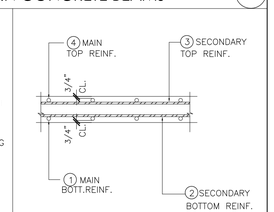
TYPICAL CONSTRUCTION JOINT DETAILS (S5)



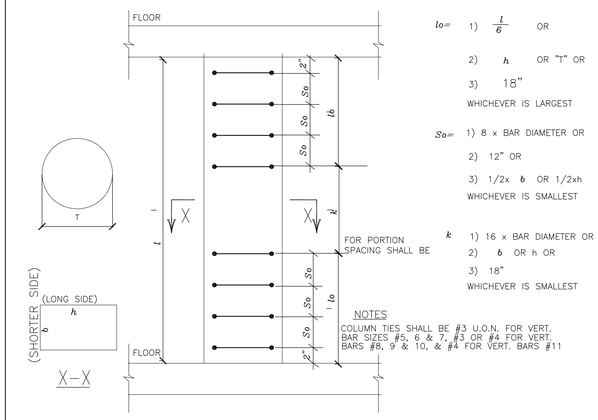
METHOD OF ANCHORING MASONRY TO CONCRETE WALLS, BEAMS & COLUMNS (S6)



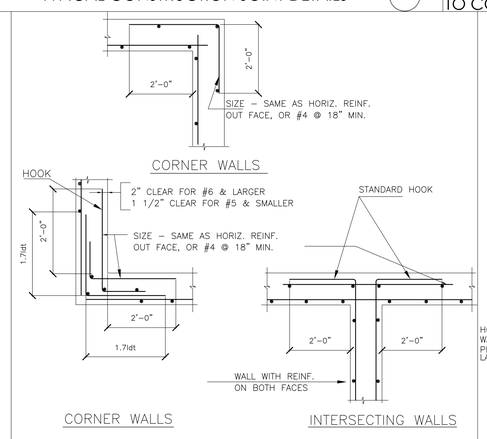
REINFORCING BAR LEGEND (S7)



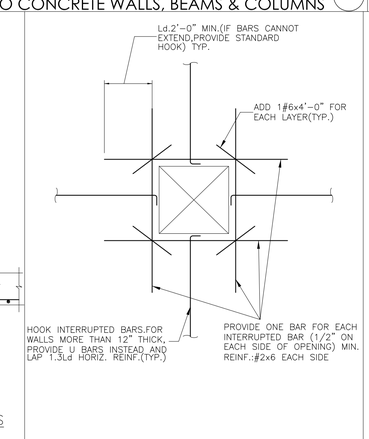
PLACEMENT OF SLAB REINFORCING (S8)



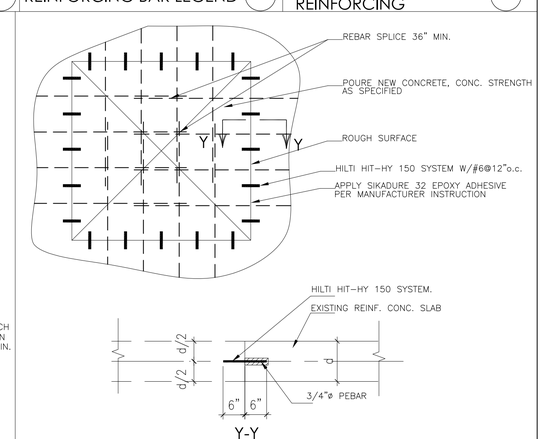
TYPICAL SPACING OF COLUMN TIES (S9)



DETAIL OF REINFORCING AT WALL CORNERS (S10)



TYP. DETAIL OF ADDED REINF. @ WALL OPENING (S11)



TYP. DETAIL OF HOIST OPENING CLOSURE (S12)

TENSION DEVELOPMENT LENGTH FOR SLAB OUTER MOST LAYER			
f'c	4000	5000	6000
BAR#	LENGTH (in.)		
3	14	13	12
4	19	17	15
5	25	22	20
6	35	31	29
7	48	43	39
8	63	56	51
9	79	71	65
10	101	90	82
11	123	110	101

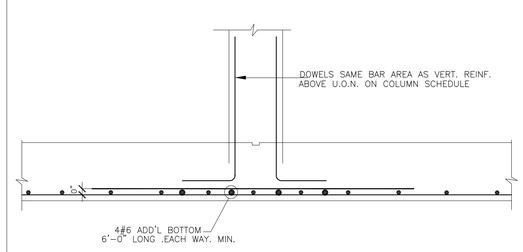
ALL OTHER DEVELOPMENT LENGTH			
f'c	4000	5000	6000
BAR#	LENGTH (in.)		
3	12	12	12
4	15	13	12
5	19	17	16
6	27	24	22
7	37	33	30
8	48	43	39
9	61	55	50
10	77	69	63
11	95	85	78

REBAR DEVELOPMENT LENGTHS l_d

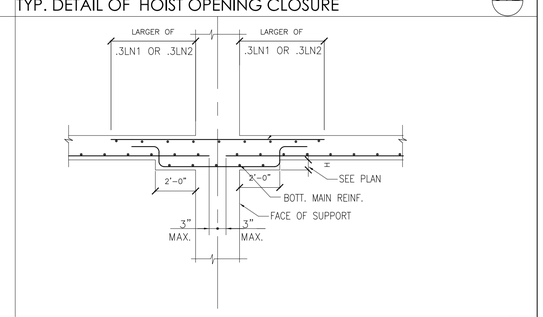
TENSION SPLICE LENGTH FOR SLAB OUTER MOST LAYER			
f'c	4000	5000	6000
BAR#	LENGTH (in.)		
3	18	16	16
4	24	22	20
5	32	29	26
6	45	41	37
7	62	55	51
8	81	73	66
9	103	92	84
10	131	117	107
11	160	143	131

ALL OTHER TENSION SPLICE LENGTH			
f'c	4000	5000	6000
BAR#	LENGTH (in.)		
3	16	16	16
4	19	17	16
5	25	22	20
6	35	31	29
7	48	43	39
8	63	56	51
9	79	71	65
10	101	90	82
11	123	110	101

REBAR SPLICE LENGTHS (S13)



TYPICAL COLUMN SUPPORTED ON SLAB @ PODIUM & BEAMS (S14)



DROP PANEL @ COLUMN (S15)

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

TYPICAL DETAILS & SECTIONS

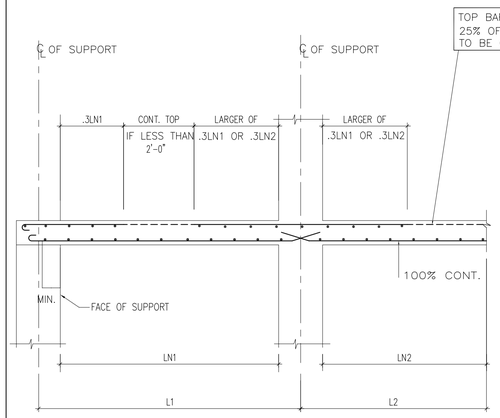
Drawing No.

S-401.00

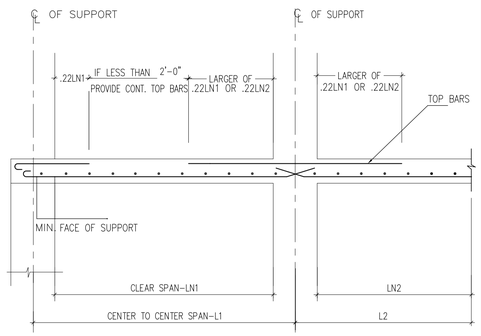
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #

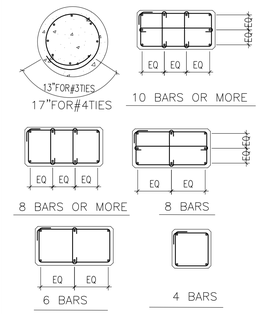


COLUMN STRIP



MIDDLE STRIP

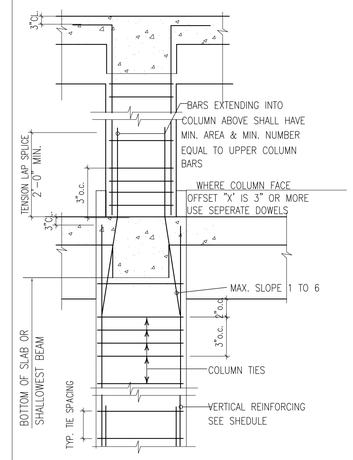
TYPICAL TWO-WAY SLAB REINFORCING DETAIL (S1)



NOTES

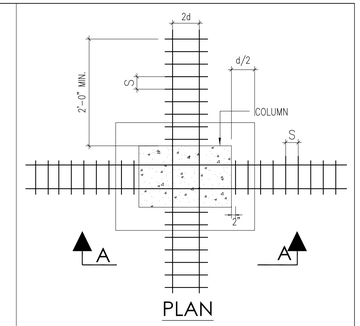
1. TOTAL NUMBER OF BARS SHOULD BE SPACED AROUND PERIMETER IN SUCH A WAY AS TO ACHEVE APPROXIMATELY EQUAL SPACING
2. USE THESE DETAILS AT BUTTRESSES.

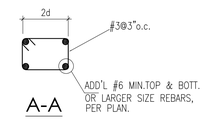
TYPICAL DETAILS AT TIED COLUMNS (S2)



ALSO SEE S9/S-501.00 FOR ADD'L INFORMATION

TYP. COLUMN SPLICE DETAILS (S3)

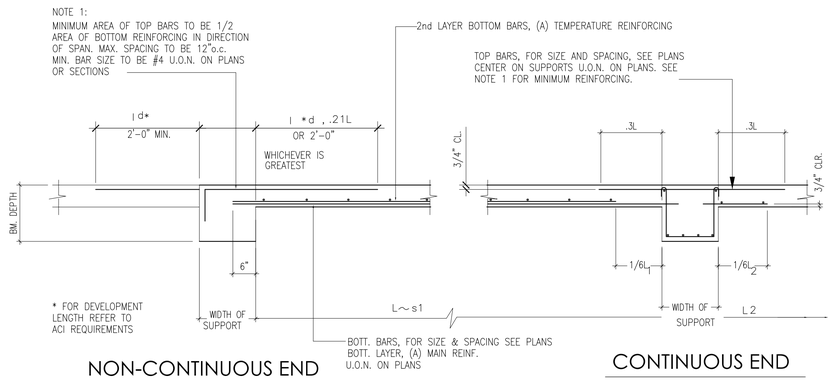




NOTES

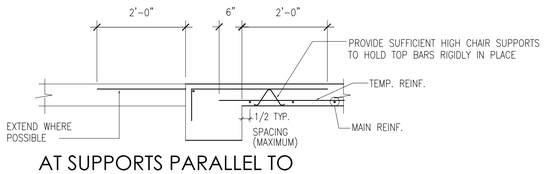
h = THICKNESS OF SLAB
d = h-1
s = d/2 SPACING B/W STIRRUPS

TYPICAL SLAB SHEAR REINFORCEMENT DETAIL (S7)



NON-CONTINUOUS END

CONTINUOUS END

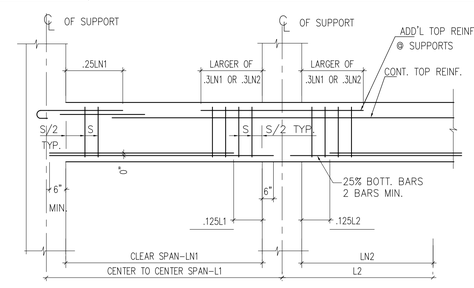


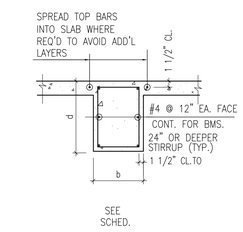
AT SUPPORTS PARALLEL TO MAIN REINF. IN ONE-WAY SLABS

ONE-WAY SLAB TEMP. REINF. SCHEDULE

SLAB	REINF.	SLAB	REINF.
5"	#4@18"	9"	#4@12"
6"	#4@18"	10"	#5@16"
7"	#4@15"	11"	#5@14"
8"	#4@13"	12"	#5@12"

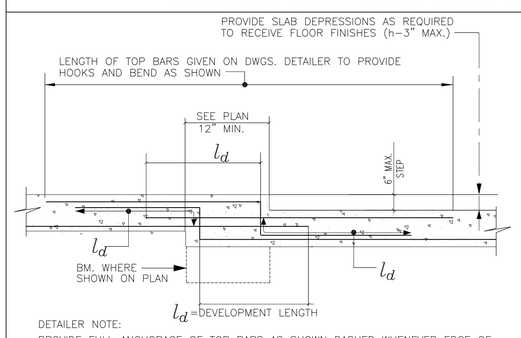
TYPICAL ONE-WAY SLAB DETAILS (S4)





TYPICAL BEAM SECTION

TYPICAL BEAM REINFORCING DETAIL (S5)



DETAILER NOTE:

PROVIDE FULL ANCHORAGE OF TOP BARS AS SHOWN DASHED WHENEVER EDGE OF DEPRESSION IS LOCATED IN A CANTILEVER OR 1/8 CLEAR SPAN OR LESS FROM A CONTINUOUS END SUPPORT.

TYPICAL DETAIL AT DEPRESSED SLAB (S6)

l_d = DEVELOPMENT LENGTH, SEE SCHEDULE ON DWG. S-10

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

TYPICAL DETAILS & SECTIONS

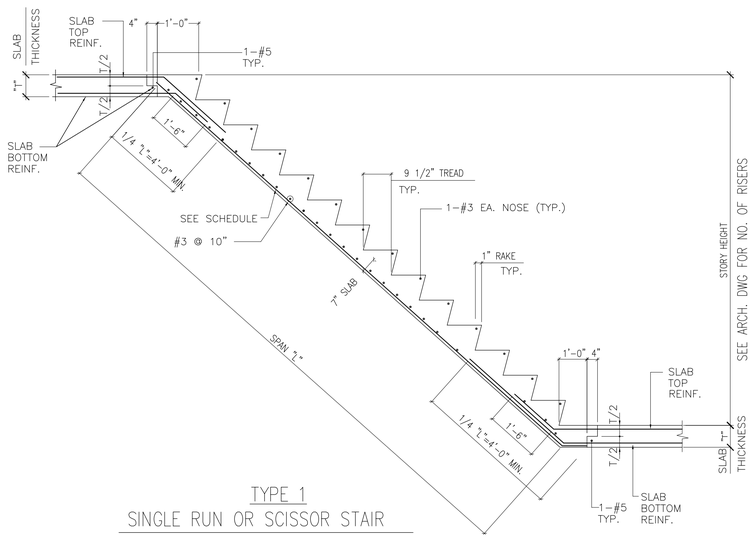
Drawing No.

S-402.00

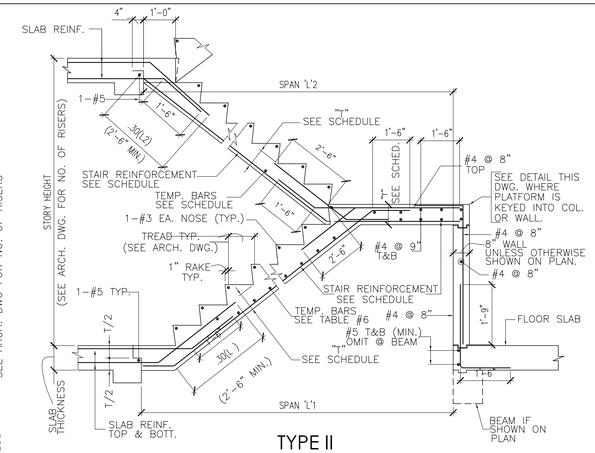
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

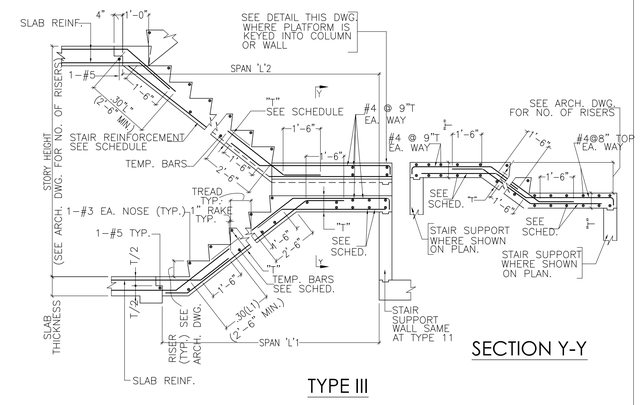
DOB #



TYPE 1
SINGLE RUN OR SCISSOR STAIR

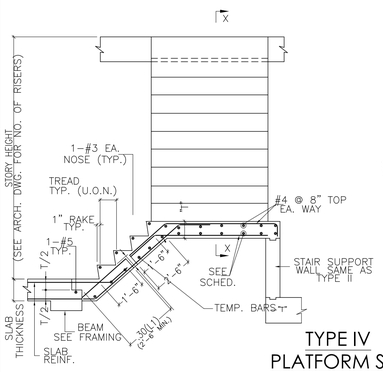


TYPE II
PLATFORM STAIR PARALLEL RUNS
TYPICAL

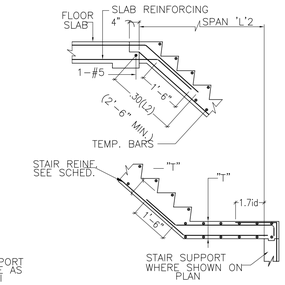


SECTION Y-Y

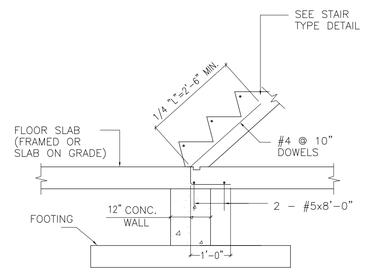
TYPE III
3-RUN STAIR



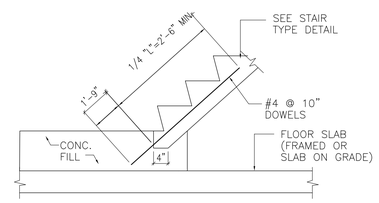
TYPE IV
PLATFORM STAIR
(PERPENDICULAR RUNS)



SECTION X-X



DETAIL AT START OF STAIR ON SLAB



DETAIL AT START OF STAIR ON FILL

STAIR SCHEDULE

NUMBER OF RISERS	SLAB THICK.	REINFORCING SIZE	REINFORCING SPACING	A
10 OR LESS	5"	#5	10"	3'-0"
11	6"	#5	9 1/2"	3'-0"
12	7"	#5	9"	3'-3"
13	7"	#5	8 1/2"	3'-3"
14	7"	#5	8"	3'-6"
15	8"	#6	8"	4'-8"
MORE THAN 18	SEE DETAILS			

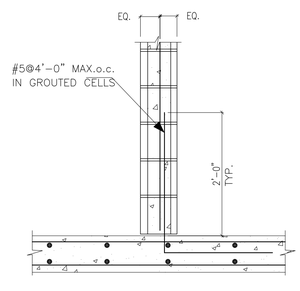
S1

LOOSE LINTEL SCHEDULE

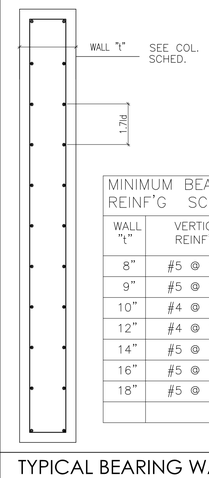
MARK	SIZE			
	WALL THICKNESS	UNDER 4'-0" OPENING	4'-0" TO 8'-0" OPENING	8'-0" TO 12'-0" OPENING
L1	4"	1L-4x3 1/2x 5/16	1L-4x3 1/2x3/8	
	6"	1L-5x3 1/2x5/16	1L-5x5x3/8	1L-8x6x7/16
	8"	2Ls-4x3x5/16	2Ls-4x3x3/8	2Ls-6x3 1/2x3/8
	NOTES: 1.-PLACE 5"LEG HORIZONTAL(MIN.) 2.-ADD 1L FOR EA. ADDITIONAL 4" EA. OF MASONRY WALL			

NOTES: 1. PROVIDE 6" BEARING AT EA. END.
2. ADD 1L FOR EACH ADD'L 4" OF MASONRY WALL.
3. LOOSE LINTEL SCHEDULE TO BE USED ONLY WHERE NOT OTHERWISE INDICATED.

SCHEDULE OF LOOSE LINTEL FOR MASONRY WALLS S2



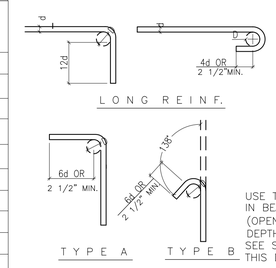
TYPICAL MASONRY BEARING WALL DETAIL S3



MINIMUM BEARING WALL REINF'G SCHEDULE		
WALL "t"	VERTICAL REINF'G	HORIZON. REINF'G
8"	#5 @ 18	#3 @ 11 ONE FACE
9"	#5 @ 18	#3 @ 9 ONE FACE
10"	#4 @ 12	#4 @ 12 EACH FACE
12"	#4 @ 12	#4 @ 12 EACH FACE
14"	#5 @ 12	#4 @ 12 EACH FACE
16"	#5 @ 12	#4 @ 10 EACH FACE
18"	#5 @ 12	#4 @ 8 EACH FACE

TYPICAL BEARING WALL DETAIL & SCHEDULE S4

TYPE A	
BAR SIZE d	D
#2	1 1/2"
#3	2 3/4"
#4	3"
#5	3 3/4"
#6	4 1/2"
#7	3 1/4"
#8	6"
#9	9"
#10	10 1/4"
#11	11 1/4"
#14	17"
#18	22 1/2"



TYPE B	
BAR SIZE d	D
#2	1 1/2"
#3	1 1/2"
#4	2"
#5	2 1/2"

USE TYPE "B" STIRRUPS IN BEAMS AT CONCRETE EDGES (OPENINGS,ETC) & WHERE BEAM DEPTH IS TOO SHALLOW FOR TYPE A. SEE SCHEDULE IN STIRRUP DETAILS, THIS DWG.

STANDARD HOOKS S5

PROJECT TITLE:
WILLOUGHBY SQUARE PARK PARKING GARAGE
BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER
Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER
Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:
TYPICAL DETAILS & SECTIONS

Drawing No.
S-403.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #

COLUMN SCHEDULE

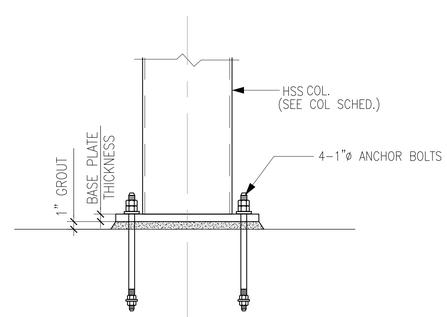
FLOOR	B							B.1	B.2	B.3	C						C.1	C.2	D									E				
COLUMN	2	3	4	5	7	8	9	6	10	8	2	3	4	5	6	7	9	8	2	3	4	5	6	7	8	9	10	2	7	8	9	10
Roof Level	456k	440k	440k	440	396k	293k	413k	406k	447k	506k	670k	619k	619k	619k	506k	605k	573k	424k	804k	790k	790k	790k	778k	743k	568k	585k	500k	817k	671k	671k	576k	413k
	HSS 12x20x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x20x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"
Conventional Level EL: 29.96'	530k	512k	512k	472k	460k	341k	550k	472k	4520k	588k	780k	720k	720k	720k	588k	703k	666k	493k	935k	920k	920k	920k	905k	865k	661k	680k	580k	950k	780k	780k	670k	480k
	HSS 12x20x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x20x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"
Parking Level EL: 4.46'																																
BASE PL.	C	A	A	A	A	A	B	A	B	B	C	C	C	C	B	C	C	A	D	D	D	D	D	D	D	D	C	D	D	D	D	B

COLUMN SCHEDULE

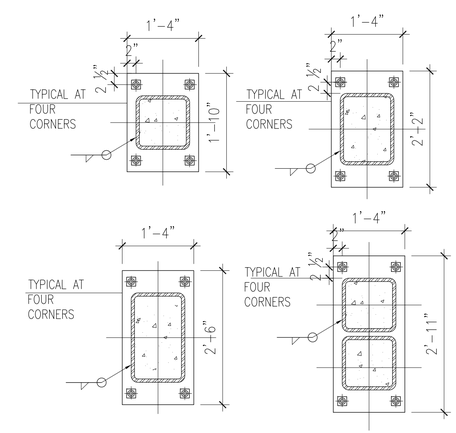
FLOOR	E.1				F					F.1				G			G.1						H								
COLUMN	3	4	5	6	6	7	8	9	10	2	3	4	5	6	7	8	2	3	4	5	8.1	10	2	3	4	5	6	7	8	8.1	10
Roof Level	774k	774k	757k	679k	542k	550k	542k	516k	413k	670k	606k	606k	567k	671k	671k	619k	645k	611k	611k	619k	559k	447k	670k	619k	619k	636k	679k	670k	615k	533k	421k
	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x12x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x12x5/8"
Conventional Level EL: 29.96'	900k	900k	880k	790k	630k	640k	630k	600k	480k	780k	705k	705k	660k	780k	780k	720k	750k	710k	710k	720k	650k	520k	780k	720k	720k	740k	790k	780k	715k	620k	490k
	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x12x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x12x5/8"
Parking Level EL: 4.46'																															
BASE PL.	D	D	D	D	B	B	B	C	B	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C	C	C	C	C	C	B	A

COLUMN BASE PLATE			
TYPE	BASE PLATE	No. & SIZE OF BOLTS	
A	16 x 22 x 1 3/4"	4 x 1" ø	C1
B	16 x 26 x 1 3/4"	4 x 1 ø	C2
C	16 x 30 x 1 3/4"	4 x 1" ø	C3
D	16 x 35 x 1 3/4"	4 x 1" ø	2-C1

C1 HSS 12x12x5/8"-623k
C2 HSS 12x16x5/8"-782k
C3 HSS 12x20x5/8"-939k



COLUMN BASE PLATE DETAIL



BASE PLATE PLAN VIEW

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

COLUMN SCHEDULE

Drawing No.

S-500.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #

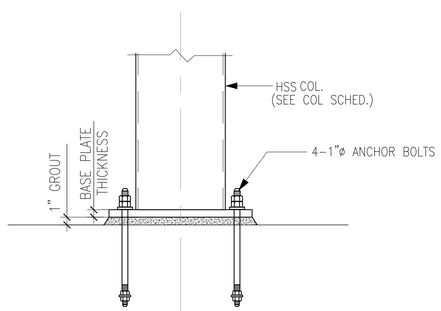
COLUMN SCHEDULE

FLOOR	J									K							K.1		K.2		K.3	L			L.1	M			M.1
COLUMN	2	3	4	5	6	7	8	8.1	10.1	2	5	6	7	8	9	11	3	4	3	4	5	6	7	8	2	3	4	11	9
Roof Level	877k	860k	860k	834k	825k	805k	808k	705k	550k	1005k	645k	791k	774k	774k	847k	593k	645k	645k	443k	456k	688k	705k	705k	679k	774k	559k	542k	447k	654k
	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"	2-HSS 12x16x5/8"	HSS 12x20x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"
Conventional Level EL: 29.96'	1020k	1000k	1000k	970k	960k	940k	940k	820k	640k	1170k	750k	920k	900k	900k	985k	690k	750k	750k	515k	530k	800k	820k	820k	790k	900k	650k	630k	520k	760k
	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"	2-HSS 12x16x5/8"	HSS 12x20x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x20x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	2-HSS 12x12x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x16x5/8"	HSS 12x20x5/8"
Parking Level EL: 4.46'																													
BASE PL.	D	D	D	D	D	D	D	D	B	D	C	D	D	D	D	C	C	C	B	B	D	D	D	D	C	B	B	B	C

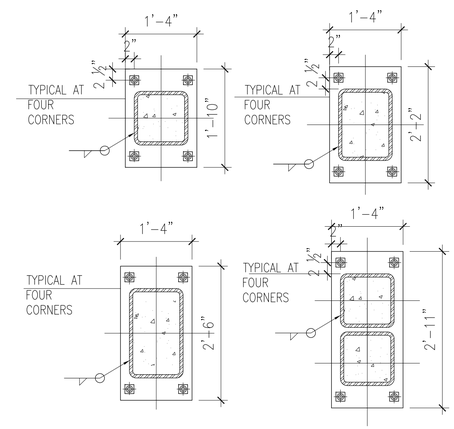
COLUMN BASE PLATE

TYPE	BASE PLATE	No. & SIZE OF BOLTS	
A	16 x 22 x 1 3/4"	4 x 1" ø	C1
B	16 x 26 x 1 3/4"	4 x 1 ø	C2
C	16 x 30 x 1 3/4"	4 x 1" ø	C3
D	16 x 35 x 1 3/4"	4 x 1" ø	2-C1

C1 HSS 12x12x5/8"-623k
C2 HSS 12x16x5/8"-782k
C3 HSS 12x20x5/8"-939k



COLUMN BASE PLATE DETAIL



BASE PLATE PLAN VIEW

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

COLUMN SCHEDULE

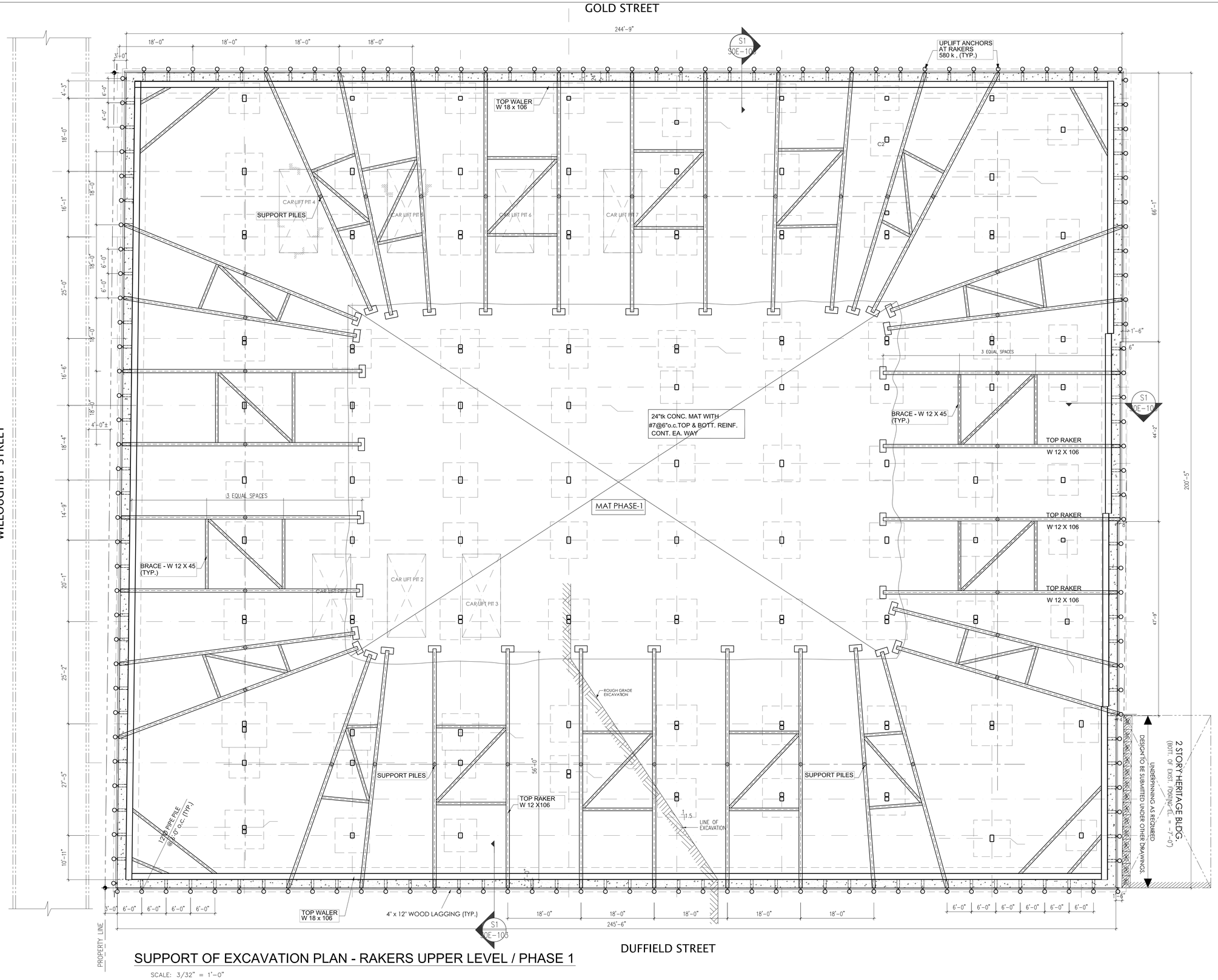
Drawing No.

S-501.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



SUPPORT OF EXCAVATION PLAN - RAKERS UPPER LEVEL / PHASE 1

SCALE: 3/32" = 1'-0"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

SUPPORT OF EXCAVATION
PLAN - RAKERS
UPPER LEVEL

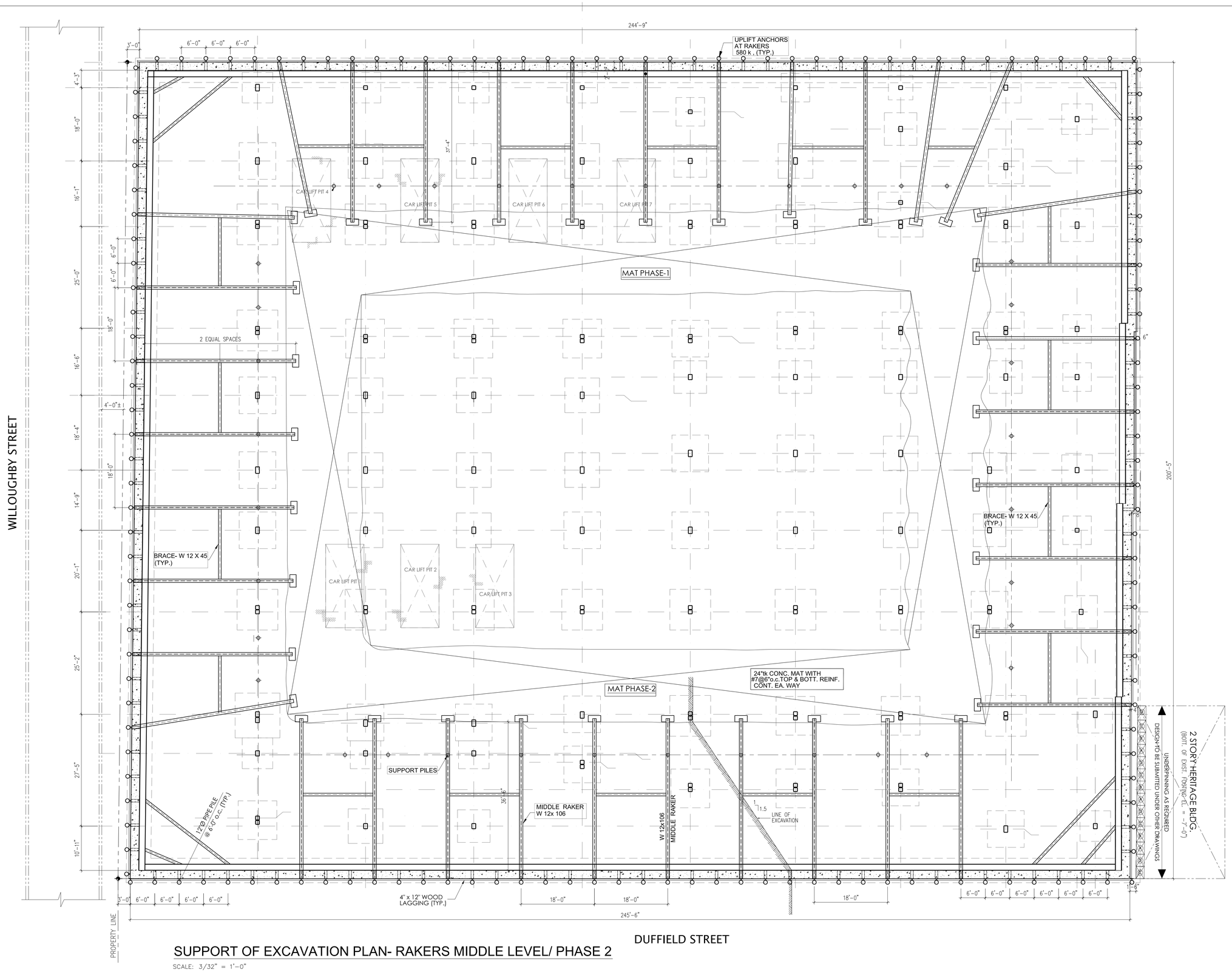
Drawing No.

SOE -100.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



SUPPORT OF EXCAVATION PLAN- RAKERS MIDDLE LEVEL/ PHASE 2

SCALE: 3/32" = 1'-0"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

SUPPORT OF EXCAVATION PLAN - RAKERS MIDDLE LEVEL

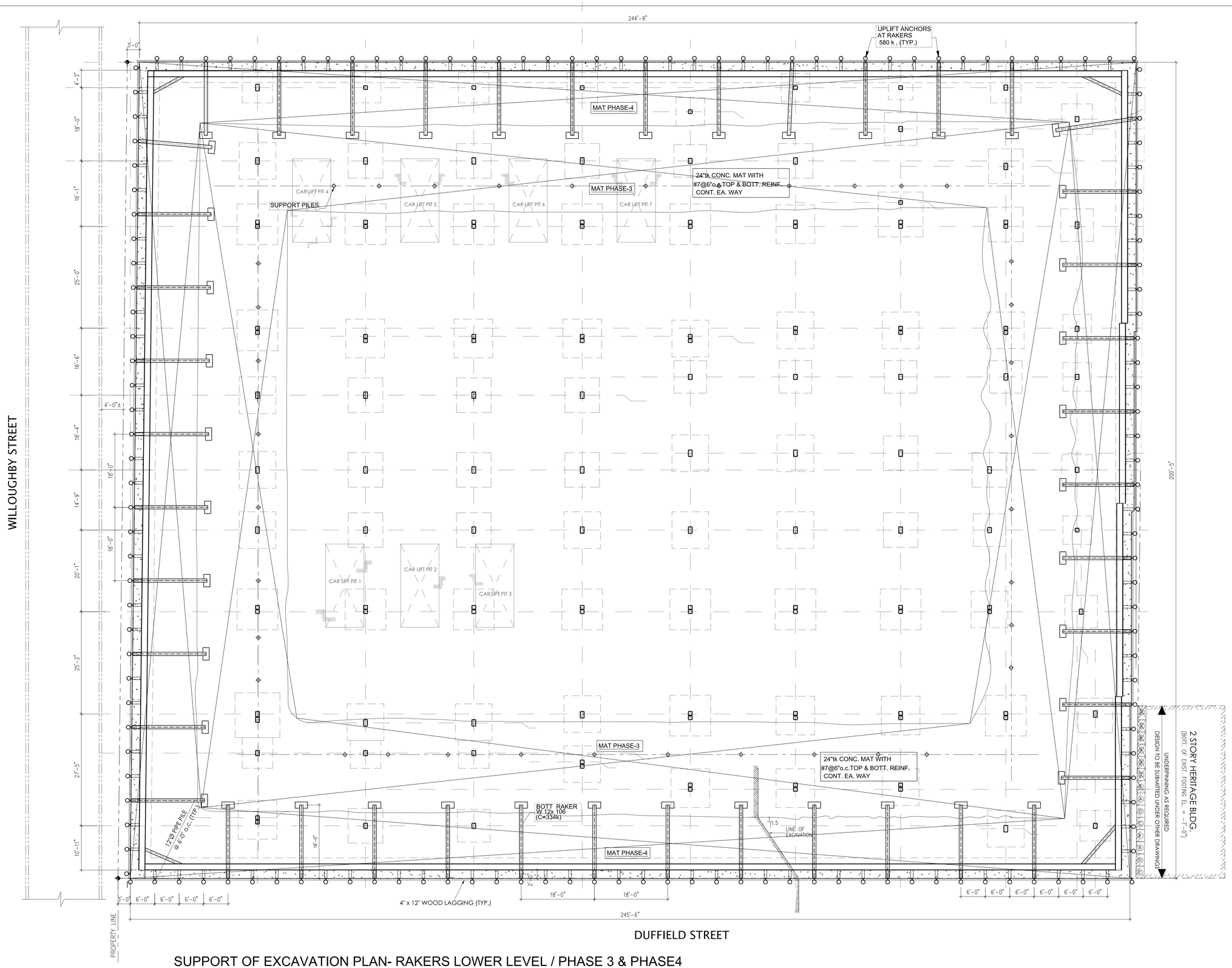
Drawing No.

SOE -101.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



SUPPORT OF EXCAVATION PLAN- RAKERS LOWER LEVEL / PHASE 3 & PHASE4

SCALE: 3/32" = 1'-0"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

SUPPORT OF EXCAVATION PLAN - RAKERS LOWER LEVEL

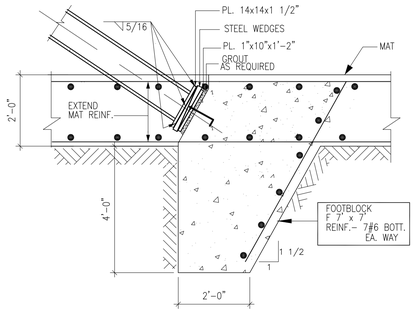
Drawing No.

SOE -102.00

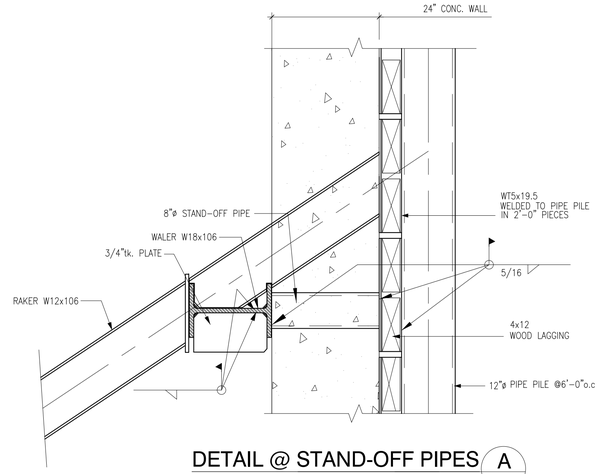
Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

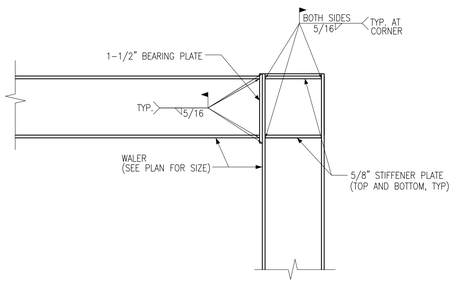
DOB #



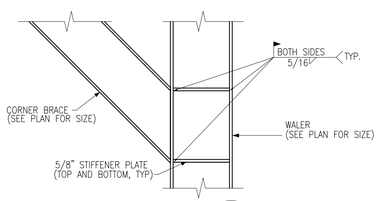
DETAIL B
SCALE: 1/2=1'-0"



DETAIL @ STAND-OFF PIPES A
SCALE: 3/4=1'-0"

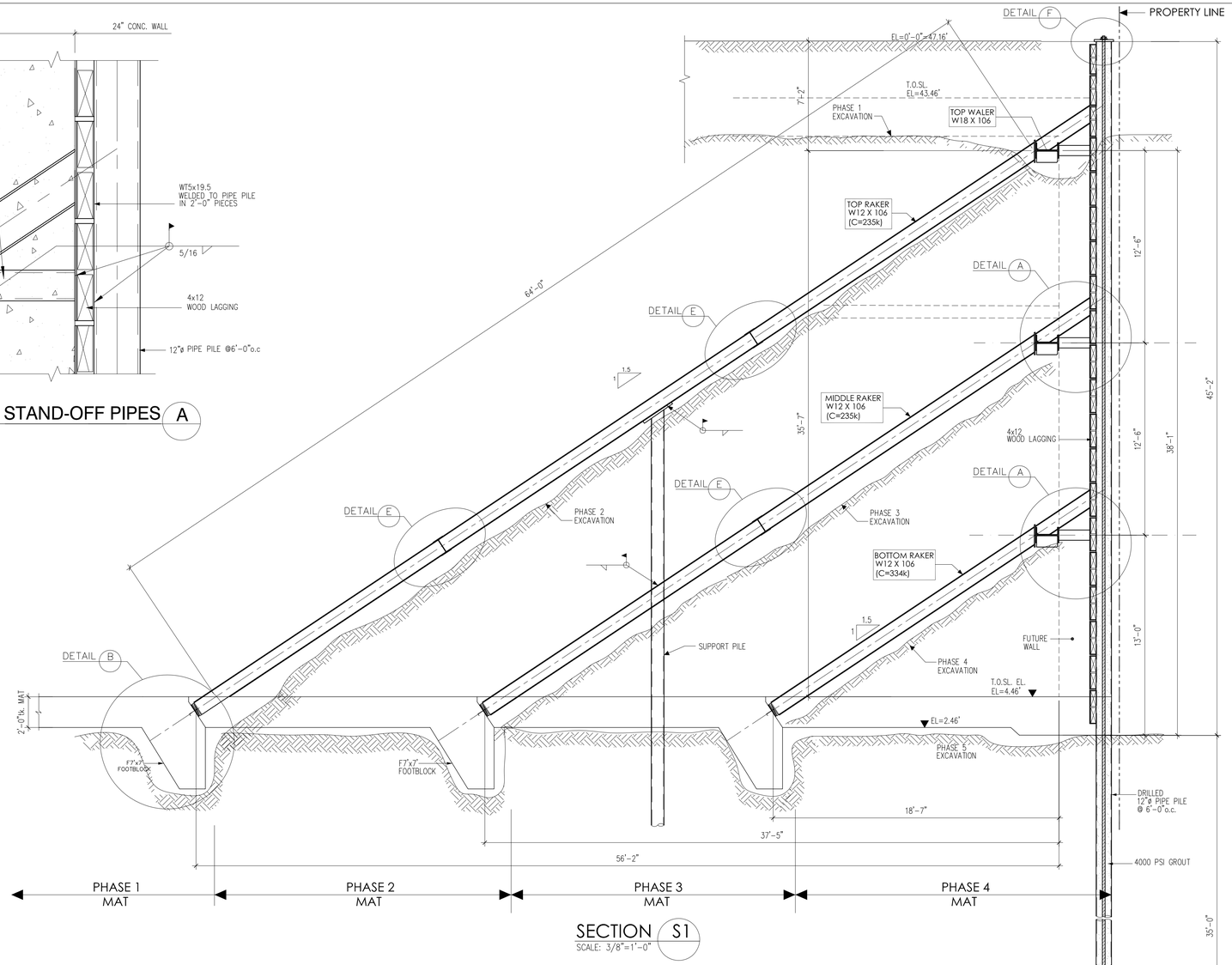


DETAIL C
SCALE: 3/4=1'-0"



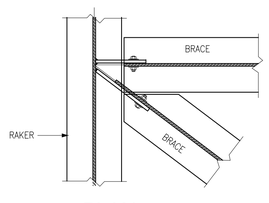
DETAIL D
SCALE: 3/4=1'-0"

TYPICAL CORNER BRACE DETAILS

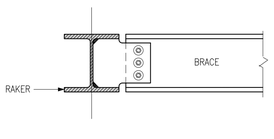


SECTION S1
SCALE: 3/8"=1'-0"

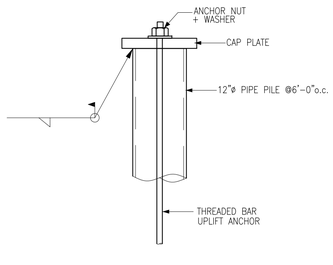
DIAGRAMMATIC SUPPORT OF EXCAVATION



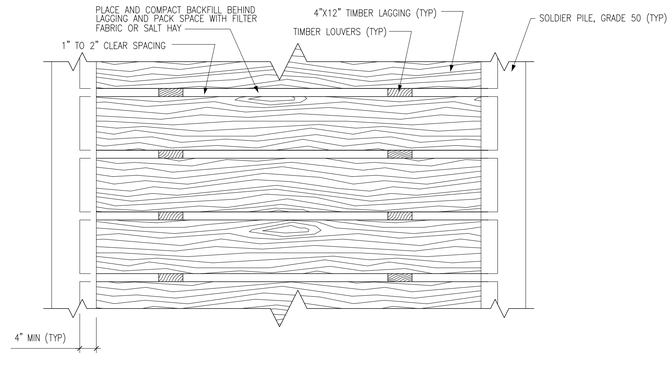
PLAN



DETAIL E
SCALE: 3/4=1'-0"



DETAIL F
SCALE: 3/4=1'-0"



TYPICAL LAGGING INSTALLATION

PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

SOE SECTIONS

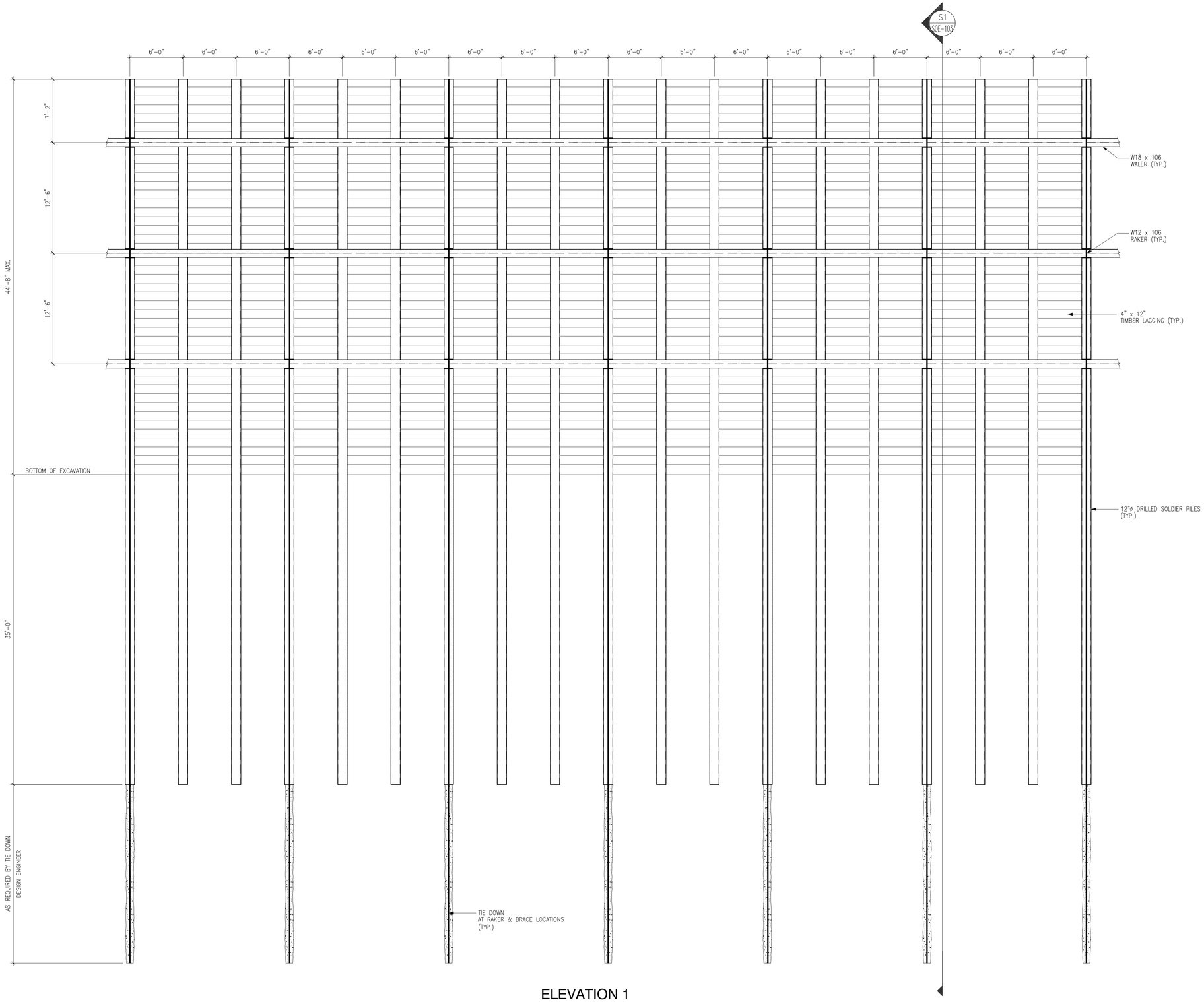
Drawing No.

SOE -103.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



ELEVATION 1

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

PRELIMINARY SOE ELEVATION

Drawing No.

SOE -104.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #

NYC TRANSIT GENERAL NOTES

NOTE: THE APPROPRIATE NOTES ARE TO BE MADE PART OF THE PROJECT'S CONTRACT DRAWINGS.

1. THE NYC TRANSIT (NYCT) RESERVES THE RIGHT TO PLACE INSPECTORS, FLAGMEN OR OTHER PERSONNEL IN THE SUBWAY STRUCTURES DURING CONSTRUCTION OF THE PROJECT LINKED BY A TELEPHONE SYSTEM, IF DEEMED NECESSARY, TO OBSERVE THE EFFECTS OF THE CONSTRUCTION ON THE TRANSIT FACILITIES. IT IS EXPECTED THAT SUCH PERSONNEL WILL BE NECESSARY WHEN THE CONSTRUCYION COMES WITHIN TWENTY-FIVE FEET OF THE SUBWAY STRUCTURE. HOWEVER, NYCT FURTHER RESERVES THE RIGHT TO PLACE SUCH PERSONNEL WHENEVER, IN ITS OPTION, THE PROJECT CONDITIONS WARRANT SUCH PLACEMRNT, REGARDLESS OF DISTANCE. THE COST OF SUCH PERSONNEL, TELEPHONE INSTALLATION AND ANY RE-ROUTES, DIVERSIONS OF SERVICE, WORK TRAINS, ETC., MADE NECESSARY BY THE PROJECT, MUST BE BORNE BY THE PROJECT OR THE RESPONSIBLE NEW YORK CITY/STATE AGENCY.
2. ALL ROCK EXCAVATION ADJECENT TO THE TRANSIT STRUCTURE IS TO BE CHANNEL DRILLED TWO FEET BELOW SUBGRADE.
3. IF TOP OF ROCK IS FOUND BELOW SUBWAY STRUCTURE, THE SUBWAY STRUCTURE MUST BE UNDERPINNED IN ACCORDANCE WITH DRAWINGS TO BE SUBMITTED TO NYCT FOR APPROVAL.
4. IF ROCK IS SOFT OR SEAMY, LATERAL SUPPORTS MUST BE PROVIDED BELOW THE SUBWAY STRUCTURE IN ACCORDANCE WITH DRAWINGS TO BE SUBMITTED TO NYCT FOR APPROVAL.
5. BLASTING WILL BE PERMITTED ONLY WITH LIGHT CHARGES SUBJECT TO THE APPROVAL OF NYCT'S ENGINEER AND IN ACCORDANCE WITH THE REGULATION OF THE FIRE DEPARTMENT. THE CONTRACTOR SHALL PROVIDE A DETAILED MONITORING PLAN, PROVIDING FOR MEASUREMENTS OF BOTH PARTICLE VELOCITY AND DISPLACEMENTS AT CRITICAL LOCATIONS OF THE NYCT STRUCTURE. THE MONITORING PLAN SHALL INCLUDE THRESHOLD AND UPSET LEVELS OF BOTH PARTICLE VELOCITY AND SETTLEMENT TOGETHER WITH AN ACTION PLAN FOR THEIR IMPLEMENTATION. THE CONTRACTOR SHALL SECURE AN APPROVED SEISMOLOGIST TO INSTALL AND OPERATE SUITABLE VELOCITY GUAGES TO CONTINUOUSLY MONITOR PARTICLE VELOCITY AND AN INDEPENDENT LICENSED SURVEYOR TO MONITOR DISPLACEMENTS. THE THRESHOLD MAXIMUM PARTICLE VELOCITY ABOVE AMBIENT CAUSED BY THE BLASITNG WILL BE 0.5 INCH PER SECOND. VALUES EXCEEDING THIS LEVEL WILL BE REVIEWED AND EVALUATED BY NYCT'S ENGINEET. IN NO CASE WILL PARTICLE VELOCITIES EXCEED THE UPSET LEVEL OF 2.0 INCHES PER SECOND.
6. BEFORE PLACING CONCRETE, THE SUBGRADE OF THE FOUNDATIONS IN THE VICINITY OF THE SUBWAY STRUCTURE IS TO BE INSPECTED AND APPROVED BY NYCT'S ENGINEER.
7. IF ANY PORTION OF THE SUBWAY STRUCTURE OR FINISH IS DAMAGED, IT SHALL BE REPAIRED OR REPLACED WITH THE SAME MATERIALS IN PLACE, SUBJECT TO THE APPROVAL OF NYCT'S ENGINEER AND AT THE EXPENSE OF THE PROJECT.
8. EXCAVATION EMBANKMENTS ARE TO BE SHORED AND BRACED. DRAWINGS INDICATING A SUGGESTED METHOD OF CONSTURCTION ARE TO BE SUBMITTED TO NYCT FOR APPROVAL IN CONJUNCTION WITH THE PROJECT'S CONTRACT DRAWINGS. IN CASE OF EXCAVATION UNDERMINING THE SUBWAY STRUCTURE, UNDERPINNING MAY BE REQUIRED. DRAWINGS FOR UNDERPINNING ARE TO BE SUBMITTED TO NYCT FOR APPROVAL.
9. TEMPORARY SHORING MAY BE PLACED IN DIRECT CONTACT WITH NYCT STRUCTURES ONLY IF THE NYCT STRUCTURE IS SHOWN TO BE ABLE TO SUPPORT ALL ANTICIPATED LOADS THAT CAN BE TRANSFERRED THROUGH THE TEMPORARY STRUCTURES WITHOUT DAMAGING THE EXISTING STRUCTURE. AT THE COMPLETION OF THE PROJECT, THESE TEMPORARY SHORING AND BRACING SYSTEMS ARE TO BE REMOVED OR CUT-OFF AS APPROVED BY NYCT.
10. WHEN PILES ARE TO BE DRIVEN ADJACENT TO THE SUBWAY STRUCTURE, BORING DATA, PILE LAYOUTS, SPECIFICATIONS AND INSTALLATION PROCEDURES ARE TO BE SUBMITTED TO NYCT FOR APPROVAL. VELOCITY METERS ARE TO BE INSTALLED IN THE SUBWAY TUNNEL AT CRITICAL LOCACATIONS TO MONITOR INDUCED VIBRATIONS. INDUCED DISPLACEMENTS ALONG THE TUNNEL SHORING AND TRACK INVERT ARE TO BE MONITORED DURING DRIVING. THE THRESHOLD MAXIMUM PARTICLE VELOCITY ABOVE AMBIENT CAUSED BY THE DRIVING WILL BE 0.5 INCH PER SECOND. VALUES EXCEEDING THSI LEVEL WILL BE REVIEWED AND EVALUATED BY NYCT'S ENGINEER. IN NO CASE WILL PARTICLE VELOCITIES EXCEED THE UPSET LEVEL OF 2.0 INCHES PER SECOND.
11. NO PILES ARE PERMITTED TO BE INSTALLED BY ANY METHOD WITHIN THREE FEET OF SUBWAY STRUCTURE, MEASURED FROM THE EDGE OF THE SOIL OUTSIDE THE CASING TO THE WALL. CLOSED-END PILES WILL NOT BE PERMITTED TO BE DRIVEN WITHIN TEN FEET OF THE SUBWAY STRUCTURE.
12. ALL PILES ARE TO BE PLACED WITHIN A PREAUGERED CASED HOLE TO THE INFLUENCE LINE. THE CASING SHALL BE CLEANED WITHOUT DISTURBING THE SOIL OUTSIDE THE CASING AND THE PILE TO BE PLACED WITHIN THE CASING FOR INSTALLATION. THE PILES MAY THEN BE DRIVEN BEYOND THE INFLUENCE LINE WITHIN THE CASING.
13. THE INFLUENCE LINE SHALL START AT THE BOTTOM OF THE SUBWAY STRUCTURE AND EXTEND AT A 1:1 SLOPE. FOR PILES INSTALLED WITHIN TEN FEET OF THE SUBWAY STRUCTURE, THE CASING SHALL BE EXTENDED UP TO THE BOTTOM OF THE SUBWAY STRUCTURE.
14. AT THE COMPLETION OF PILLE INSTALLATION, THE SPACE BETWEEN THE PILE AND THE CASING IS TO BE FILLED WITH EITHER CLEAN SAND OR GROUT. IF THE CASING IS TO BE REMOVED, THE FILLING MUST BE COMPLETED PRIOR TO REMOVAL OF THE CASING.
15. ALL PILES ARE TO BE DRIVEN A MINIMUM OF TEN FEET BELOW THE INTERSECTION OF THE PILE CENTER LINE AND THE INFLUENCE LINE OF THE SUBWAY STRUCTURE.
16. THE USE OF "DOWN-THE-HOLE-HAMMERS" FOR INSTALLATION OF PILES THROUGH OVERBURDEN AND FILL WILL BE PERMITTED ONLY TO REMOVE BOULDERS. IT WILL NOT BE PERMITTED AS A MATTER OF COURSE TO ADVANCE THE HOLE. THEIR USE TO CONSTRUCT ROCK SOCKETS WILL NOT BE ALLOWED WITHIN 5 FEET OF THE NYCT STRUCTURE.
17. VIBRATORY HAMMERS WILL NOT BE PERMITTED WITHIN 75 FEET OF SUBWAY STRUCTURES. HOERAMS WILL NOT BE PERMITTED WITHIN 25 FEET OF SUBWAY STRUCTURES.
18. DYNAMIC COMPACTION METHIDS USING DROPPED HEAVY WEIGHTS CANNOT BE CONDUCTED WITHIN 1000 FEET OF ANY NYCT STRUCTURE UNLESS IT IS SHOWN THAT INDUCED SETTLEMENTS AND VIBRATIONS WILL NOT DAMAGE THESE STRUCTURES. A SUITABLE MONTIORING PLAN INCLUDING SETTLEMENT ADN VIBRATION MEASUREMENTS MUST BE APPROVED BY NYCT'S ENGINEER FOR ALL SUCH OPERATIONS WITHIN THESE DISTANCES.
19. THERE SHALL BE NO MACHINE EXCAVATION WITHIN 3 FEET OF NYCT STRUCTURES, POWER DUCT LINES, OR ANY OTHER FACILITIES UNTIL THEY HAVE BEEN CAREFULLY EXPOSED BY HAND EXCAVATION.
20. ALL DEWATERING OPERATIONS CONDUCTED WITHIN 500 DEET OF THE NYCT STRUCTURE MUST BE PERFORMED IN ACCORDANCE WITH DRAWINGS AND PROCEDURES SUBMITTED TO NYCT FOR APPROVAL. THE DISTANCE FROM THE STRUCTURE TO THE DEWATERING OPERATION CAN BE REDUCED PROVIDED THAT SOIL CONDITIONS AT THE SITE INDICATE THAT THE RADIUS OF INFLUENCE OF THE DEWATERING IS LESS THAN 500 FEET. FOR DEWATERING WITHIN THE RADIUS OF INFLUENCE, THE DEWATERING PROGRAM MUST BE SHOWN TO HAVE NEGLIGLE INFLUENCE ON SETTLEMENTS OF THE NYCT STRUCTURE.
21. SUBWAY ENTRANCES (VENTILATORS, ETC.) ARE TO BE UNDERPINNED OR SHORED AND BRACED IF DIRECTED BY NYCT'S ENGINEER.
22. NYCT, AT ITS DISCRETION, RESERVES THE RIGHT TO REQUIRE THE PROJECT TO CLOSE OR MAINTAIN AND PROTECT EXISTING SUBWAY ENTRENCES, VENTILATORS, ETC. ADJACENT TO THE PROJECT DURING CONSTRUCTION. SUCH CONSTRUCTION MAY INCLUDE UNDERPINNING, SHORING, BRACING AND ERECTION OF SUITABLE BARRICADES AND /OR CANOPIES AND SHIELD. SUCH PROTECTION SHALL BE IN ACCORDANCE WITH DRAWINGS SUBMITTED TO NYCT FOR APPROVAL.
23. IF SHIELDS ARE TO BE INSTALLED TO PROTECT NYCT FACILITIES AND/OR THE PUBLIC, PLANS SHOWING THE LOCATION, TYPE AND METHOD OF ATTACHMENT TO THE TRANSIT STRUCTURE MUST BE SUBMITTED TO NYCT FOR APPROVAL.
24. ALL LUMBER AND PLYWOOD USED FOR PROTECTION OF SUBWAY FACILITIES MUST BE FIRE RETARDANT.
25. SUBWAY EMERGENCY EXITS MUST BE KEPT CLEAR ALL TIMES.
26. IN EXCAVATING OVER OR NEAR THE SUBWAY ROOF, SPECIAL CARE SHALL BE EXERCISED SO THAT THE THIN CONCRETE PROTECTION OF THE SUBWAY WATERPROOFING IS NOT DAMAGED.
27. BURNING OF, WELDING TO OR DRILLING THROUGH EXISTING STEEL STRUCTURES WILL NOT BE PERMITTED EXCEPT AS SHOWN ON DRAWINGS APPROVED BY NYCT.
28. HORIZONTAL AND VERTICAL CONTROL SURVEY DATA OF THE EXISTING NYCT STRUCTURE IS TO BE TAKEN BY A LICENCED LAND SURVEYOR TO MONITOR ANY MOVEMENTS THAT OCCUR DURING CONSTRUCTION AND TO SHOW THAT THE INDUCED MOVEMENTS ARE WITHIN ALLOWABLES PROVIDED AND APPROVED BY NYCT'S ENGINEER. IF ANY MOVEMENTS EXCEED ALLOWABLES, REMEDIATION AS APPROVED BY NYCT SHALL BE PERFORMED.
29. BUS ROUTES AFFECTED BY THE PROJECT WILL OR MAY REQUIRE BUS DIVERSIONS. THESE ARRANGEMENTS SHALL BE MADE THROUGH:

Mr. SARAH WYSS
ACTING DIRECTOR, OPERATIONS PLANNING
NEW YORK CITY TRANSIT
2 BROADWAY, ROOM A17.82
NEW YORK, NEW YORK 10004
TEPHONE NUMBER (646) 252-5517

WHEN IMPACTING ANY BUS STOP, SPECIAL OPERATIONS MUST BE NOTIFIED TWO WEEKS IN ADVANCE.

30. DUCT LINES MUST BE MAINTAINED AND PROTECTED DURING CONSTRUCTION. ANY INTERFERENCE WITH DUCT LINES SHOULD BE REPORTED TO NYCT INSPECTOR. WHEN A DUCT LINE CONTAINING CABLES IS TO BE REMOVED, OR WHEN MASONRY ADJACENT THERETO IS TO BE REMOVED, PENETRATED, OR DRILLED, THE WORK SHALL BE DONE WITH ENTIRELY, USING HAMMER AND CHISEL. JACKHAMMERS, BULL POINTS OR OTHER POWER EQUIPMENT SHALL NOT BE USED.
31. WHERE MANHOLES ARE ENCOUNTERED:
    - A) THEY SHALL BE PROTECTED AND RAISED OR LOWERED AS REQUIRED, TO MATCH THE NEW STREET GRADE.
    - B) IF MANHOLE COVERS ARE RAISED OR LOWERED, PROTECT CABLES IN MANHOLE BY WOOD SHEETING OF 2" NOMINAL THICKNESS.
    - C) PRIOR TO THE START OF CONSTRUCTION OPERATIONS AFFECTING MANHOLES AND DUCT LINES, SEVEN DAYS NOTICE MUST BE GIVEN TO MR. JOHN MALVASIO, P.E., DIRECTOR, DEPARTMENT OF MAINTENANCE OF WAY, AT (718) 694-1358.
32. CONSTRUCTION WORK DONE NEAR VENT GRANTINGS AND HATCHES SHALL BE AS FOLLOWS:
    - A) UNLESS APPROVED BY THE NYCT'S ENGINEER, ALL VENT GRANTINGS AND HATCHES SHOULD REMAIN OUTSIDE THE CONSTRUCTION SITE, SEPARATED BY A CONSTRUCTION FENCE. PROTECTIVE SHIELDS MUST BE PROVIDED OVER VENT GRATINGS AS REQUIRED BY NYCT'S ENGINEER.
    - B) NO BUILDING MATERIAL, VEHICLES OR CONSTRUCTION EQUIPMENT IS TO BE STORED OR RUN OVER VENT, GRATINGS, HATCHES OR EMERGENCY EXITS.
    - C) DETAILS OF SIDEWALK RECONSTRUCTION AROUND VENT GRATINGS, HATCHES AND EMERGENCY EXITS ARE TO BE SUBMITTED TO NYCT FOR APPROVAL.
33. TRACTORS, CRANES, EXCAVATORS, ETC. USED IN THE VICINITY OF THE ELEVATED STRUCTURES SHALL BE ISOLATED FROM THE GROUND. SINCE THE ELEVATED STRUCTURE IS USED AS A NEGATIVE RETURN PATH, WITH A CONSEQUENT POTENTIAL BETWEEN IT AND THE GROUND, ANY CONTACT BETWEEN THE STRUCTURE AND GROUNDED EQUIPMENT COULD RESULT IN BURNING OF THE STEEL.
34. TEMPORARY CONSTRUCTION SHEDS, BARRICADES OR PLYWOOD PARTITIONS MUST BE A MINIMUM OF 5'-0" FROM EDGE OF FINISHED PLATFORM.
35. STAIRWAY/ENTRANCE CLOSINGS: THE GENERAL REQUIREMENTS FOR STAIRWAY/ENTRANCE CLOSINGS ARE AS FOLLOWS:
    - A) ONLY ONE STAIRWAY AT EACH STATION WILL BE PERMITTED TO BE CLOSED AT THE SAME TIME. APPROVALS FOR CLOSING ANY STAIRWAY MUST BE OBTAINED FROM THE DIVISION OF STATION OPERATINS AT LEAST THREE WEEKS IN ADVANCE.
    - B) MR. ASHOK PATEL, DIRECTOR, OFFICE OF STATION PROGRAMS; TELEPHONE (718) 694-1695 OF THE DIVISION OF STATIONS MUST BE NOTIFIED ONE WEEK PRIOR TO THE ACTUAL CLOSING AND REOPENING OF THE ENTRANCE.
    - C) AMPLE SIGNAGE MUST BE SUPPLIED AND POSTED AT LEAST ONE WEEK IN ADVANCE, ADVISING THE PUBLIC OF THE PROPOSED SUBWAY STAIR CLOSING.
    - D) THE STREET ENTRANCE STAIRWAY SHOULD NOT BE CLOSED UNLESS MANPOWER AND MATERIALS ARE AVAILABLE TO COMMENCE WORK ON DATES PERMITTED.
    - E) ONCE THE CLOSING IS EFFECTED, CONSTRUCTION SIGNS MUST BE PLACED AT APPROPRIATE LOCATIONS ON THE BARRICADES AT THE STREET AND MEZZANINE LEVELS, STATING THE CONTRACTOR'S NAME, 24 HOUR EMERGENCY TELEPHONE NUMBER, CONTRACT NUMBER, THE DURATION OF THE CLOSING, DIRECTION TO AN ALTERNATE ENTRANCE/EXIT, AND AN APOLOGY FOR THE INCONVENIENCE TO OUR CUSTOMERS.
    - F) EXISTING STATION SIGNAGE MUST BE ADJUSTED TO REFLECT ANY CHANGES IN ACCESS/EGRESS.
    - G) BARRICADES ARE TO BE PAINTED AND KEPT GRAFFITI FREE AT ALL TIMES. THE CONTRACTOR MUST MAINTAIN THE BARRICADED AREA CLEAN OF ALL DEBRIS.
    - H) ALL MATERIALS ARE TO BE PROPERLY STORED AND SECURED AWAY FROM PASSENGER TRAFFIC.
    - I) THE CONTRACTOR MUST REMOVE ALL WASTE MATERIAL AND BARRICADES FROM ALL STATION AREAS WHEN CONSTRUCTION IS COMPLETED.
    - J) INSPECTION OF THE AREA UNDER CONSTRUCTION BY AUTHORIZED STATION DEPARTMENT EMPLOYEES SHALL NOT BE INHIBITED.
    - K) IF STREET LIGHTS ON THE SIDEWALKS ARE AFFECTED, TEMPORARY LIGHTS SHALL BE PROVIDED.
36. IF NEW CONCRETE CONSTRUCTION IS JOINED TO EXISTING CONCRETE, DOWELS AND KEYWAYS ARE TO BE USED IN ACCORDANCE WITH NYCT STANDARDS.
37. IF THE PROJECT INVOLVES CONSTRUCTION OR ALTERNATION OF A SUBWAY FACILITY ON PRIVATE PROPERTY, THE PROPERTY OWNERS WILL BE REQUIRED TO ENTER INTO AN AGREEMENT WITH NYCT PERTAININ TO ALL WORK AFFECTING THE TRANSIT FACILITIES AND CLEARLY DEFINING LIMITS AND RESPONSIBILITY FOR MAINTENANCE AND LIABILITY.
38. WHEREVER A NEW SIDEWALK IS BEING PLACED TO NYCT STRUCTURES THE FOLLOWING WILL BE REQUIRED:
    - A) THE TOP OF THE NEW SIDEWALK SHALL BE FLUCH WITH THE SUBWAY VENT GRATINGS, HATCHES AND EMERGENCY EXITS.
    - B) THE SLOPE OF THE NEW SIDEWALK SHALL BE SUCH THAT THE DRAINAGE BE AWAY FROM THESE STRUCTURES.
    - C) A 1/2" PREMOLDED FILLER SHALL BE INSTALLED BETWEEN THE NEW SIDEWALK AND NYCT STRUCTURE.
    - D) WHERE SIDEWALK ELEVATIONS ARE BEING CHANGED DETAILS OF PROPOSED WORK AROUND NYCT STRUCTURES ARE TO BE SUBMITTED FOR APPROVAL.
39. BEFORE THE START OF ANY WORK, THE CONTRACTOR SHALL MAKE AN EXAMINATION, IN THE PRESENCE OF NYCT'S ENGINEER, OF THE INTERIOR AND EXTERIOR OF NYCT SUBWAY OR OTHER STRUCTURE ADJACENT TO THE PROPOSED WORK. THE PERSON OR PERSONS AUTHORIZED BY THE CONTRACTOR TO MAKE THESE EXAMINATIONS SHALL BE APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL TAKE ALL PHOTOGRAPHS AS MAY BE NECESSARY OR ORDERED TO INDICATE THE EXISTING CONDITION OF NYCT STRUCTURE. ONE COPY OF EACH PHOTOGRAPH, EIGHT INCHES BY TEN INCHES IN SIZE, AND THE NEGATIVE IS TO BE SUBMITTED TO MR. JOHN MALVASIO, P.E., DIRECTOR, DEPARTMENT OF MAINTENANCE-OF-WAY, 130 LIVINGSTON STREET, ROOM 8044D, BROOKLYN, NEW YORK 11201, TELEPHONE (718) 694-1358 BEFORE THE START OF CONSTRUCTION.
40. ALL ARCHITECTURAL DETAILS (TOKEN, RAILINGS, DOORS, ETC.) ARE TO CONFORM TO THE LATEST NYCT STANDARDS. THESE STANDARDS ARE AVAILABLE AT NYCT.
41. STANDARD NYCT INSURANCE CLAUSES ARE TO BE MADE PART OF THE PROJECT'S CONTRACT DRAWINGS. PROOF THAT THE NECESSARY INSURANCE IS IN EFFECT WILL BE REQUIRED BEFORE WORK CAN COMMENCE.
42. AT THE CLOSE OF ANY PROJECT INVOLVING CONSTRUCTION OR ALTERATIONS TO TRANSIT FACILITIES, ONE SET OF VELLUMS OR MYLARS, FIVE SETS OF 35mm MICROFILM, AND ELECTRONIC COPIES COMPLYING TO MICROSTATION.DGN FORMAT OF "APPROVED AS-BUILTS" MUST BE PROVIDED TO NYCT FOR ITS RECORDS. FOR DETAILS OF SPECIFIC REQUIREMENTS CONTACT NYCT OUTSIDE PROJECTS.
43. AT LEAST SEVEN WORKING DAYS PRIOR TO THE START OF CONSTRUCTION OPERATIONS, NOTIFICATION MUST BE GIVEN TO MR. JOHN MALVASIO, P.E., DIRECTOR, DEPARTMENT OF MAINTENANCE-OF-WAY, AT (718) 694-1358. THE CONTRACTOR TO PROVIDE TEMPORARY QUARTERS NEAR THE JOB SITE FOR NYCT INSPECTORS CONTAINING A DESK AND TELEPHONE.

NYCT OUTSIDE CONTRACT INSURANCE REQUIREMENTS

1. THE PERMITTEE AT ITS SOLE COST AND EXPENSE SHALL CARRY OR CAUSE TO CARRIED AND SHALL MAINTAIN AT ALL TIMES DURING THE PERIOD OF PERFORMANCE UNDER THIS AGREEMENT POLICIES OF INSURANCE AS HEREIN BELOW SET FORTH BELOW:
    - A. WORKERS' COMPENSATION INSURANCE (INCLUDING EMPLOYER'S LIABILITY INSURANCE) WITH LIMITS OF NOT LESS THAN $2,000,000, WHICH LIMIT MAY BE MET BY A COMBINATION OF PRIMARY AND EXCESS INSURANCE MEETING THE STATUTORY LIMITS OF NEW YORK STATE. THE POLICY SHALL BE ENDORSED TO INCLUDE LONGSHOREMAN'S AND HARBOR WORKERS' COMPENSATION ACT/MARITIME COVERAGE ENDORSEMENT AND/OR JONES ACT ENDORSEMENT WHEN APPLICABLE.
    - B. COMMERCIAL GENERAL LIABILITY INSURANCE (I.S.O. 2001 FORM OR EQUIVALENT) APPROVED BY PERMITTOR IN THE PERMITTEE'S NAME WITH LIMITS OF LIABILITY IN THE AMOUNT OF AT LEAST $3,000,000 FOR EACH OCCURRENCE ON A COMBINED SINGLE LIMIT BASIS FOR INJURIES TO PERSONS (INCLUDING DEATH) AND DAMAGE TO PROPERTY, $3,000,000 GENERAL AGGREGATE AND $3,000,000 IN THE AGGREGATE WITH RESPECT TO PRODUCTS/COMPLETED OPERATIONS. THE LIMITS MAY BE PROVIDED IN THE FORM OF A PRIMARY POLICY OR COMBINATION OF PRIMARY AND UMBRELLA/EXCESS POLICY. WHEN THE MINIMUM CONTRACT AMOUNTS CAN ONLY BE MET WHEN APPLYING THE UMBRELLA/EXCESS POLICY, THE UMBRELLA/EXCESS POLICY MUST FOLLOW FORM OF THE UNDERLYING POLICY AND BE EXTENDED TO "DROP DOWN" TO BECOME PRIMARY IN THE EVENT PRIMARY LIMITS ARE REDUCED OR AGGREGATE LIMITS ARE EXHAUSTED. SUCH INSURANCE SHALL BE PRIMARY AND NON-CONTRIBUTORY TO ANY OTHER VALID AND COLLECTIBLE INSURANCE AND MUST BE EXHAUSTED BEFORE IMPLICATING ANY PERMITTOR/MTA POLICY AVAILABLE.

      SUCH POLICY SHOULD BE WRITTEN ON AN OCCURRENCE FORM, AND SHALL INCLUDE:
      - CONTRACTUAL COVERAGE FOR LIABILITY ASSUMED BY THE PERMITTEE UNDER THIS AGREEMENT;
      - PERSONAL AND ADVERTISING INJURY COVERAGE;
      - PRODUCTS-COMPLETED OPERATIONS;
      - INDEPENDENT CONTRACTORS COVERAGE;
      - "XCU" COVERAGE (EXPLOSION, COLLAPSE, AND UNDERGROUND HAZARDS) WHERE NECESSARY;
      - CONTRACTUAL LIABILITY EXCLUSION, APPLICABLE TO CONSTRUCTION OR DEMOLITION OPERATIONS TO BE PERFORMED WITHIN 50 FEET OF RAILROAD TRACKS, MUST BE VOIDED, WHERE NECESSARY; AND
      - ADDITIONAL INSURED ENDORSEMENT (I.S.O. FORM CG 20 26 07/04 VERSION OR EQUIVALENT) APPROVED BY THE PERMITTOR NAMING:

      NEW YORK CITY TRANSIT AUTHORITY (NYCTA), THE MANHATTAN AND BRONX SURFACE TRANSIT OPERATING AUTHORITY (MABSTOA), THE STATEN ISLAND RAPID TRANSIT OPERATING AUTHORITY (SIRTOA), MTA CAPITAL CONSTRUCTION CO., THE METROPOLITAN TRANSPORTATION AUTHORITY (MTA) INCLUDING ITS SUBSIDIARIES AND AFFILIATES, AND THE CITY OF NEW YORK (AS OWNER).
    - C. BUSINESS AUTOMOBILE LIABILITY INSURANCE POLICY

      EQUIVALENT) APPROVED BY THE PERMITTOR IS REQUIRED IF PERMITEE'S VEHICLE ENTERS PERMITTOR PROPERTY. THE INSURANCE MUST BE IN THE NAME OF THE PERMITTEE OR ITS CONTRACTOR ENTERING THE PERMITTOR PROPERTY WITH LIMITS OF LIABILITY IN THE AMOUNT OF $2,000,000 EACH ACCIDENT FOR CLAIMS FOR BODILY INJURIES (INCLUDING DEATH) TO PERSONS AND FOR DAMAGE TO PROPERTY ARISING OUT OF THE OWNERSHIP, MAINTENANCE OR USE OF ANY OWNED, HIRED OR NON-OWNED MOTOR VEHICLE.
    - D. RAILROAD PROTECTIVE LIABILITY INSURANCE (ISO-RIMA OR EQUIVALENT FORM) APPROVED BY PERMITTOR COVERING THE WORK TO BE PERFORMED AT THE DESIGNATED JOB SITE AND AFFORDING PROTECTION FOR DAMAGES ARISING OUT OF BODILY INJURY OR DEATH, PHYSICAL DAMAGE TO OR DESTRUCTION OF PROPERTY, INCLUDING DAMAGE TO THE INSURED'S OWN PROPERTY AND CONFORMING TO THE FOLLOWING:
      - THE FOLLOWING ARE THE NAMED INSUREDS FOR THIS COVERAGE:

      NEW YORK CITY TRANSIT AUTHORITY (NYCTA), THE MANHATTAN AND BRONX SURFACE TRANSIT OPERATING AUTHORITY (MABSTOA), THE STATEN ISLAND RAPID TRANSIT OPERATING AUTHORITY (SIRTOA), MTA CAPITAL CONSTRUCTION CO., THE METROPOLITAN TRANSPORTATION AUTHORITY (MTA) INCLUDING ITS SUBSIDIARIES AND AFFILIATES, AND THE CITY OF NEW YORK (AS OWNER).
      - THE LIMIT OF LIABILITY SHALL BE $2,000,000 AT LEAST EACH OCCURRENCE, SUBJECT TO A $6,000,000 ANNUAL AGGREGATE;
      - POLICY ENDORSEMENT CG 28 31 - POLLUTION EXCLUSION AMENDMENT IS REQUIRED TO BE ENDORSED ONTO THE POLICY WHEN ENVIRONMENTAL-RELATED WORK AND/OR EXPOSURES EXIST.
      - INDICATE THE NAME AND ADDRESS OF THE CONTRACTOR TO PERFORM THE WORK, THE CONTRACT # AND THE NAME OF THE RAILROAD PROPERTY WHERE THE WORK IS BEING PERFORMED AND THE AGENCY PERMIT.
      - EVIDENCE OF RAILROAD PROTECTIVE LIABILITY INSURANCE, MUST BE PROVIDED IN THE FORM OF THE ORIGINAL POLICY. A DETAILED INSURANCE BINDER (ACORD OR MANUSCRIPT FORM) WILL BE ACCEPTED PENDING ISSUANCE OF THE ORIGINAL POLICY, WHICH MUST BE PROVIDED WITHIN 30 DAYS OF THE BINDER APPROVAL.
    - C. ENVIRONMENTAL/POLLUTION EXPOSURES

      IN THE EVENT ENVIRONMENTAL OR POLLUTION EXPOSURES EXIST; THE PERMITTEE SHALL REQUIRE THE ENVIRONMENTAL CONTRACTOR OR SUB-CONTRACTOR TO PROVIDE THE APPLICABLE INSURANCE COVERING SUCH EXPOSURE. THE LIMITS AND TYPE OF INSURANCE PROVIDED SHALL BE SATISFACTORY TO THE PERMITTOR AND WILL BE CONFIRMED TO THE PARTIES PRIOR TO THE START OF THE WORK.
2. GENERAL REQUIREMENTS APPLICABLE TO INSURANCE POLICIES
    - a) ALL OF THE INSURANCE REQUIRED BY THIS ARTICLE SHALL BE WITH COMPANIES LICENSED OR AUTHORIZED TO DO BUSINESS IN THE STATE OF NEW YORK WITH AN A.M. BEST COMPANY RATING OF NOT LESS THAN A-/VII OR BETTER AND REASONABLY APPROVED BY THE PERMITTOR/MTA AND SHALL DELIVER EVIDENCE OF SUCH POLICIES.
    - b) EXCEPT FOR WORKERS COMPENSATION, ALL REFERENCES TO FORMS AND COVERAGES REFERRED TO ABOVE SHALL BE THE MOST RECENT USED BY THE INSURANCE SERVICES OFFICE, INC. ("ISO") OR EQUIVALENT FORMS APPROVED BY THE INSURANCE DEPARTMENT OF THE STATE OF NEW YORK, PROVIDED, HOWEVER, THAT EXCESS COVERAGES MAY BE WRITTEN ON FORMS REASONABLY ACCEPTABLE TO PERMITTOR CONTAINING PROVISIONS OTHER THAN THOSE CONTAINED IN ISO FORMS BUT OTHERWISE CONFORMING IN SUBSTANCE TO THE REQUIREMENTS OF THIS ARTICLE.
    - c) THE PERMITTEE OR ITS CONTRACTOR PERFORMING THE WORK SHALL FURNISH EVIDENCE OF ALL POLICIES BEFORE ANY WORK IS STARTED TO THE PERMITTOR:

      FOR NYCT CONTRACT INSPECTION
      C/O MR. JOHN MALVASIO
      DIRECTOR, MOW ENGINEERING
      130 LIVINGSTON STREET, ROOM 8044F
      BROOKLYN, NY 11201
      TELEPHONE: (718) 694-1358

      THESE POLICIES MUST: (I) BE WRITTEN IN ACCORDANCE WITH THE REQUIREMENTS OF THE PARAGRAPHS ABOVE, AS APPLICABLE; (II) BE ENDORSED IN FORM ACCEPTABLE TO INCLUDE A PROVISION THAT THE POLICY WILL NOT BE CANCELED, MATERIALLY CHANGED, OR NOT RENEWED, UNLESS OTHERWISE INDICATED HEREIN, AT LEAST THIRTY (30) DAYS PRIOR WRITTEN NOTICE TO THE PERMITTOR C/O MTA RISK AND INSURANCE MANAGEMENT DEPARTMENT - STANDARDS, ENFORCEMENT & CLAIMS UNIT, 2 BROADWAY - 21ST FLOOR, NEW YORK, NY 10004; (III) STATE OR BE ENDORSED TO PROVIDE THAT THE COVERAGE AFFORDED UNDER THE CONTRACTOR'S POLICIES SHALL APPLY ON A PRIMARY AND NOT ON AN EXCESS OR CONTRIBUTING BASIS WITH ANY POLICIES WHICH MAY BE AVAILABLE TO THE PERMITTOR/MTA, AND ALSO THAT THE CONTRACTOR'S POLICIES, PRIMARY AND EXCESS, MUST BE EXHAUSTED BEFORE IMPLICATING ANY PERMITTOR/MTA POLICY AVAILABLE. (IV) IN ADDITION, CONTRACTOR'S POLICIES SHALL STATE OR BE ENDORSED TO PROVIDE THAT, IF A SUBCONTRACTOR'S POLICY CONTAINS ANY PROVISION THAT MAY ADVERSELY AFFECT WHETHER CONTRACTOR'S POLICIES ARE PRIMARY AND MUST BE EXHAUSTED BEFORE IMPLICATING ANY PERMITTOR/MTA POLICY AVAILABLE, CONTRACTOR'S AND SUBCONTRACTOR'S POLICIES SHALL NEVERTHELESS BE PRIMARY AND MUST BE EXHAUSTED BEFORE IMPLICATING ANY PERMITTOR/MTA POLICY AVAILABLE. EXCEPT FOR PROFESSIONAL LIABILITY, POLICIES WRITTEN ON CLAIMS MADE BASIS ARE NOT ACCEPTABLE. AT LEAST TWO (2) WEEKS PRIOR TO THE EXPIRATION OF THE POLICIES, CONTRACTOR SHALL ENDEAVOR TO PROVIDE EVIDENCE OF RENEWAL OR REPLACEMENT POLICIES OF INSURANCE, WITH TERMS AND LIMITS NO LESS FAVORABLE THAN THE EXPIRING POLICIES. EXCEPT AS OTHERWISE INDICATED IN THE DETAILED COVERAGE PARAGRAPHS BELOW, SELF INSURED RETENTIONS AND POLICY DEDUCTIBLES SHALL NOT EXCEED $100,000, UNLESS SUCH INCREASED DEDUCTIBLE OR RETENTION IS APPROVED BY PERMITTOR/MTA. THE PERMITTEE SHALL BE RESPONSIBLE FOR ALL CLAIM EXPENSE AND LOSS PAYMENTS WITHIN THE DEDUCTIBLE OR SELF-INSURED RETENTION. INSURANCE MONETARY LIMITS REQUIRED HEREIN MAY BE MET THROUGH THE COMBINED USE OF THE INSURED'S PRIMARY AND UMBRELLA/EXCESS POLICIES.
    - d) CERTIFICATES OF INSURANCE MAY BE SUPPLIED AS EVIDENCE OF POLICIES OF THE ABOVE POLICIES, EXCEPT THE RAILROAD PROTECTIVE LIABILITY POLICY, DESIGNATED AS POLICY D. HOWEVER, IF REQUESTED BY THE PERMITTOR, THE PERMITTEE SHALL DELIVER TO THE AUTHORITY, WITHIN FORTY-FIVE (45) DAYS OF THE REQUEST, A COPY OF SUCH POLICIES, CERTIFIED BY THE INSURANCE CARRIER AS BEING TRUE AND COMPLETE. THE RAILROAD PROTECTIVE LIABILITY INSURANCE POLICY MUST BE PROVIDED IN THE FORM OF THE ORIGINAL POLICY. A DETAILED INSURANCE BINDER MAY BE PROVIDED, ACORD OR MANUSCRIPT FORM, PENDING ISSUANCE OF THE ORIGINAL POLICY. THE ORIGINAL POLICY MUST BE SUBMITTED TO MTA RIM WITHIN 30 DAYS OF THE BINDER APPROVAL.
    - e) IF A CERTIFICATE OF INSURANCE IS SUBMITTED, IT MUST: (1) BE PROVIDED ON THE PERMITOR CERTIFICATE OF INSURANCE FORM OR MTA CERTIFICATE OF INSURANCE FORM FOR JOINT AGENCY AGREEMENTS; (2) BE SIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE INSURANCE CARRIER OR PRODUCER AND NOTARIZED; (3) DISCLOSE ANY DEDUCTIBLE, SELF-INSURED RETENTION, SUB-LIMIT, AGGREGATE LIMIT OR ANY EXCLUSIONS TO THE POLICY THAT MATERIALLY CHANGE THE COVERAGE; (4) INDICATE THE ADDITIONAL INSUREDS AND NAMED INSUREDS AS REQUIRED HEREIN, ALONG WITH A PHYSICAL COPY OF THE ADDITIONAL INSURED ENDORSEMENT (I.S.O. FORM CG 20 26 07/04 VERSION OR EQUIVALENT), AS APPLICABLE AND THE ENDORSEMENT(S) MUST INCLUDE POLICY NUMBER(S); (5) REFERENCE THE CONTRACT BY NUMBER ON THE FACE OF THE CERTIFICATE; AND (6) EXPRESSLY REFERENCE THE INCLUSION OF ALL REQUIRED ENDORSEMENTS.
    - f) THE MINIMUM AMOUNTS OF INSURANCE REQUIRED IN THE DETAIL DESCRIPTION OF POLICIES A, B C, AND D ABOVE SHALL NOT BE CONSTRUED TO LIMIT THE EXTENT OF THE PERMITTEE'S LIABILITY UNDER THIS AGREEMENT.
    - g) IF, AT ANY TIME DURING THE PERIOD OF THIS AGREEMENT, INSURANCE AS REQUIRED IS NOT IN EFFECT, OR PROOF THEREOF IS NOT PROVIDED TO THE PERMITTOR, THE PERMITTOR SHALL HAVE THE OPTIONS TO: (I) DIRECT THPERMITTEE TO SUSPEND WORK OR OPERATION WITH NO ADDITIONAL COST OR EXTENSION OF TIME DUE ON ACCOUNT THEREOF; OR (II) TREAT SUCH FAILURE AS AN EVENT OF DEFAULT.

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

NYCT STRUCTURAL NOTES

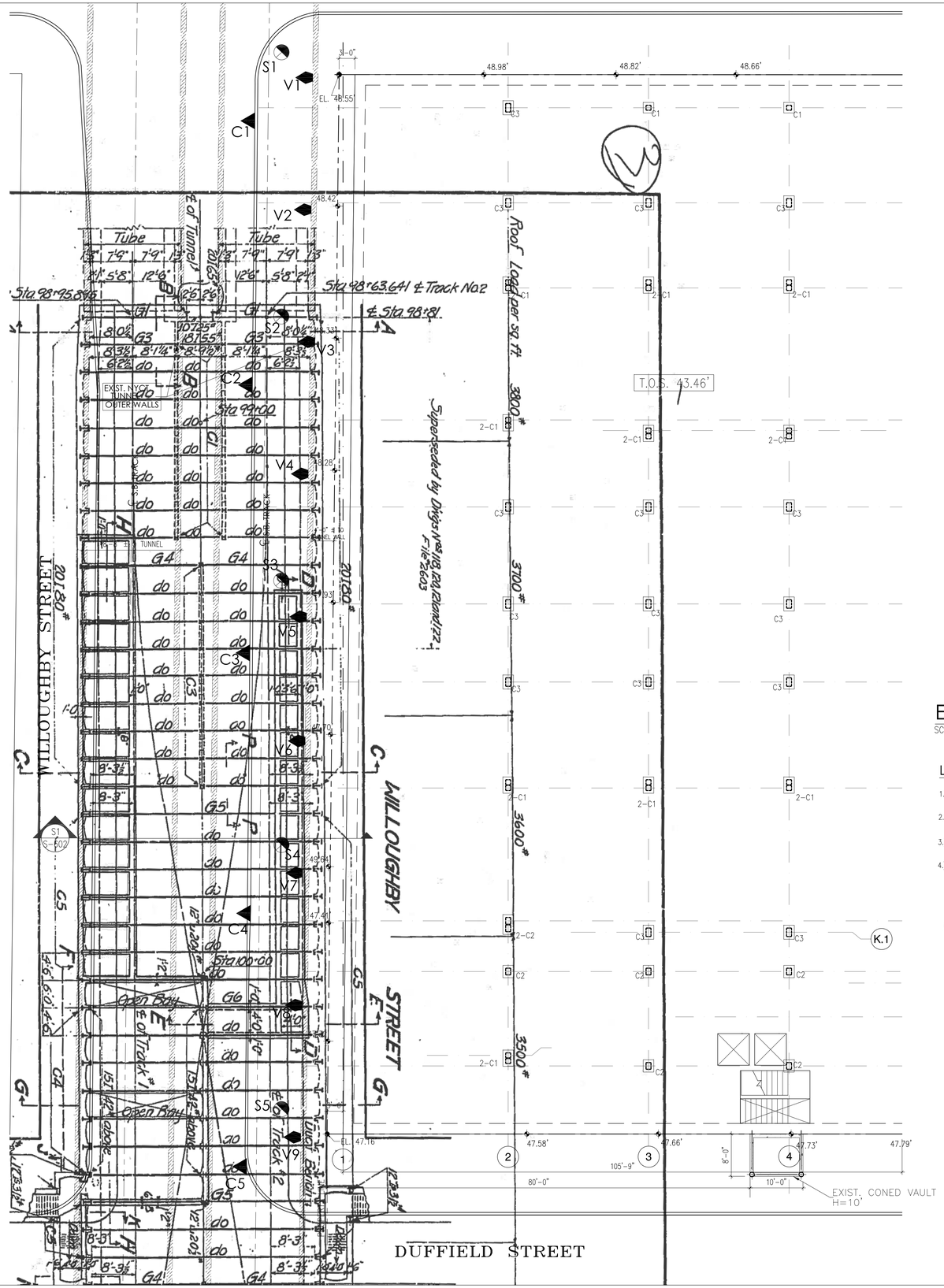
Drawing No.

S-600.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



EXISTING NYCTA ROOF FRAMING PLAN

SCALE: 3/32"=1'-0"

LEGEND

1.) S1-S5 INDICATES SIDEWALK SETTLEMENT MONITORS TO BE PLACED ON SIDEWALK.

2.) VS1 INDICATES VENT SETTLEMENT MONITOR TO BE PLACED ON SUBWAY VENT.

3.) C1-C5 INDICATES CURB SETTLEMENT MONITORS TO BE PLACED ON CURB.

4.) VI – V9 INDICATES VELOCITY METERS (SEISMOGRAPHS) TO BE PLACED INSIDE SUBWAY TUNNEL AS PER NYC TRANSIT GENERAL NOTE 10 DWG S-25 SEISMOGRAPHS SHOULD BE ATTACHED TO EXTERIOR COLUMNS (AT MID-HEIGHT OF TUNEL)

MONITORING NOTES

1.) ALL MONITOR LOCATIONS WILL BE DETERMINED BY NYCT INSPECTORS

2.) SURVEY TO BE DONE AFTER EACH PROPOSED FLOOR IS COMPLETED.

3.) SURVEY READINGS TO BE SUBMITTED TO NYCTA.

4.) SURVEY TO BE DONE BY A LICENCED SURVEYOR.

5.) ELEVATIONS ARE REFERENCED TO THE MANHATTAN TOPOGRAPHICAL BUREAU DATUM WHICH IS 2.750' ABOVE MEAN SEA LEVEL AT SANDY HOOK.

PROJECT TITLE:

WILLOUGHBY SQUARE PARK PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

NYCT ROOF PLAN

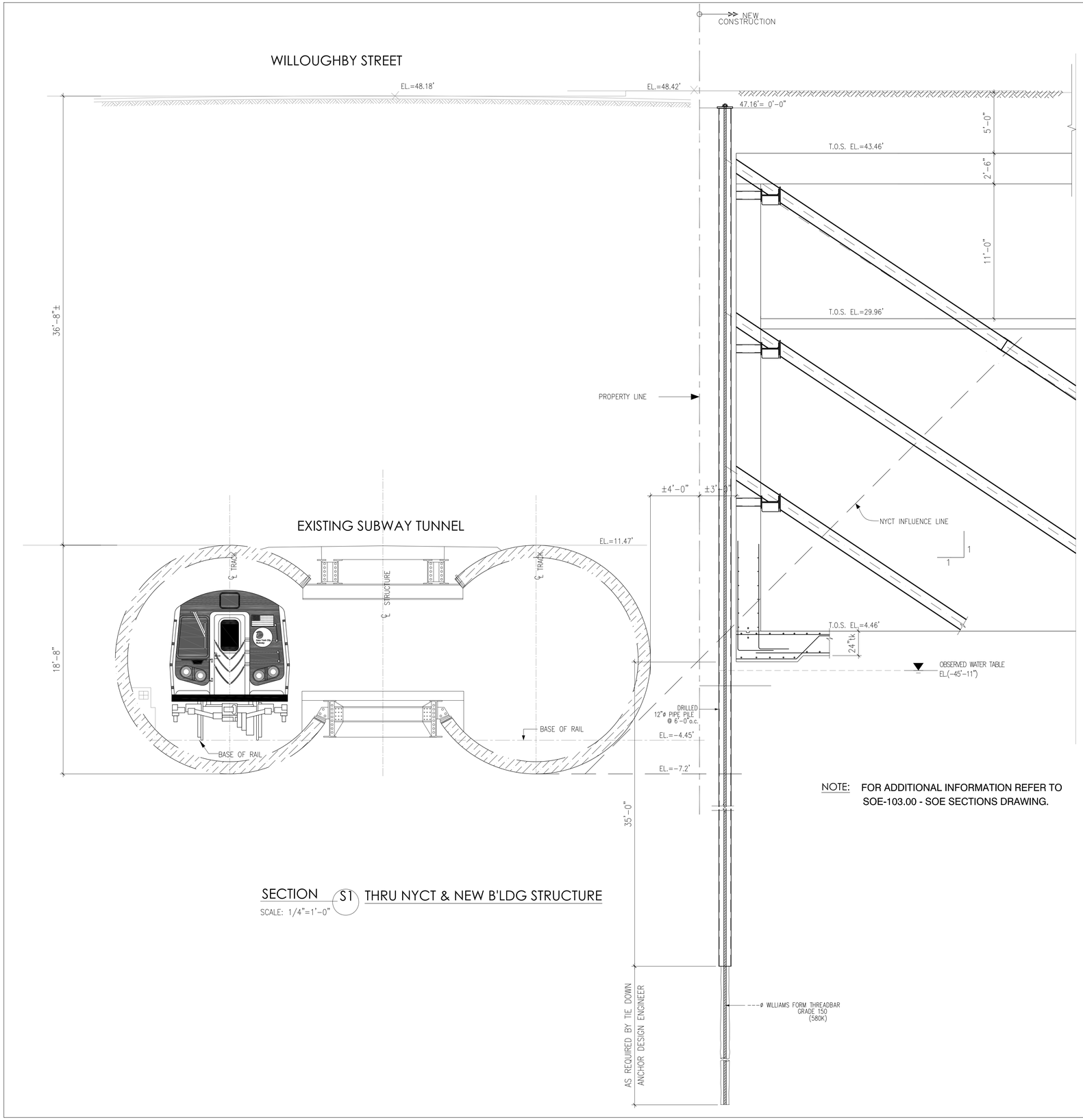
Drawing No.

S-601.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #



NOTE: FOR ADDITIONAL INFORMATION REFER TO SOE-103.00 - SOE SECTIONS DRAWING.

SECTION S1 THRU NYCT & NEW B'LDG STRUCTURE

SCALE: 1/4"=1'-0"

PROJECT TITLE:

WILLOUGHBY SQUARE PARK
PARKING GARAGE

BROOKLYN, NEW YORK

ARCHITECT

STRUCTURAL ENGINEER

Wexler & Associates
12 West 32nd Street, 8th Floor
New York, NY 10001

TRANSPORTATION ENGINEER

Philip Habib & Associates
102 Madison Avenue, 11th Floor
New York, NY 10016

1	01/08/2015	DOB SUBMISSION

Drawing Title:

NYCT SECTION

Drawing No.

S-602.00

Seal

Job No:	13-41
Chk. by:	
Dwg. by:	
Scale:	
Date:	01/08/15

DOB #

APPENDIX 6

KRYSTOL INTERNAL MEMBRANE (KIM) WATERPROOFING SPECIFICATIONS

KRYSTOL INTERNAL MEMBRANE™ (KIM®)

Section 03 & 07 - Integral Crystalline Waterproofing of Concrete

PART 1 GENERAL

1.01 SUMMARY

Section Includes: Furnishing of all materials, services, application instructions, testing guidelines, quality control requirements and supervision necessary for the supply and installation of crystalline integral waterproofing admixture to concrete structures as indicated on the drawings and as specified herein. The crystalline waterproofing admixture shall be added to the concrete mixture at the time of batching and the concrete shall be designed, batched, placed, finished and cured in accordance with the guidelines set out by the American Concrete Institute and the instructions of the manufacturer.

Related Sections:

1. Section 03 30 00 – Cast-in-Place Concrete
2. Section 03 40 00 – Precast Concrete
3. Section 03 15 00 – Concrete Accessories
4. Section 07 10 00 – Damp proofing and Waterproofing

1.02 REFERENCES

Applicable Standards: The following standards may be referenced.

A. ACI 212.3R – 10 (Chapter 15).
B. ACI 305R – Hot Weather Concreting; 1999.
C. ACI 306R – Cold Weather Concreting; 1988.
D. ACI 308 – Standard Practice for Curing Concrete; 1992 (Reapproved 1997).
E. ASTM C 39/C 39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1999.
F. ASTM C 309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1998a.
G. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing; 1997.
H. BS 5075-2: 1998 – Concrete Admixtures: Specification for Air Entraining Admixtures.
I. ASTM E 329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction; 1998a.
J. COE CRD-C 48 – Standard Test Method for Water Permeability of Concrete; 1992.
K. AASHTO T277 – Standard Method to Test for Rapid Determination of Chloride Permeability of Concrete.
L. NSF/ANSI Standard 61; 2000a.
M. BS 12390-8 – Testing Hardened Concrete – Depth of Water Penetration Under Pressure.

Kryton, Krystol and KIM are trademarks of Kryton International Inc. ©2014

1.03 SYSTEM DESCRIPTION

A. **Crystalline Integral Concrete Waterproofing Admixture System:** The admixture must be a Permeability Reducing Admixture for Hydrostatic Conditions (PRAH) as indicated by ACI 212.3R-10 (Chapter 15). The admixture is a dry chemical admixture supplied in sealed plastic buckets and/or in disintegrating paper bags. The admixture will initiate and promote the growth of long, narrow crystal structures sufficient to fill and block capillary pores and microcracks within the concrete preventing the passage of water. The admixture must remain available within the hardened concrete and must react with any future presence of water to self-seal minor cracking that may occur in the future.

B. **Additional System Requirements** include construction joint details, penetration details, waterstops and remedial waterproofing steps.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

All testing must be performed at dosing rates equal to manufacturer recommended dosing rate for the given application.

A. **Permeability:** The coefficient of permeability for admixture treated concrete will be reduced by a minimum of 70% compared to untreated concrete when tested using BS EN 12390-8 at 150 psi of pressure for 96 hours (Taywood-Valenta Method, ACI 212.3R-10).

B. **Permeability:** No passage of water through treated samples when exposed to a vertical water head equal to 140 meters (460 feet).

C. **Compressive Strength:** Treated concrete must have compressive strength equal or higher than plain concrete when tested in accordance with ASTM C 39/C 39M at 28 days and at one year.

D. **Drying Shrinkage:** Minimum 20% reduced drying shrinkage for treated concrete compared to untreated concrete when tested according to ASTM C157 or equivalent.

E. **Self-Sealing:** Autogenous crack sealing of treated concrete for cracks with width of up to 0.5mm (0.02 inches) or greater; verified by independent testing.

F. **Chemical Resistance:** Minimum 20% less weight loss compared to untreated specimen after exposure to 5% sulfuric acid for 70 days.

G. **Carbonation Resistance:** No increase in rate of carbonation compared to untreated concrete when exposed to a 4% carbon dioxide atmosphere for 28 days.

H. **Sulfate Resistance:** Improved resistance to sulfate attack compared to untreated concrete when tested to the US Bureau of Reclamation Accelerated Method.

I. **Potable Water Contact Approval:** Certified by NSF to NSF/ANSI Standard 61

J. **History:** The waterproofing admixture must have demonstrated success in similar applications that are no less than 15 years old.

1.05 SUBMITTALS

A. **General:** Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.

B. **Product Data:** Submit Technical Data Sheets, the KIM Best Practices Guide and Application Instructions including all instructions relating to jointing and penetration details.

C. **Test Reports:** Submit, for acceptance, complete test reports from approved independent testing laboratories certifying that the waterproofing system meets the performance and testing requirements specified herein.

D. **Project References:** Provide case study documents demonstrating successful applications of the waterproofing admixture in similar projects over a period of no less than 15 years.

Kryton International Inc.
1645 East Kent Avenue, Vancouver BC, Canada V5P 2S8 | **TEL** 1.604.324.8280 | **FAX** 1.604.324.8899 | **TOLL FREE** 1.800.267.8280 | **WEB** kryton.com

Kryton, Krystol and KIM are trademarks of Kryton International Inc. ©2014

1.06 QUALITY ASSURANCE

A. The waterproofing admixture shall comply with CAN/CSA A266 – 1-M in the latest addition as both a WR type water reducing admixture and optionally as an air entraining admixture should also comply with ASTM C494 and as a Type D, water reducing and set retarding admixture.

B. Waterproofing admixture to be certified by the International Code Council (ICC) as a Chemical Admixture Used in Concrete (AC198).

C. Waterproofing admixture must be certified to NSF/ANSI Standard 61

D. Waterproofing admixture must bear a CE mark and conform to the performance and quality requirements of EN 934- 2:2001.

E. Waterproofing admixture shall hold a valid Agrément Certificate from the British Board of Agrément.

F. Waterproofing admixture shall hold a valid Appraisal certificate from BRANZ Limited.

G. A meeting with the involved parties must be held prior to installation. This meeting will clarify procedures, roles and responsibilities among the parties. This meeting requires the presence of representatives from the manufacturer, owner, concrete supplier, consulting engineer/architect and all involved contractors.

H. The concrete supplier shall conduct laboratory and field trials as necessary to successfully incorporate the waterproofing admixture into their concrete mixture. Follow the manufacturer's testing guidelines.

I. All parties shall follow the manufacturer's written instructions as contained in the KIM Best Practices Guide, published by the manufacturer.

J. All parties shall follow the manufacturer's written instructions as contained in the Application Instructions, published by the manufacturer.

K. All waterproofing system components shall bear a traceable manufacturer's lot number.

1.07 DELIVERY, STORAGE AND HANDLING

A. **Delivery:** Deliver materials in manufacturer's original, unopened packages bearing the complete product label and lot number.

B. **Storage:** Store materials in a warm and dry location. Protect from humidity or moisture contamination at all times.

C. **Handling:** Observe all occupational health and safety requirements. Read and follow the Material Safety Data Sheet for each product. Conform to all local regulations.

1.08 WARRANTY

A. Provide 25-year manufacturer's limited standard material warranty for the waterproofing admixture.

B. Provide 10-year manufacturer's limited labor and material performance warranty for the waterproofing admixture system. (Additional service costs are applicable for this option)

Kryton, Krystol and KIM are trademarks of Kryton International Inc. ©2014

PART 2 PRODUCTS

2.01 MATERIALS

A. **Acceptable Manufacturer:**
Kryton International Inc.
1645 Kent Ave. NE
Vancouver, BC, Canada
www.kryton.com
T: 1.604.324.8280
TF: 800.267.8280
Fax: 1.604.324.8899
Email: info@kryton.com

B. **Acceptable Products:**
1. Krystol Internal Membrane (KIM)
2. Krystol Waterstop Grout
3. Krystol Waterstop Treatment

C. **Substitutions:** Substitutions are not permitted.

D. **Source Quality:** Obtain all crystalline integral waterproofing products from a single manufacturer.

2.02 DOSAGE

A. KIM doesd at 2% of cementing materials by weight, to a maximum dosage of 8 kg/m^3 (13.5 lb. /cu. yd.) Dosage may be varied for specific projects in consultation with Kryton's Technical Services Department.

PART 3 EXECUTION

3.01 GENERAL

A. **Safety:** Comply with local regulations for health and safety. Read and observe all precautions contains in the Material Safety Data Sheets for the products.

B. **Compliance:** Follow all of the manufacturer's written Application Instructions.

3.02 PROJECT CONDITIONS

A. **Structural Design:** The concrete structure shall be designed to meet local building codes and in addition shall be designed to minimize and control any occurrence of cracks within the concrete mass. Follow ACI 224.R and ACI 301 regarding the placement of reinforcement and crack control joints.

B. **Scheduling:** Trial mixes conducted prior to the project start shall have determined workability and setting times and strength development. This data shall be used to plan appropriate schedules for placing, finishing and removal of formwork.

C. **Weather Conditions:** For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices as referred to in ACI 305R-77 (Hot Weather Concreting) and ACI 306R-78 (Cold Weather Concreting) respectively. For flatwork being placed in either hot, dry or windy conditions, surface humidity must be maintained by fogging or use of monomolecular film (evaporation retardant).

3.03 CONCRETE BATCHING & MIXING

A. KIM admixture shall be added to the concrete at the time of batching at a concrete plant that is acceptable to the manufacturer. Dosage shall be properly supervised and a record kept of quantities and lot numbers.

B. Minimum Portland cement content shall be 250 kg per cubic meter (420 lb. per cubic yard). Minimum Portland cement content may be varied for specific projects in consultation with Kryton's Technical Services Department. Concrete shall be batched following the approved mix design as determined through prior trials. Water content shall be kept to within the specified water to cementing material ratio and this ratio shall not exceed 0.45.

Kryton International Inc.
1645 East Kent Avenue, Vancouver BC, Canada V5P 2S8 | TEL 1.604.324.8280 | FAX 1.604.324.8899 | TOLL FREE 1.800.267.8280 | WEB kryton.com

Kryton, Krystol and KIM are trademarks of Kryton International Inc. ©2014

C. KIM admixture shall be added to the dry ingredients prior to batching and if this is not possible, KIM should be added prior to the addition of other admixtures. Do not mix KIM with other admixtures prior to addition. Add KIM separately from other admixtures.

D. Allow KIM to thoroughly mix at medium/high speed for 1 minute per cubic meter/yard in the batch for a minimum of 3 minutes. Place and finish in accordance with ACI guidelines. If possible, hold back a portion of super plasticizer during the initial batching and add the held portion at the jobsite immediately before discharging.

3.04 CONCRETE PLACING

Place concrete promptly. KIM concrete will be expected to perform as a waterproofing membrane. Therefore, superior consolidation is required. Follow ACI Guideline 309R for properly consolidating concrete with special attention given to joint locations.

Shotcrete: Shotcrete shall be placed by an ACI certified nozzleman in accordance with ACI 506R – Guide to Shotcrete.

3.05 CURING

Curing is essential to reduce or eliminate shrinkage cracking: Wet cure concrete in accordance with ACI 308 Guidelines. If wet curing is not possible, apply a curing compound that meets ASTM C309.

3.06 CONSTRUCTION JOINTS, PENETRATIONS AND TIE-HOLES

A. Construction joints and control joints must be designed and spaced to isolate and control shrinkage cracking following the guidelines in ACI 224.R and ACI 301. The locations of joints must be indicated on the project drawings and be acceptable to the architect/engineer.

B. The Krystol Waterstop System, consisting of Krystol Waterstop Grout and Krystol Waterstop Treatment, shall be installed in all non-moving construction joints and shrinkage control joints according to Application Instructions 4.11 to 4.22 — Use of Krystol Waterstop System, as applicable.

C. All pipe penetrations shall be treated as per the admixture manufacturer's recommendations. Application Instruction 5.32 – Waterproofing Pipe Penetrations (Existing Construction).

D. After completion of pour, all tie-holes shall be treated as per the admixture manufacturer's recommendations. Application Instruction 5.31 — Waterproofing Tie Holes and Concrete Defects.

3.07 FIELD QUALITY CONTROL

A. **Examination for Defects:** Do not conceal KIM concrete before it has been observed by a manufacturer's representative and other designated entities. Concrete shall be examined for structural defects such as faulty construction joints, cold joints and cracks. Such defects to be repaired in accordance with manufacturer's repair procedures.

B. **Observance of Leaks:** Leaks that occur through well-consolidated concrete or tight cracks will self-seal within a few days or weeks. Leaks that occur through poorly consolidated concrete or large cracks must be repaired in accordance with the manufacturers repair instructions.

3.08 INTERACTION WITH OTHER MATERIALS

A. **Backfilling:** Normal backfilling procedures may be used after concrete has been cured for at least seven days. If backfill takes place within seven days after concrete placement, then backfill material shall be moist so as not to draw moisture from the concrete. In no event shall backfilling take place before concrete has gained sufficient strength to withstand the applied load.

END OF SECTION

Kryton, Krystol and KIM are trademarks of Kryton International Inc. ©2014