529 WEST 29TH STREET

NEW YORK, NEW YORK

Remedial Action Work Plan

NYC VCP Number: 12CVCP038M

Prepared for:

West 30th Highline Holdings, L.L.C.
c/o The Related Companies L.P.
60 Columbus Circle
New York, NY 10023

Prepared by:

Arnold F. Fleming, P.E.
Fleming-Lee Shue
158 West 29th Street, 9th Floor
New York, NY 10001
212 675-3225

MAY 2012

REMEDIAL ACTION WORK PLAN
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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/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 VCP	New York City Voluntary 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, Arnold F. Fleming, P.E., am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 529-539 W 29th Street Site, (NYC VCP Site No. 12CVCP038M).

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.

Arnold F. Fleming
Name

050411
NYS PE License Number

Signature

Date

PE Stamp

QEP Name

QEP Signature

Date

EXECUTIVE SUMMARY

West 30th Highline Holdings, L.L.C. anticipates enrolling in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 13,990-square foot property located at 529-539 W. 29th Street in Chelsea, Manhattan, New York (Site). A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 529-539 W. 29th Street in the Chelsea section in Manhattan, New York and is identified as Block 701 and Lot 16 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 13,990-square feet and is bounded by block 701, Lot 56, 58, 59, and 62 (partially) to the north. Lot 56 and 58 are vacant lots, Lot 59 is developed with a 3- to 7- story building, and lot 62 is developed with a 2- to 34-story building. To the south, the Site is bounded by West 29th Street. To the east, the Site is bounded by block 701, Lot 22, developed with a 4-story building. Block 701, Lot 1 – developed with a 4 to 9story building bounds the Site to the west. A map of the Site boundary is shown in Figure 2. Currently, the Site is a vacant lot. Over time, the neighborhood character is anticipated to develop into a residential/commercial mix, due to the Special West Chelsea District Rezoning.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of a residential high rise with parking and commercial uses on the ground floor. The 126 residential units are anticipated to be affordable Section 8 housing units. The project is being coordinated in conjunction with the U.S. Department of Housing and Urban Development (HUD). In order to qualify for the limited HUD funding that is available for affordable housing, the building must be ready for occupancy by August 2013.

The footprint of the development will cover substantially the entire lot. The current zoning designation is C6-3, high-bulk commercial uses requiring a central location, allowing a commercial floor area ratio of 6.0 or a residential floor area of up to 7.5. The proposed use is consistent with existing zoning for the property.

The proposed development will consist of a residential 14-story 130,000 sq. ft. building (126 apartments – Floors 2-14), with one basement level and will occupy, substantially, the full footprint of Lot 16. The basement will house mechanical equipment as well as amenities (computer room, common room and retail). The foundation depth will be approximately 13 feet below grade. Parking will occupy approximately 50 percent of the grade level, with the lobby and small retail spaces occupying the remaining 50 percent.

Most of the Site will be excavated to a depth of approximately 14 feet (ft.), 1 foot below the water table. Excavations for two elevator pits will extend approximately 6 ft. deeper or to approximately 20 ft. below existing grade. Two areas, totaling 730 square ft. will be excavated to a depth of approximately 8 ft. so that the structure of adjacent buildings is not compromised. Also, an existing foundation wall around the perimeter of the lot that extends to a depth of approximately 10 ft. and 18 inches wide will substantially be left in place. The total amount of material anticipated to be removed is approximately 191,479 cubic ft.

Summary of Past Uses of Site and Areas of Concern

The subject property consisted of tenement style buildings from before 1890 up until the property was redeveloped by the current structure in the mid 1900's. This building was historically occupied by the Metal Purchasing Company before it was converted into a parking garage.

Presence of historic fill is identified as on-site Areas of Concern (AOCs). Several off-site AOCs have been identified for this Site in a 2005 Phase I report:

1. The historic junkyard and filling station operations on Lot 37, up-gradient from the Site.
2. No. 4 fuel oil was stored in a storage tank located in a vault in the basement of 502-504 West 30th Street (up/cross-gradient from the Site).

3. The historic auto repair operations beneath the High Line, up-gradient from the Site.
4. The chemical manufacturer located at 515 West 30th Street (up-gradient to the Site).

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 4 soil borings in 2007 and 8 soil borings in 2011 across the entire project Site, and collected 8 soil samples in 2007 and 16 soil samples in 2011 for chemical analysis from the soil borings to evaluate soil quality;
3. Installed 2 temporary groundwater monitoring points in 2007 and 3 temporary groundwater monitoring points in 2011 throughout the Site to collect 2 groundwater samples in 2007 and 3 groundwater samples in 2011 for chemical analysis to evaluate groundwater quality;
4. Installed 3 soil vapor probes around the Site in 2011 and collected 3 samples for chemical analysis.

Summary of Environmental Findings

1. The elevation of the property ranges from 14 to 18 ft.
2. The depth-to-groundwater ranges from 10.16 to 11.34 ft.
3. The groundwater flow is generally from southeast to northwest.
4. The depth-to-bedrock at the Site is not known, but is definitely below the groundwater interface.
5. The stratigraphy consists of 2-8 ft. of urban fill material underlain by a minimum of 8 feet of silty sand.
6. Soil samples collected during the 2011 remedial site investigation revealed the presence of several contaminants in excess of Track 1 Unrestricted Soil Clean-up Objectives SCOs and Track 2 Restricted Residential SCOs at all 8 locations sampled, most notably semi-volatile organic compounds (SVOCs: polycyclic aromatic compounds, PAHs) and metals. PAH levels exceeding Track 1 and Track 2 SCOs were detected in 3 of 8 sampling locations. Metal levels, including those for barium, lead, mercury and arsenic,

exceeding Track 1 and Track 2 SCOs were detected in all shallow samples. At one deeper sample location, metals were detected at high levels, including barium (1170 ppm), lead (2860 ppm), mercury (0.94 ppm), and zinc (1340 ppm). Surface metal contamination can be attributable to the presence of historic fill material. Trace-level Track 1 SCO exceedances of PCBs and pesticides (4,4'-DDT) were detected in 2 of 8 samples. However, at location SB-6, PAHs were detected at an aggregate level of over 2,000 parts per million (ppm) within a deep, subsurface interval (12-14 ft.). The PAHs detected in this sample were at higher concentrations than those detected in the other 7 samples and higher than are typically found in urban fill. However, the SB-6 soil sample appeared to be native sandy silt with no obvious fill or other unnatural material or odor. Rather, the specific PAH compounds detected in the sample from SB-6 are indicative of weathered creosote. Creosote was commonly used as a preservative on wood used to construct piers.

7. Volatile Organic Compounds (VOCs), SVOCs, pesticides, PCBs were not present in groundwater above NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards (GQS). Dissolved metals including selenium, iron, magnesium, manganese and sodium were detected above GQS. This may be attributed to intrusion of saline or brackish water or road salting.

8. The results of the laboratory analysis of the soil vapor samples did not identify any volatile organic compounds at concentrations exceeding regulatory standards. Soil vapor results were evaluated based on New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion. Trace levels of methylene chloride, tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in the samples analyzed, but at levels that do not exceed NYSDOH Air Guidance Values of 60, 100 and 5 $\mu g/m^3$ respectively.

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 standard 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 a Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program during ground invasive activities.
3. Establishment of Track 4 SCOs.
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
6. Excavation and removal of soil/fill exceeding SCOs to a depth of approximately 14 feet below grade, and 1 foot below the water table.
7. Removal of any underground storage tanks and closure of petroleum spills that may be encountered during site work in compliance with applicable local, State and Federal laws and regulations.
8. Screening for indicators of contamination by visual means and odor of excavated soil/fill during all intrusive work.
9. 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 will be conducted as required by disposal facilities. Appropriate segregation of excavated media onsite will be carried out in accordance with OER guidance.
10. Collection and analysis of endpoint samples to evaluate the performance of the remedy with respect to the anticipated Track 4 SCOs.
11. Importation of materials to be used for backfill and cover in compliance with this OER-approved plan and in accordance with applicable Federal, State, and City laws and regulations.
12. Installation of a vapor barrier system beneath the building slab and over all sub-grade foundation sidewalls.

13. Construction and maintenance of an engineered composite cover consisting of the building foundation slab and sidewalls and integrated vapor barrier system/waterproofing membrane to prevent human exposure to residual soil/fill remaining under the Site.
14. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.
15. 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.
16. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.
17. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.

Community Protection Statement

The Office of Environmental Remediation created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in New York City. 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 high level of protection for neighboring communities. It 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. Land uses within the area predominantly include commercial space, with some pockets of residential space as well.

Health and Safety Plan - This cleanup plan includes a Health and Safety Plan 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. 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 safety coordinator maintains an emergency contact sheet and protocol for management of emergencies.

Site Safety Coordinator Contact Information:
Marco Carcich
Monadnock Construction, Inc.
155-3rd Street Brooklyn,
NY 11231 (718) 875
8160
mcarcich@moncon.com

Worker Training - Workers participating in cleanup of this Site will be appropriately trained for the activities being performed. Workers who might potentially be exposed to contaminants during cleanup activities will be trained in a 40-hour hazardous waste operators training course and will take annual refresher training.

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 monitoring will be performed in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). The results will be 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/or dust nuisances and include steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager Kevin McGuinness at 212-675-3225 or NYC Office of Environmental Remediation Project Manager Jimit Shah at 212-788-8348.

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 of remedial construction will be determined by the contractors. These hours will conform to the New York City Department of Buildings construction code requirements. OER will be notified by the Volunteer of any variances issued by the NYC Department of Buildings.

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 and provides project contact names and numbers and locations where 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 Scott Hunt at 212-801-1000, the NYC Office of Environmental Remediation Project Manager Jimit Shah at 212-788-8348, or call 311 and mention that 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 professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be inspected for signs of contamination and screened for volatile organic compounds with a photoionization detector to ensure proper material handling and management, and community protection.

Stockpile Management - Soil stockpiles, if any, 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, as appropriate, 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 the New York Public Library (455 5th Avenue) or online at http://www.nyc.gov/html/oer/html/repository/RManhattan.shtml.

Long-Term Site Management - To provide long-term protection 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. 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

West 30th Highline Holdings, L.L.C. has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 529-539 West 29th Street in the Chelsea section of Manhattan, New York (Site). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides an analysis of remedial alternatives that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 529-539 W. 29th Street in the Chelsea section of Manhattan, New York and is identified as Block 701 and Lot 16 on the New York City Tax Map. The Site location is presented on Figure 1. The Site is 13,990-square feet and is bounded by block 701, Lot 56, 58, 59, and 62 (partially) to the north. Lot 56 and 58 are vacant lots, Lot 59 is developed with a 3- to 7- story building, and lot 62 is developed with a 2- to 34-story building. To the south, the Site is bounded by 29th Street. The east side is bounded by block 701, Lot 22 – developed with a 4-story building, to the east. Block 701, Lot 1 – developed with a 4 to 9-story building bounds the Site to the west. Currently, the Site is a vacant lot. The Site Boundaries are shown on Figure 2 and the Surrounding Land Use on Figure 3.

1.2 PROPOSED REDEVELOPMENT PLAN

The proposed future use of the Site will consist of a residential high rise with parking and commercial uses on the ground floor. The 126 residential units are anticipated to be affordable Section 8 housing units. The project is being coordinated in conjunction with the U.S. Department of Housing and Urban Development (HUD). In order to qualify for the limited HUD funding that is available for affordable housing, the building must be ready for

occupancy by August 2013.

The footprint of the development will cover a substantial portion of the entire lot. The current zoning designation is C6-3, high-bulk commercial uses requiring a central location, allowing a commercial floor area ratio of 6.0 or a residential floor area of up to 7.5. The proposed use is consistent with existing zoning for the property.

The proposed development will consist of a residential 14-story 130,000 sq. ft. building (126 apartments – Floors 2-14), with one basement level and will occupy the full footprint of Lot 16. The basement will house mechanical equipment as well as amenities (computer room, common room, retail, etc.). The foundation depth will be approximately 13 feet below grade. Parking will occupy approximately 50% of the grade level, with the lobby and small retail spaces occupying the remaining 50%. Development plans are provided in Appendix A.

Most of the Site will be excavated to a depth of approximately 14 feet (ft.), 1 foot below the water table. Excavations for two elevator pits will extend approximately 6 ft. deeper or to approximately 20 ft. below existing grade. Two areas, totaling 730 square feet will be excavated to a depth of approximately 8 ft. so that the structure of adjacent buildings is not compromised. Also, an existing foundation wall around the perimeter of the lot, which extends to a depth of approximately 10 ft. and 18 inches wide, will substantially be left in place. The total amount of material anticipated to be removed is approximately 191,479 cubic feet. An Excavation Plan is provided as Figure 4.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

According to the data available in OER's *SPEED* application, no schools, hospitals or day care facilities are located within a 250 to 500-foot radius of the Site. The area bordered by West 30th Street, 10th Avenue, West 26th Street and 8th Avenue is considered a NYS Environmental (EN) Zone, according to OER's *SPEED* application. The Site appears on the City of New York Department of City Planning Zoning Map 8b. According to the zoning map, the property is designated C6-3, which is a general central commercial district. The use of the surrounding properties is mainly commercial with some residential uses as well. The Surrounding Land Use is presented on Figure 3.

1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called *", 529 West 29th Street Remedial Investigation Report,* dated February, 2012 (RIR).

Summary of Past Uses of Site and Areas of Concern

The subject property consisted of tenement style buildings from before 1890 until the property was redeveloped in the mid 1900's. This building was historically occupied by the Metal Purchasing Company before it was converted into a parking garage. The parking garage remained in operation until operations ceased to allow for redevelopment. The parking garage was demolished in mid-2011 and the Site is currently a vacant lot.

Presence of historic fill is identified as on-site Areas of Concern (AOCs). Several off- site AOCs have been identified for this Site in a 2005 Phase I report:

1. The historic junkyard and filling station operations on Lot 37, up-gradient from the Site.
2. No. 4 fuel oil was stored in a storage tank located in a vault in the basement of 502-504 West 30th Street (up/cross-gradient from the Site).
3. The historic auto repair operations beneath the high line, up-gradient from the Site.
4. The chemical manufacturer located at 515 West 30th Street (up-gradient to the Site).

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 4 soil borings in 2007 and 8 soil borings in 2011 across the entire Site, and collected 8 soil samples in 2007 and 16 soil samples in 2011 for chemical analysis to evaluate soil quality;

3. Installed 2 temporary groundwater monitoring points in 2007 and 3 temporary groundwater monitoring points in 2011 to collect 2 groundwater samples in 2007 and 3 groundwater samples in 2011 for chemical analysis to evaluate groundwater quality;

4. Installed 3 soil vapor probes in the Site in 2011 and collected 3 soil vapor samples for chemical analysis.

Summary of Environmental Findings

1. The elevation of the property ranges from 14 to 18 feet.
2. The depth-to-groundwater ranges from 10.16 to 11.34 feet.
3. The groundwater flow is generally from southeast to northwest.
4. The depth to bedrock at the Site is not known, but is definitely below the groundwater interface.
5. The stratigraphy consists of 2-8 feet of urban fill material underlain by a minimum of 8 feet of silty sand.
6. Soil samples collected during the 2011 remedial site investigation revealed the presence of several contaminants in excess of Track 1 Unrestricted Soil Clean-up Objectives (SCOs) and Track 2 Restricted Residential SCOs at all 8 locations sampled, most notably semi-volatile organic compounds (SVOCs: polycyclic aromatic compounds , PAHs) and metals. PAH levels exceeding Track 1 and Track 2 SCOs were detected in 3 of 8 sampling locations. Metal levels, including those for barium, lead, mercury and arsenic, exceeding Track 1 and Track 2 SCOs were detected in all shallow samples. At one deeper sample location, metals were detected at high levels, including barium (1170 ppm), lead (2860 ppm), mercury (0.94 ppm), and zinc (1340 ppm). Surface metal contamination can be attributable to the presence of historic fill material. Trace-level Track 1 SCO exceedances of PCBs and pesticides (4,4'-DDT) were detected in 2 of 8 samples. However, at location SB-6, PAHs were detected at an aggregate level of over 2,000 parts per million (ppm) within a deep, subsurface interval (12-14 ft.). The PAHs detected in this sample were at higher concentrations than those detected in the other 7 samples and higher than are typically found in urban fill. However, the SB-6 soil sample appeared to be native sandy silt with no obvious fill or other unnatural material or odor. Rather, the specific PAH compounds detected in the sample from SB-6 are indicative of weathered creosote. Creosote was commonly used as a preservative on wood used to construct piers.

7. Volatile Organic Compounds (VOCs), SVOCs, pesticides, PCBs were not present in groundwater above NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards (GQS). Dissolved metals including selenium, iron, magnesium, manganese and sodium were detected above GQS. This may be attributed to intrusion of saline or brackish water or road salting.

8. The results of the laboratory analysis of the soil vapor samples did not identify any volatile organic compounds at concentrations exceeding regulatory standards. Soil vapor results were evaluated based on New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion. Trace levels of methylene chloride, PCE and TCE were detected in the samples analyzed, but at levels that do not exceed NYSDOH Air Guidance Values of 60, 100 and 5 $\mu g/m^3$ respectively.

For more detailed results, consult the RIR (Appendix B). 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:

Soil

- Prevent direct contact with contaminated soil.
- Remove contaminant source areas.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater

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

Soil Vapor

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

3.0 REMEDIAL ALTERNATIVES ANALYSIS

Two remedial action alternatives are considered in this alternatives analysis for the site. Alternative 1 is Track 1 alternatives that involve establishment of Track 1 SCOs and complete removal of all soil and fill material that exceed the unrestricted Track 1 SCOs. Alternative 2 is Track 4 alternative that involves establishment of Track 4 SCOs and removal of the soil and fill material that exceed the Track 4 SCOs.

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 (ECs) or Institutional Controls (ICs). Protection of public health and the environment must be achieved for all approved remedial actions.

The Track 1 alternative would result in removal of all soil/fill with contaminant concentration above Track 1 SCOs. As such, this alternative would be consistent with the RAOs and provide overall protection of public health and the environment in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and
- Eliminating the potential sources for on-site production of soil vapors.

Alternative 2 would achieve comparable protections of human health and the environment by removing soil/fill with contaminant concentrations above Track 4 SCOs as well as placement of institutional and engineering controls, including a composite cover system and a vapor barrier. As such, this alternative would be consistent with the RAOs and would provide overall protection of public health and the environment in consideration of current and potential future land use by:

- Removing all contaminated fill through the excavation of all soil to approximately 14 feet for the majority of the site, (excavations for two elevator pits will extend approximately 6 ft. deeper or to approximately 20 ft. below existing grade) and to 8 feet for two areas totaling 730 square feet in area;
- Minimizing the potential for direct contact with contaminated on-site soils by implementing an approved soil and materials management plan and CAMP during remediation and by establishing a composite cover system over the entire site once construction is complete;
- Eliminating the potential for direct contact with contaminated soil or groundwater by placement of composite cover system and via institutional controls;
- Although the soil vapor samples did not contain any VOCs the potential for any future migration of soil vapor into the structures and associated inhalation exposures will be minimized or eliminated by the placement of a vapor barrier/waterproofing system.
- Establish a SMP to ensure long term management of ICs and ECs to ensure that all controls are inspected periodically and require certification that the remedy continues to perform as it was designed, thus ensuring that the protections achieved for public health and the environment remain in perpetuity;
- Place a deed restriction to memorialize these controls in order to decrease the risk of future exposures with contaminated media consistent with remedial action objectives to memorialize the remedial action and the existence of ECs and ICs and will ensure that these controls will be appropriately managed by future owners of the Site.

3.2. BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

The Track 1 alternative would comply with the SCGs, as all soil/fill in excess of Track 1 SCOs would be removed. All soil/fill excavated from the Site would be managed and disposed of in accordance with all applicable regulations.

The Track 4 alternative would address the chemical-specific SCGs for soil, groundwater and soil vapor by establishment of Track 4 Site-Specific SCOs over the property and attainment of these standards for onsite soil. Similar to the Track 1 alternative, focused attention on means and

methods employed during the remedial action would ensure that handling and management of contaminated material would be incompliance with applicable SCGs.

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.

The Track 1 alternative would provide short-term effectiveness with the removal of all soil/fill above Track 1 SCOs. All potential exposure pathways for site-derived contaminants would be incomplete following construction. Implementation of this RAWP would prevent unacceptable exposure during remediation and construction activities.

Alternative 2 would result in fewer short-term impacts associated with excavation, handling, load out of materials, and truck traffic than a Track 1 remediation. 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.

The Track 1 and Track 4 Alternatives would both employ appropriate measures to prevent short term impacts, including a CAMP and a Soil/Materials Management Plan, during all on-site soil disturbance activities and would effectively prevent the release of significant contaminants into the environment. Construction workers operating under appropriate management procedures and a Health and Safety Plan (HASP) 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 ECs.

The proposed remedial actions would achieve long-term effectiveness and permanence by permanently removing impacted fill. Additionally, the construction of the building, in conjunction with the vapor barrier/waterproofing system, further adds to the effectiveness and permanence. The establishment of use restrictions, a SMP to ensure long-term management of ICs and ECs, and placing a deed restriction to memorialize these controls for the long term, further add to the effectiveness and permanence of the remedy. The SMP will ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and functioning as they were intended, assuring that protections designed into the remedy will provide continued high level of protection.

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 removing all soil in excess of unrestricted use SCOs.

Alternative 2 would greatly reduce the toxicity, mobility, and volume of contaminants from on-site soil by excavation to approximately 14 ft. (to 20 ft. for two elevator pits and to 8 ft. in two limited areas) below grade and removal of soil/fill that exceed Track 4 SCOs. For Alternative 2, placement of a building slab and vapor barrier will reduce toxicity by eliminating

potential exposures with remaining soil, groundwater, and vapors. Groundwater use restrictions will reduce toxicity by ensuring that there is no use of on-Site groundwater for potable purposes.

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 Track 1 cleanup is feasible and implementable. The remedial methods used are easily implemented using standard construction technologies.

Similarly, the Track 4 alternative is also both feasible and implementable. It uses standard materials and services and well established technologies for the removal of approximately 7100 cubic yards of soil. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed, which utilize standard industry methods. Installation of the waterproofing/vapor barrier system will be conducted in accordance with standard methods utilized to install waterproofing membranes.

For implementation of both remedies, standard construction equipment utilized for the overall earthwork would be used. OSHSA trained personnel will complete all activities that

include excavation and handling of impacted soils. No special permits other than earthwork permits required for completion of the required site redevelopment scope are required for implementation of the remedy.

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.

The capital costs associated with achieving a Track 4 status over the entire site can be viewed as fairly high. However, the amount of soils to be removed and disposed of off-site (approximately 191,500 cubic feet), while significant, eliminates the need for additional or future (expensive) remedies.

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.

The overall goals of the remedial program are considered to be acceptable to the community. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for public input on the selected remedial actions. Any public comments related to environmental remediation will be considered by OER prior to approval of this plan.

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 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.

Because of the fill removal proposed for the Site, protection of public health and the environment is provided for the proposed use of the Site. The Track 4 remedial action is beneficial to the surrounding community and is consistent with the goals of the City for remediating and redeveloping brownfield sites. Additionally, the redeveloped site will provide affordable housing, of which there is a significant need. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is

surrounded by commercial and residential properties and remedies provide comprehensive protection of public health and the environment for these uses. Improvements in the current brownfield condition of the property are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse, in this case, critically needed affordable housing. The remedial action is 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. Any 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.

The development is expected to be an environmentally friendly, LEED certified building.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The preferred remedial action alternative is the Track 4 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 a Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program during ground invasive activities.
3. Establishment of Track 4 SCOs.
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
6. Excavation and removal of soil/fill exceeding SCOs to a depth of approximately 14 feet below grade, and 1 foot below the water table.
7. Removal of any underground storage tanks and closure of petroleum spills that may be encountered during site work in compliance with applicable local, State and Federal laws and regulations.
8. Screening for indicators of contamination by visual, odor and for VOCs, using a photoionization detector, of excavated soil/fill during all intrusive work.
9. 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 will be conducted as required by disposal facilities. Appropriate segregation of excavated media onsite will be carried out in accordance with OER guidance.

10. Collection and analysis of endpoint samples to evaluate the performance of the remedy with respect to the anticipated Track 4 SCOs.
11. Importation of materials to be used for backfill and cover in compliance with this OER-approved plan and in accordance with applicable Federal, State, and City laws and regulations.
12. Installation of a vapor barrier system beneath the building slab and over all sub-grade foundation sidewalls.
13. Construction and maintenance of an engineered composite cover consisting of the building foundation slab and sidewalls and integrated vapor barrier system/waterproofing membrane to prevent human exposure to residual soil/fill remaining under the Site.
14. Submission of a RAR that describes the remedial activities certifies that the remedial requirements have been achieved, defines the Site boundaries, describes all EC/ICs to be implemented at the Site, and lists any changes from this RAWP.
15. Submission of an approved 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.
16. Recording of a Declaration of Covenants and Restrictions that includes a listing of ECs and a requirement that management of these controls must be in compliance with an approved SMP; and ICs including prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.
17. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

A Track 1SCO is proposed for this project. The SCOs for this Site are listed in Table 1. 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 C. The Excavation

Plan is provided as Figure 5.

Discrete contaminant sources (such as hotspots, if any) identified during the remedial action will be identified by mapped. 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 10,650 tons. The proposed disposal locations for Site-derived impacted materials are listed below. Additional disposal locations established at a later date will be reported promptly to the OER Project Manager.

Disposal Facility	**Waste Type**	**Estimated Quantities**
Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.	Historic fill	10,650 tons

End-Point Sampling

Removal actions under this plan will be performed in conjunction with remedial end-point sampling. End-point sampling frequency was performed insitu, prior to the initiation of excavation. The "insitu post-excavation" or end-point samples were collected at a frequency 1 for every 900 square feet of excavation bottom. Sheeting and shoring will prevent the collection of side-wall samples. The samples were analyzed by a NYS ELAP laboratory for the following:

- 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.

The post-excavation samples did not show any constituents in exceedance of the SCOs. The complete results of the post-excavation samples will be presented in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data, including non-detects and applicable standards and/or guidance values.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for trigger analytes (those for which SCO exceedance is identified) 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

Endpoint soil samples were containerized in laboratory-prepared jars, labeled, sealed, and placed in a chilled cooler for shipment to the laboratory. Chain-of-Custody procedures outlined in the RIWP were followed. Soil samples were analyzed by an ELAP-certified laboratory approved by the NYSDOH.

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 C. The estimated quantity of soil to be imported into the Site for backfill and cover soil, if any is to be determined. No onsite soil/fill is expected to be reused/relocated on Site.

4.3 ENGINEERING CONTROLS

Engineering Controls will be employed in the remedial action to address residual contamination remaining at the site. The Site has two primary Engineering Control Systems. These are:

- A composite cover system consisting of concrete building basement slab and walls, and
- A waterproofing/vapor barrier system under the building basement slab (and slab-on- grade portion) and on the foundation walls. The basement slab is below groundwater and is primarily a waterproofing system.

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 the concrete building basement slabs and walls.

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/Materials Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RAR.

Vapor Barrier

Migration of soil vapor will be mitigated with a combination of building slab and vapor barrier. The building structure has a single basement with the bottom of the floor slab below the groundwater level. A waterproofing barrier will be used under the slab and side walls, and will also act as a vapor barrier if the groundwater level were ever to drop below the basement slab bottom. The vapor barrier/waterproofing system will be a combination of Preprufe 300R (46- mil) and Bituthene 4000 (59-mil) (both manufactured by W. R. Grace & Co.) or the equivalent. The vapor barrier installation diagram is shown on Figure 6 and specifications are provided in Appendix D.

4.4 INSTITUTIONAL CONTROLS

Institutional Controls (IC) have been incorporated 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 SMP that will be included in the RAR.

Institutional Controls for this remedial action are:

- Recording of an OER-approved 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 SMP 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 comply with RCNY §43-1407(l)(3).
- Vegetable gardens and farming on the Site are prohibited;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for residential and commercial use and will not be used for a higher level of use without prior approval by OER.

4.5 SITE MANAGEMENT PLAN

Site Management is 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 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 SMP 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 on an periodic basis to be established in the SMP and will be subject to review and modification by OER. The SMP will be based on a calendar year and certification reports will be due for submission to OER by March 31 of the year following the reporting period.

4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

Investigations reported in the 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 EA 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.

4.6.1 Known and Potential Sources

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

Soil:

- SVOCs (PAHs) exceeding Track 4 Unrestricted Residential SCOs, and
- Metals exceeding Track 4 Unrestricted Residential SCOs.

Groundwater:

- Metals (Iron, Lead, Magnesium, Manganese, Selenium, and Sodium) exceeding the GQS.

Soil Gas:

- None.

Nature, Extent, Fate and Transport of Contaminants

Metals and PAHs found in the soil are present throughout the Site and are associated with the urban fill . Only iron, magnesium, manganese and sodium were detected in groundwater above GQS, indicating that the property is not contributing to groundwater standard violation. Soil vapor samples did not identify any volatile organic compounds at concentrations exceeding regulatory standards.

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 particulates; and
- Dermal contact with water, fill, soil, or building materials.

Existence of Human Health Exposure

Current Conditions: As the site is currently capped with a (former) building slab, there are no potential exposure pathways from soil/fill, except for a 1 ft. wide strip of exposed soil

adjacent to the walkway. Groundwater is not exposed at the site, and because the site is served by the public water supply, groundwater is not used at the site.

Construction/ Remediation Activities: The potential exposure pathways to onsite contamination are: ingestion, dermal, or inhalation exposure by onsite workers during the remedial action. During the remedial action, on-site exposure pathways will be eliminated by preventing access to the site, through implementation of soil/ materials management, storm-water pollution prevention, and dust controls in accordance with the Construction Health and Safety Plan.

Proposed Future Conditions: Under future conditions, the site will be fully capped, limiting potential direct exposure to soil and groundwater. The site is served by the public water supply, groundwater is not used at the site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

Receptor Populations

On-Site Receptors: The site is currently vacant, fenced and gates locked. Therefore the only potential human receptors are potential trespassers.

Off-Site Receptors: Potential off-site receptors within a 0.25 mile radius of the Site include: adult and child residents; 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 0.25 mile) – existing and future

Overall Human Health Exposure Assessment

Complete on-site exposure pathways appear to be present only during the construction phase. During the construction phase on-site exposure pathways will be eliminated by preventing access to the site, through implementation of soil/materials management, storm water pollution prevention, dust controls and implementation of a Construction Health and Safety Plan.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Arnold Fleming, P.E. (supervising engineer), Peter Helseth, P.E. (environmental engineer), and Kevin McGuinness, P.G. (project manager). The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project is Arnold Fleming, P.E.

5.2 Site Security

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

5.3 Work Hours

The hours for operation of remedial construction will be determined by the construction contractors. The hours of operation will conform with 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 E. The Site Safety Coordinator will be assigned by the construction contractor. 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.

Site Safety Officer will be responsible for maintaining workers training records. 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 monitoring for dust, particulates and VOCs will be performed. The 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. Exceedences of action levels observed during performance of the CAMP will be reported to the OER Project Manager and included in the Daily Report.

Particulate Monitoring and Actions

Particulate concentrations will be monitored during soil excavation and loading activities. The particulate monitoring will be performed visually.

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 no visible dust is migrating from the work area. If, after implementation of dust suppression techniques, visible dust is still migrating from the work area, 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 preventing visible dust migration.

All dust observations will be regularly recorded and will 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

De-watering and discharge to the NYC storm/sewer system may be necessary during construction. If dewatering is determined to be necessary, a NYCDEP Sewer Discharge Permit will be obtained prior to the start of the dewatering activities.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed truck inspection station is shown in Figure 7.

The location of proposed equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management features will be determined by the contractors.

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.

5.8 Traffic Control

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on Figure 7.

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

Reporting

Reports, providing a general summary of activities for *active remedial work* will be reported to the OER Project Manager. 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, if any;

- A summary of any citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photographs of any 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. The 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 reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. The 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;
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Recorded Declaration of Covenants and Restrictions.
- Reports and supporting material will be submitted in digital form.

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a 20 month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	2	2
Remedial Excavation	4	12 - 16
Demobilization	66	4
Record Declaration of Covenants and Restrictions	70	4
Submit Remedial Action Report	78	8

Figures

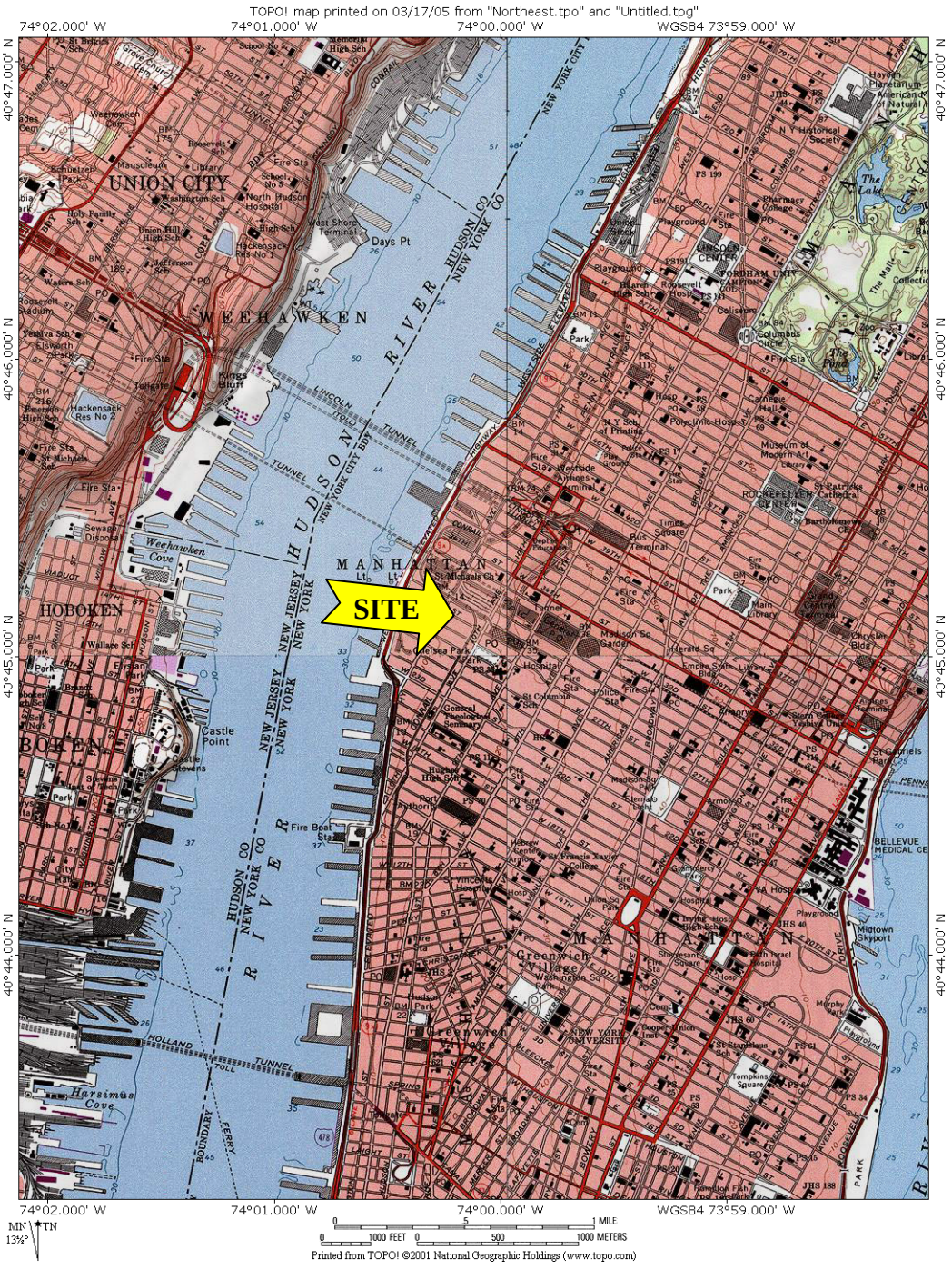
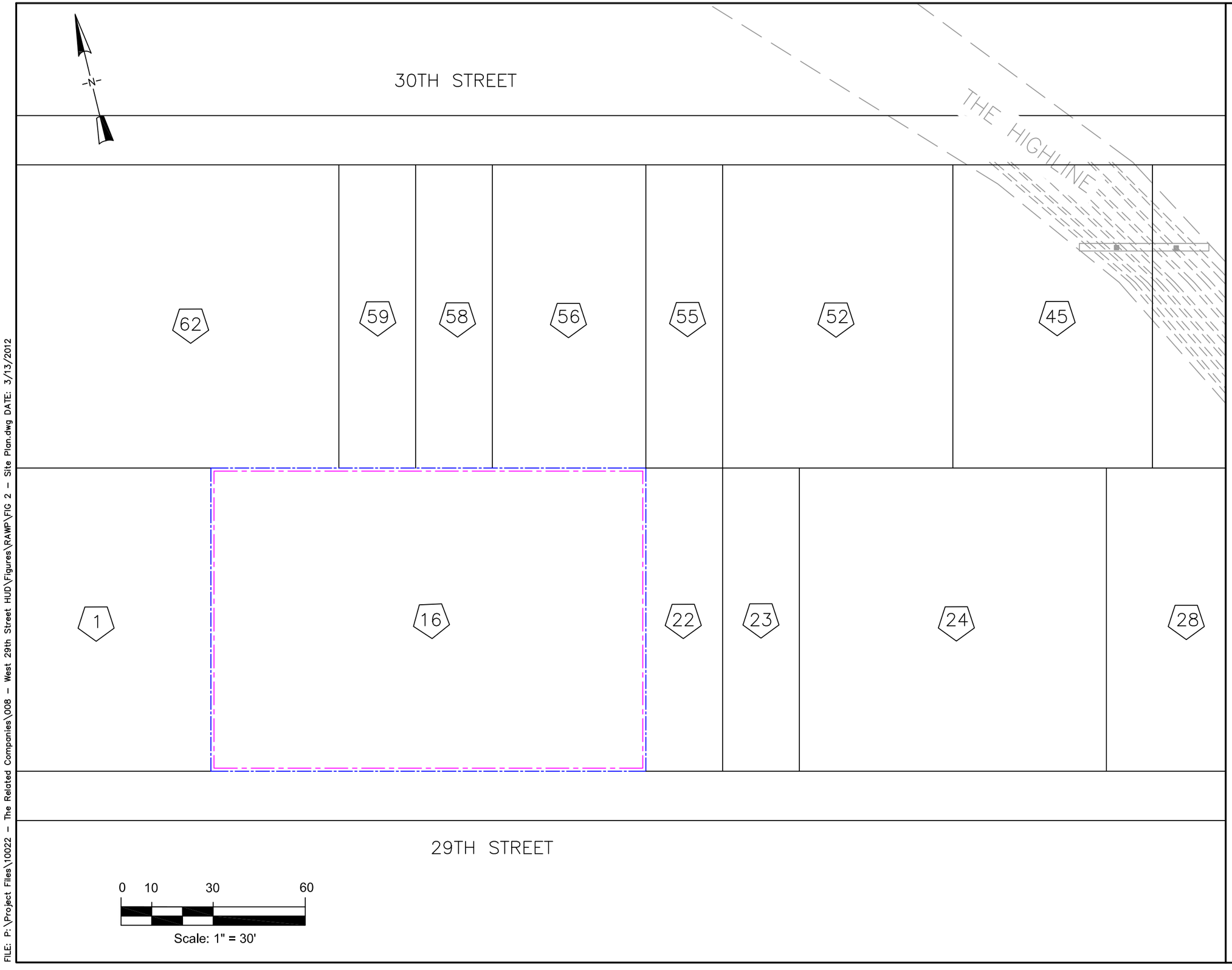


FIGURE 1 - SITE LOCATION

529 West 29th Street Site
529-539 West 29th Street
New York, N.Y. 10001



Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 2

SITE BOUNDARY

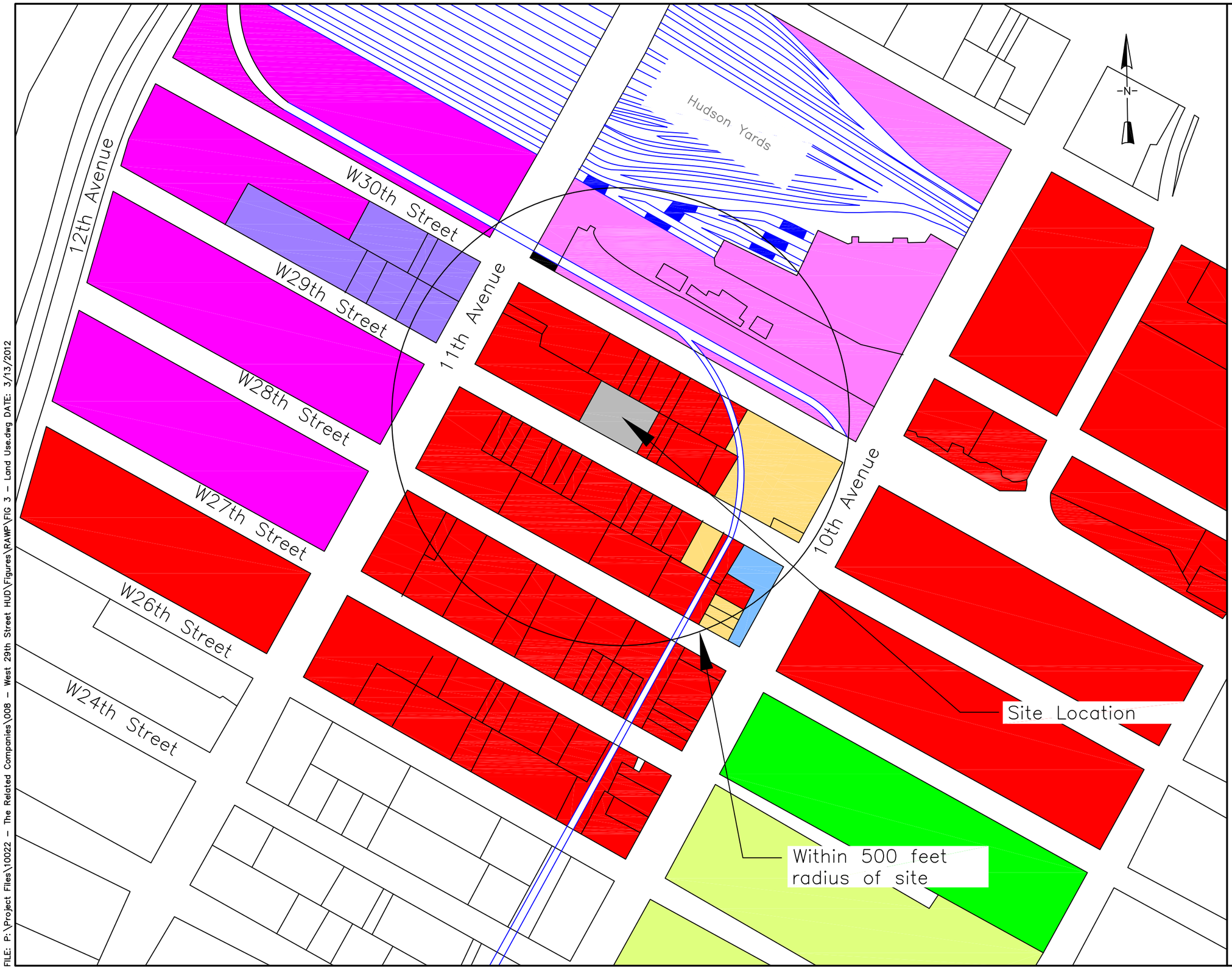
Date
March 2012

Project Number
10022-008-1

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- 16 TAX LOT #

FILE: P:\Project Files\10022 - The Related Companies\008 - West 29th Street HUD\Figures\RAWP\FIG 2 - Site Plan.dwg DATE: 3/13/2012



FILE: P:\Project Files\10022 - The Related Companies\008 - West 29th Street HUD\Figures\RAWP\FIG 3 - Land Use.dwg DATE: 3/13/2012

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New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 3

SURROUNDING LAND USE

Date
March 2012

Project Number
10022-008-1

LEGEND

- Commercial & Office
- Industrial & Manufacturing
- Transportation & Utility
- Open Space & Outdoor Recreations
- Multi– Family
- Mixed Residential & Commercial
- Parking Facilities

30TH STREET

THE HIGHLINE

62 | 59 | 58 | 56 | 55 | 52 | 45

8 FEET

14 FEET

8 FEET

1 | 22 | 23 | 24 | 28

29TH STREET

0 10 30 60

Scale: 1" = 30'

FILE: P:\Project Files\10022 - The Related Companies\008 - West 29th Street HUD\Figures\RAWP\FIG 4 - Site Excavation.dwg DATE: 3/13/2012

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New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 4

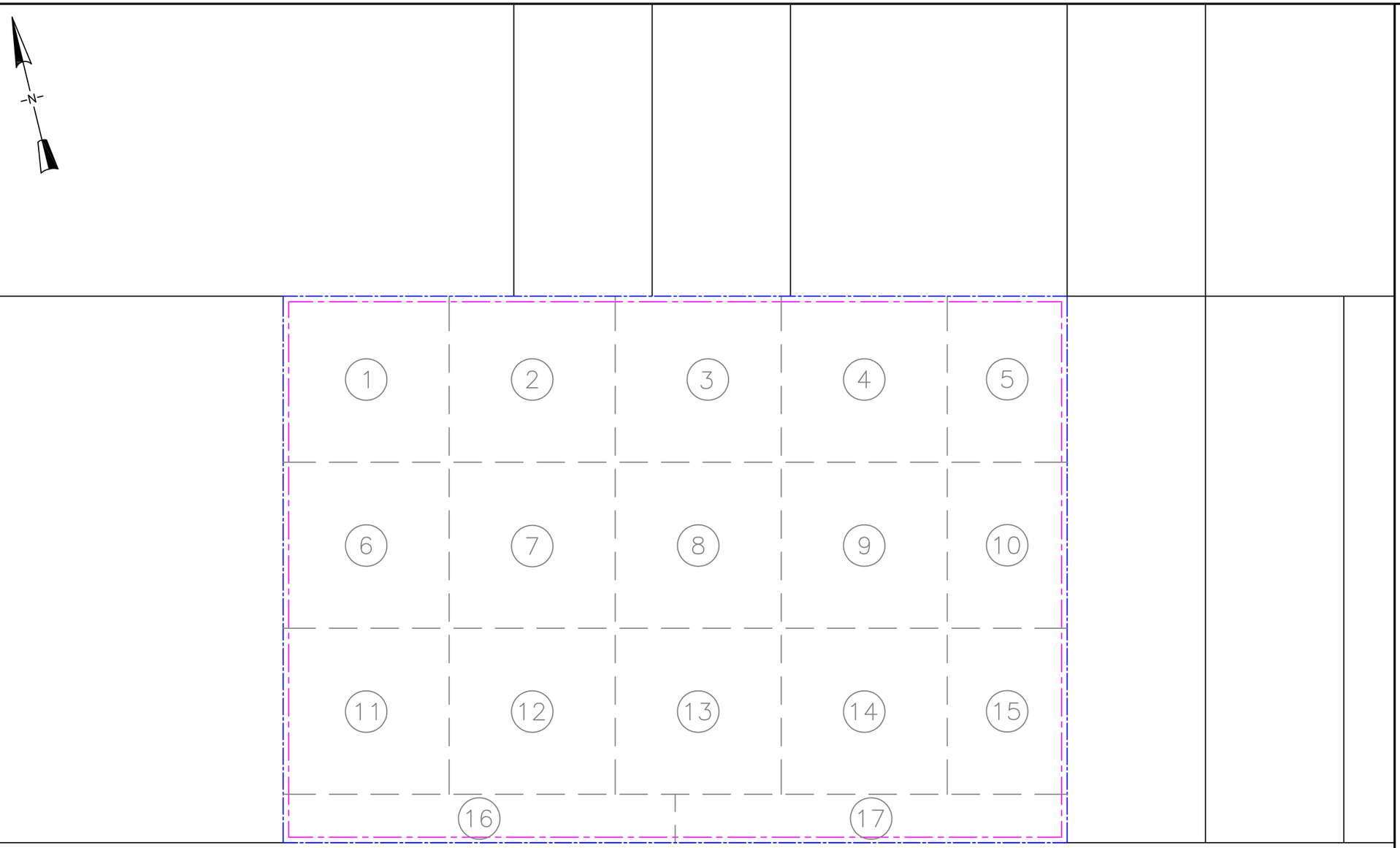
SITE EXCAVATION PLAN

Date
March 2012

Project Number
10022-008-1

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- 22 TAX LOT #
- DEPTH OF EXCAVATION 14 FEET
- DEPTH OF EXCAVATION 8 FEET



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New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 5

ENDPOINT SAMPLE LOCATIONS

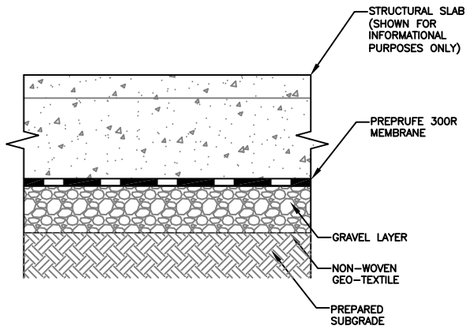
Date
March 2012

Project Number
10022-008-1

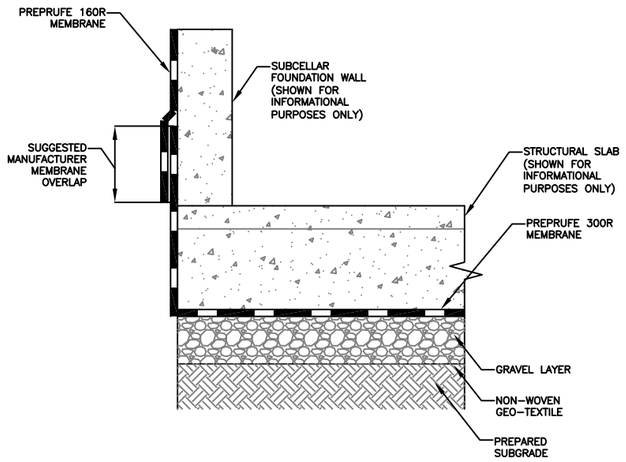
LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- (16) END POINT SAMPLE LOCATION
- SAMPLING GRIDLINE

FILE: P:\Project Files\10022 - The Related Companies\008 - West 29th Street HUD\Figures\RAWP\FIG 5 - Endpoint Sample Locations.dwg DATE: 3/13/2012



TYPICAL WATERPROOFING/VAPOR BARRIER
CROSS SECTION DETAIL
N.T.S.



TYPICAL WATERPROOFING/VAPOR BARRIER
AT EDGE OF BUILDING
N.T.S.

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New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 6

WATERPROOFING / VAPOR BARRIER DETAILS

Date
March 2012

Project Number
10022-008-1

LEGEND

30TH STREET

THE HIGHLINE

62 | 59 | 58 | 56 | 55 | 52 | 45

1 | 16 | 22 | 23 | 24 | 28

LOCATION OF TRUCK INSPECTION STATION

29TH STREET

0 10 30 60

Scale: 1" = 30'

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New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 7

TRUCK INSPECTION STATION LOCATION

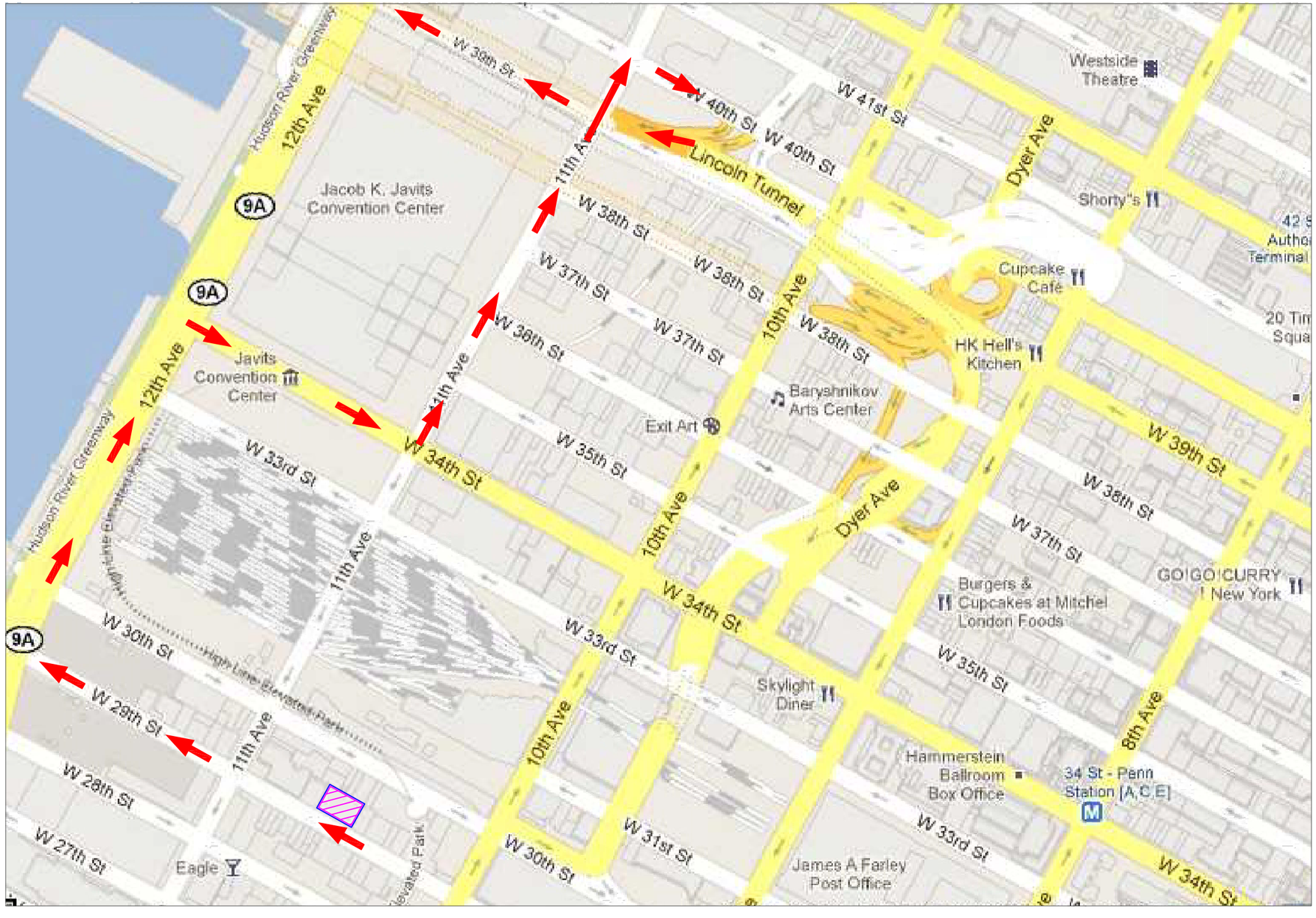
Date
March 2012

Project Number
10022-008-1

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- 16 TAX LOT #
- GRAVEL PAD

FILE: P:\Project Files\10022 - The Related Companies\008 - West 29th Street HUD\Figures\RAWP\FIG 7 - Truck Inspection Stations.dwg DATE: 3/13/2012



0 200 400 800

Scale: 1" = 400'

N

Fleming Lee Shue

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New York, NY 10001

529 West 29th Street
Block 701 Lot 16

FIGURE 8

TRUCK ROUTE PLAN

Date
March 2012

Project Number
10022-008-1

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- PROPOSED TRUCK ROUTES

Tables

Table 1
Clean-up Objectives
West 29th Street HUD

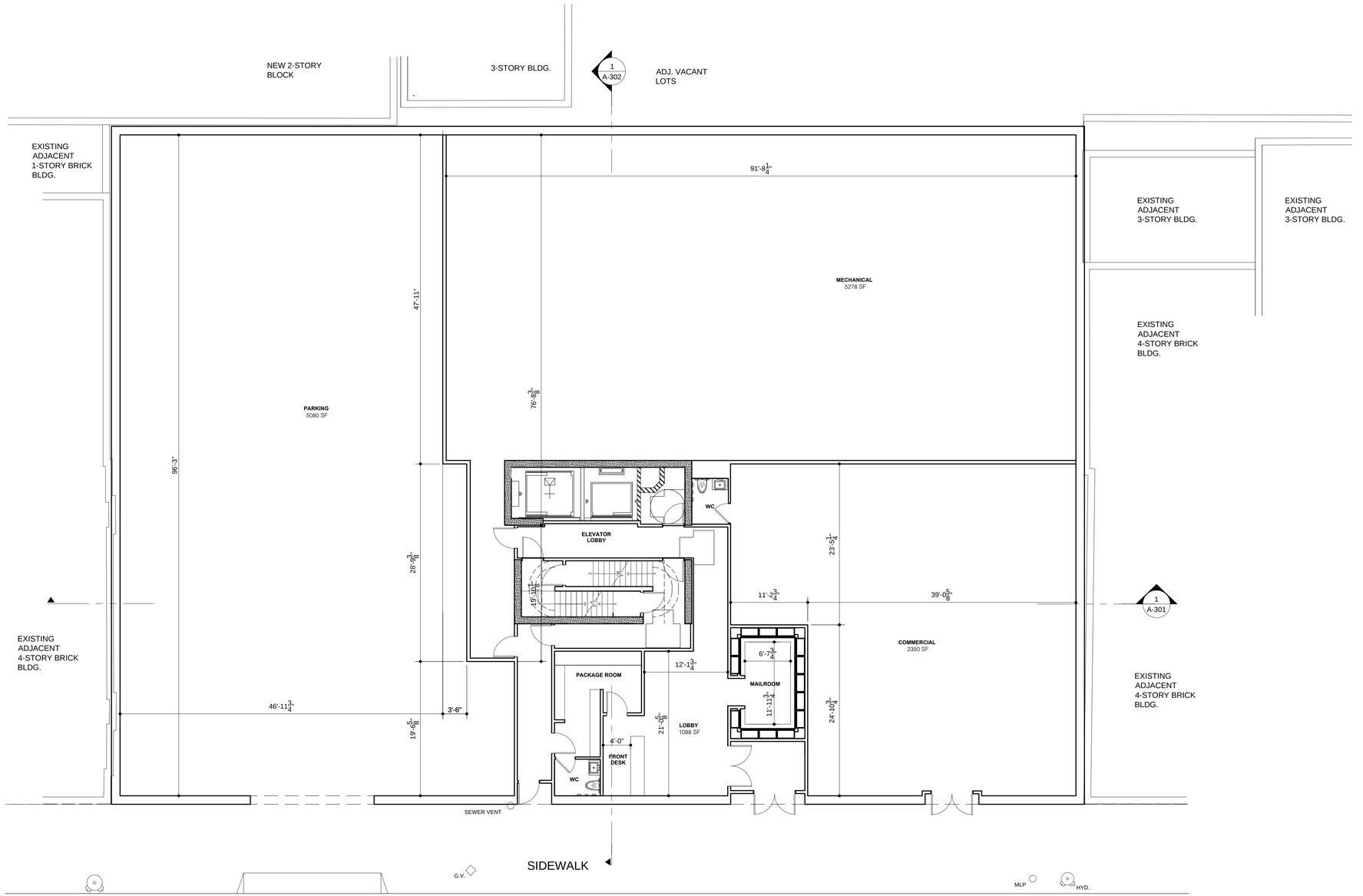
	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)		NYSDEC TOGS 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values		NYS DOH Standard from Final Guidance on Soil Vapor Intrusion	
Matrix:	**Soil**		**Groundwater**		**Soil Vapor**	
GC/MS Volatiles						
Acetone	50	ug/kg	50	ug/l	-	ug/m3
Benzene	60	ug/kg	1	ug/l	-	ug/m3
Bromodichloromethane	-	ug/kg	50	ug/l	-	ug/m3
Bromoform	-	ug/kg	50	ug/l	-	ug/m3
Bromomethane	-	ug/kg	5	ug/l	-	ug/m3
2-Butanone (MEK)	120	ug/kg	50	ug/l	-	ug/m3
Carbon disulfide	-	ug/kg	60	ug/l	-	ug/m3
Carbon tetrachloride	760	ug/kg	5	ug/l	-	ug/m3
Chlorobenzene	1100	ug/kg	5	ug/l	-	ug/m3
Chloroethane	-	ug/kg	5	ug/l	-	ug/m3
Chloroform	370	ug/kg	7	ug/l	-	ug/m3
1,2-Dibromo-3-chloropropane	-	ug/kg	0.04	ug/l	-	ug/m3
Dibromochloromethane	-	ug/kg	50	ug/l	-	ug/m3
1,2-Dichlorobenzene	1100	ug/kg	3	ug/l	-	ug/m3
1,3-Dichlorobenzene	2400	ug/kg	3	ug/l	-	ug/m3
1,4-Dichlorobenzene	1800	ug/kg	3	ug/l	-	ug/m3
1,1-Dichloroethane	270	ug/kg	5	ug/l	-	ug/m3
1,2-Dichloroethane	20	ug/kg	0.6	ug/l	-	ug/m3
1,1-Dichloroethene	330	ug/kg	5	ug/l	-	ug/m3
cis-1,2-Dichloroethene	250	ug/kg	5	ug/l	-	ug/m3
trans-1,2-Dichloroethene	190	ug/kg	5	ug/l	-	ug/m3
1,2-Dichloropropane	-	ug/kg	1	ug/l	-	ug/m3
1,4-Dioxane	100	ug/kg	-	ug/l	-	ug/m3
Ethylbenzene	1000	ug/kg	5	ug/l	-	ug/m3
2-Hexanone	-	ug/kg	50	ug/l	-	ug/m3
Isopropylbenzene	-	ug/kg	5	ug/l	-	ug/m3
Methyl Tert Butyl Ether	930	ug/kg	10	ug/l	-	ug/m3
Methylene chloride	50	ug/kg	5	ug/l	60	ug/m3
1,1,2,2-Tetrachloroethane	-	ug/kg	5	ug/l	-	ug/m3
Tetrachloroethene	1300	ug/kg	5	ug/l	100	ug/m3
Toluene	700	ug/kg	5	ug/l	-	ug/m3
1,2,4-Trichlorobenzene	-	ug/kg	5	ug/l	-	ug/m3
1,1,1-Trichloroethane	680	ug/kg	5	ug/l	-	ug/m3
1,1,2-Trichloroethane	-	ug/kg	1	ug/l	-	ug/m3
Trichloroethene	470	ug/kg	5	ug/l	5	ug/m3
Trichlorofluoromethane	-	ug/kg	5	ug/l	-	ug/m3
Vinyl chloride	20	ug/kg	2	ug/l	-	ug/m3
m,p-Xylene	260	ug/kg	-	ug/l	-	ug/m3
o-Xylene	260	ug/kg	-	ug/l	-	ug/m3
Xylene (total)	260	ug/kg	5	ug/l	-	ug/m3

Table 1
Clean-up Objectives
West 29th Street HUD

	NY SCO - Unrestricted Use (6 NYCRR 375-6 12/06)		NYSDEC TOGS 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values		NYS DOH Standard from Final Guidance on Soil Vapor Intrusion	
Matrix:	**Soil**		**Groundwater**		**Soil Vapor**	
GC/MS Semi-volatiles						
2,4-Dichlorophenol	-	ug/kg	5	ug/l	-	ug/m3
2,4-Dimethylphenol	-	ug/kg	1	ug/l	-	ug/m3
2,4-Dinitrophenol	-	ug/kg	10	ug/l	-	ug/m3
2-Methylphenol	330	ug/kg	-	ug/l	-	ug/m3
2-Nitrophenol	-	ug/kg	1	ug/l	-	ug/m3
4-Nitrophenol	-	ug/kg	1	ug/l	-	ug/m3
Pentachlorophenol	800	ug/kg	-	ug/l	-	ug/m3
Phenol	330	ug/kg	1	ug/l	-	ug/m3
2,4,5-Trichlorophenol	-	ug/kg	1	ug/l	-	ug/m3
2,4,6-Trichlorophenol	-	ug/kg	1	ug/l	-	ug/m3
Acenaphthene	20000	ug/kg	20	ug/l	-	ug/m3
Acenaphthylene	100000	ug/kg	-	ug/l	-	ug/m3
Anthracene	100000	ug/kg	50	ug/l	-	ug/m3
Atrazine	-	ug/kg	7.5	ug/l	-	ug/m3
Benzo(a)anthracene	1000	ug/kg	0.002	ug/l	-	ug/m3
Benzo(a)pyrene	1000	ug/kg	-	ug/l	-	ug/m3
Benzo(b)fluoranthene	1000	ug/kg	0.002	ug/l	-	ug/m3
Benzo(g,h,i)perylene	100000	ug/kg	5	ug/l	-	ug/m3
Benzo(k)fluoranthene	800	ug/kg	0.002	ug/l	-	ug/m3
Butyl benzyl phthalate	-	ug/kg	50	ug/l	-	ug/m3
1,1'-Biphenyl	-	ug/kg	5	ug/l	-	ug/m3
2-Chloronaphthalene	-	ug/kg	10	ug/l	-	ug/m3
4-Chloroaniline	-	ug/kg	5	ug/l	-	ug/m3
Chrysene	1000	ug/kg	0.002	ug/l	-	ug/m3
bis(2-Chloroethoxy)methane	-	ug/kg	5	ug/l	-	ug/m3
bis(2-Chloroethyl)ether	-	ug/kg	1	ug/l	-	ug/m3
2,4-Dinitrotoluene	-	ug/kg	5	ug/l	-	ug/m3
2,6-Dinitrotoluene	-	ug/kg	5	ug/l	-	ug/m3
3,3'-Dichlorobenzidine	-	ug/kg	5	ug/l	-	ug/m3
Dibenzo(a,h)anthracene	330	ug/kg	50	ug/l	-	ug/m3
Dibenzofuran	7000	ug/kg	-	ug/l	-	ug/m3
Di-n-butyl phthalate	-	ug/kg	50	ug/l	-	ug/m3
Di-n-octyl phthalate	-	ug/kg	50	ug/l	-	ug/m3
Diethyl phthalate	-	ug/kg	50	ug/l	-	ug/m3
Dimethyl phthalate	-	ug/kg	50	ug/l	-	ug/m3
bis(2-Ethylhexyl)phthalate	-	ug/kg	5	ug/l	-	ug/m3
Fluoranthene	100000	ug/kg	50	ug/l	-	ug/m3
Fluorene	30000	ug/kg	50	ug/l	-	ug/m3
Hexachlorobenzene	330	ug/kg	0.04	ug/l	-	ug/m3
Hexachlorobutadiene	-	ug/kg	0.5	ug/l	-	ug/m3
Hexachlorocyclopentadiene	-	ug/kg	5	ug/l	-	ug/m3
Hexachloroethane	-	ug/kg	5	ug/l	-	ug/m3
Indeno(1,2,3-cd)pyrene	500	ug/kg	0.002	ug/l	-	ug/m3
Isophorone	-	ug/kg	5	ug/l	-	ug/m3
2-Nitroaniline	-	ug/kg	5	ug/l	-	ug/m3
3-Nitroaniline	-	ug/kg	5	ug/l	-	ug/m3
4-Nitroaniline	-	ug/kg	5	ug/l	-	ug/m3
Naphthalene	12000	ug/kg	10	ug/l	-	ug/m3
Nitrobenzene	-	ug/kg	0.4	ug/l	-	ug/m3
N-Nitrosodiphenylamine	-	ug/kg	50	ug/l	-	ug/m3
Phenanthrene	100000	ug/kg	50	ug/l	-	ug/m3
Pyrene	100000	ug/kg	50	ug/l	-	ug/m3

Appendix A

Proposed Development Plans



1 GROUND FLOOR PLAN

SCALE: 1/8" = 1'-0"

ISMAEL LEYVA ARCHITECTS, P.C.
48 West 37th St. New York, NY 10018
TEL.(212)290-1444 FAX.(212)290-1425

Axis Design Group
Structural Engineers
744 Broad Street,14th Floor
Newark, NJ 07102
Tel : 973-242-2626 / Fax: 973-242-2676
www.axisdg.com

ETTINGER ENGINEERING ASSO.
MEP Engineer
505 Eighth Avenue
New York, NY 10018
Tel: 212-244-2410 / Fax: 212-643-1606
www.ettingerengineering.com

-
Exterior Wall Consultant
Address
Address
Tel: /Fax:
www.

FLEMING LEE SHUE, INC.
Environmental Engineer
158 West 29th Street
New York, NY 10001
Tel: 212-675-3225 / Fax: 212-675-3224
www.flemingleeshue.com

MRCE
Geotechnical Engineer
Penn Plaza, 225 West 34th Street
New York, NY 10122
Tel: 917-339-9300 / Fax:917-339-9400
www.mrce.com

CERAMI & ASSOCIATES
Acoustic Engineer
404 Fifth Avenue
New York, NY 10018
Tel: 212-370-1776 / Cel: 347-291-4048
www.ceramiassociates.com

-
Vertical Transportation Consultation
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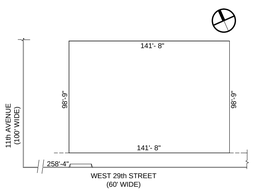
Tel: /Fax:
www.

No	Date:	Rev	Issue:

NOTES:



KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE
Ground Floor Plan

SCALE:1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

A
102

NYS LIC.# 21712

1 2nd - 6th Floor Plan

SCALE: 1/8" = 1'-0"

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48 West 37th St. New York, NY 10018
TEL.(212)290-1444 FAX.(212)290-1425

Axis Design Group
Structural Engineers

744 Broad Street,14th Floor
Newark, NJ 07102
Tel / 973-242-2626 / Fax: 973-242-2676
www.axisdgi.com

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MEP Engineer

505 Eighth Avenue
New York, NY 10018
Tel: 212-244-2410 / Fax: 212-643-1606
www.ettingerengineering.com

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Exterior Wall Consultant

Address
Address
Tel: /Fax:
www.

FLEMING LEE SHUE, INC.
Environmental Engineer

158 West 29th Street
New York, NY 10001
Tel: 212-675-3225 / Fax: 212-675-3224
www.flemingleeshue.com

MRCE
Geotechnical Engineer

Penn Plaza, 225 West 34th Street
New York, NY 10122
Tel: 917-339-9300 / Fax:917-339-9400
www.mrce.com

CERAMI & ASSOCIATES
Acoustic Engineer

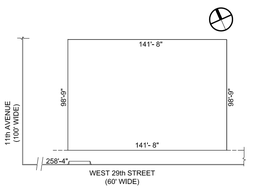
404 Fifth Avenue
New York, NY 10018
Tel: 212-370-1776 / Cel: 347-291-4048
www.ceramiassociates.com

-
Vertical Transportation Consultation

Address
Address
Tel: /Fax:
www.

No	Date:	Rev	Issue:

NOTES:



KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

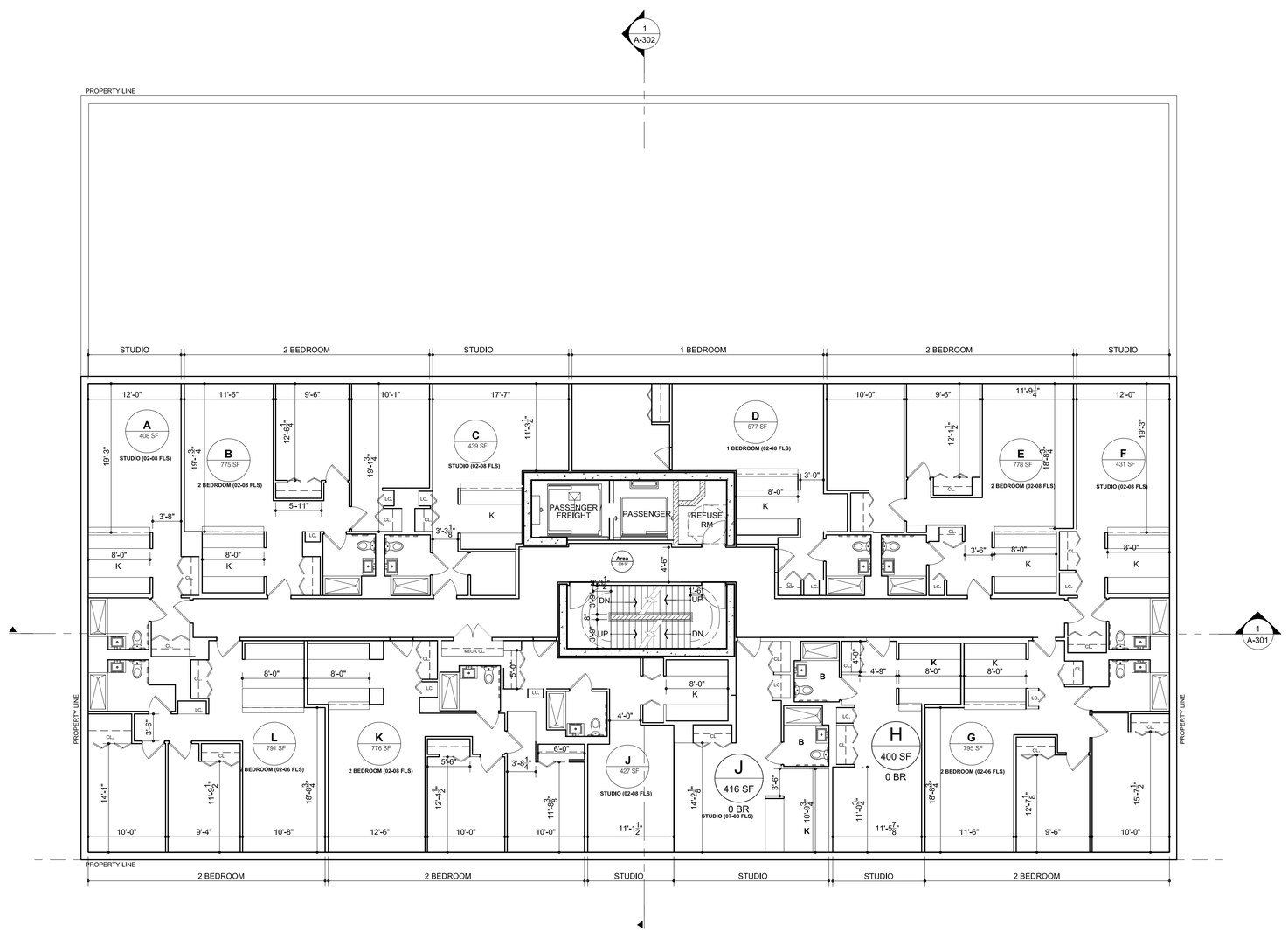
PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE
2nd - 6th Floor Plan

SCALE: 1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

A
103

NYS LIC.# 21712



1 7th-8th Floor Plan

SCALE: 1/8" = 1'-0"

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48 West 37th St. New York, NY 10018
TEL.(212)290-1444 FAX.(212)290-1425

Axis Design Group
Structural Engineers

744 Broad Street,14th Floor
Newark, NJ 07102
Tel / 973-242-2626 / Fax: 973-242-2676
www.axisdgi.com

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MEP Engineer

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New York, NY 10018
Tel: 212-244-2410 / Fax: 212-643-1606
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Penn Plaza, 225 West 34th Street
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Tel: 917-339-9300 / Fax:917-339-9400
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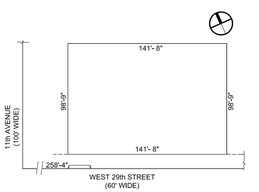
No	Date:	Rev	Issue:

NOTES:



KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

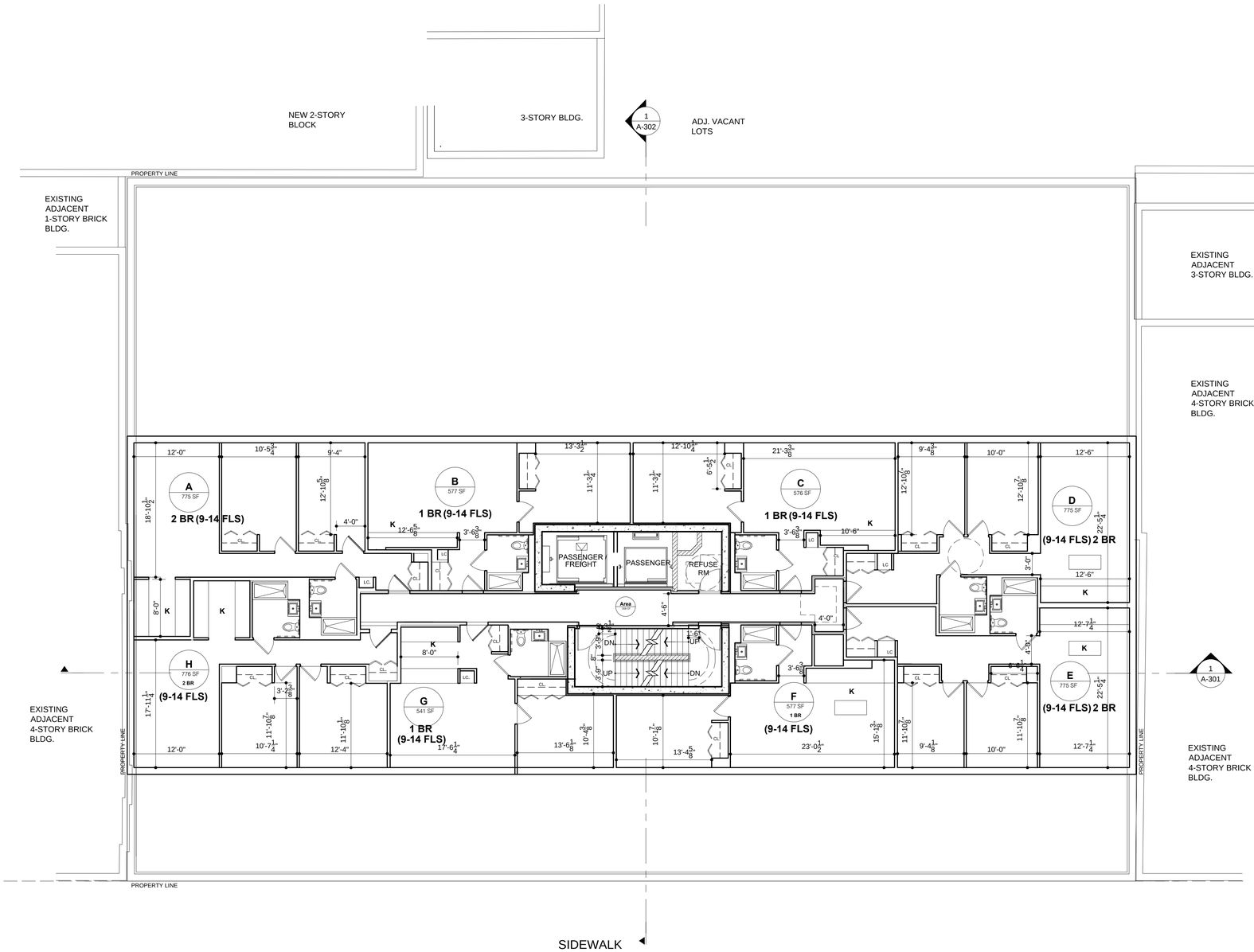
PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE
7th - 8th Floor Plan

SCALE: 1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

A
104

NYS LIC.# 21712



1 9th-14th Floor Plan

SCALE: 1/8" = 1'-0"

ISMAEL LEYVA ARCHITECTS, P.C.
48 West 37th St. New York, NY 10018
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Structural Engineers

744 Broad Street,14th Floor
Newark, NJ 07102
Tel : 973-242-2626 / Fax: 973-242-2676
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No	Date:	Rev	Issue:

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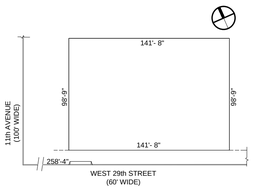


KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

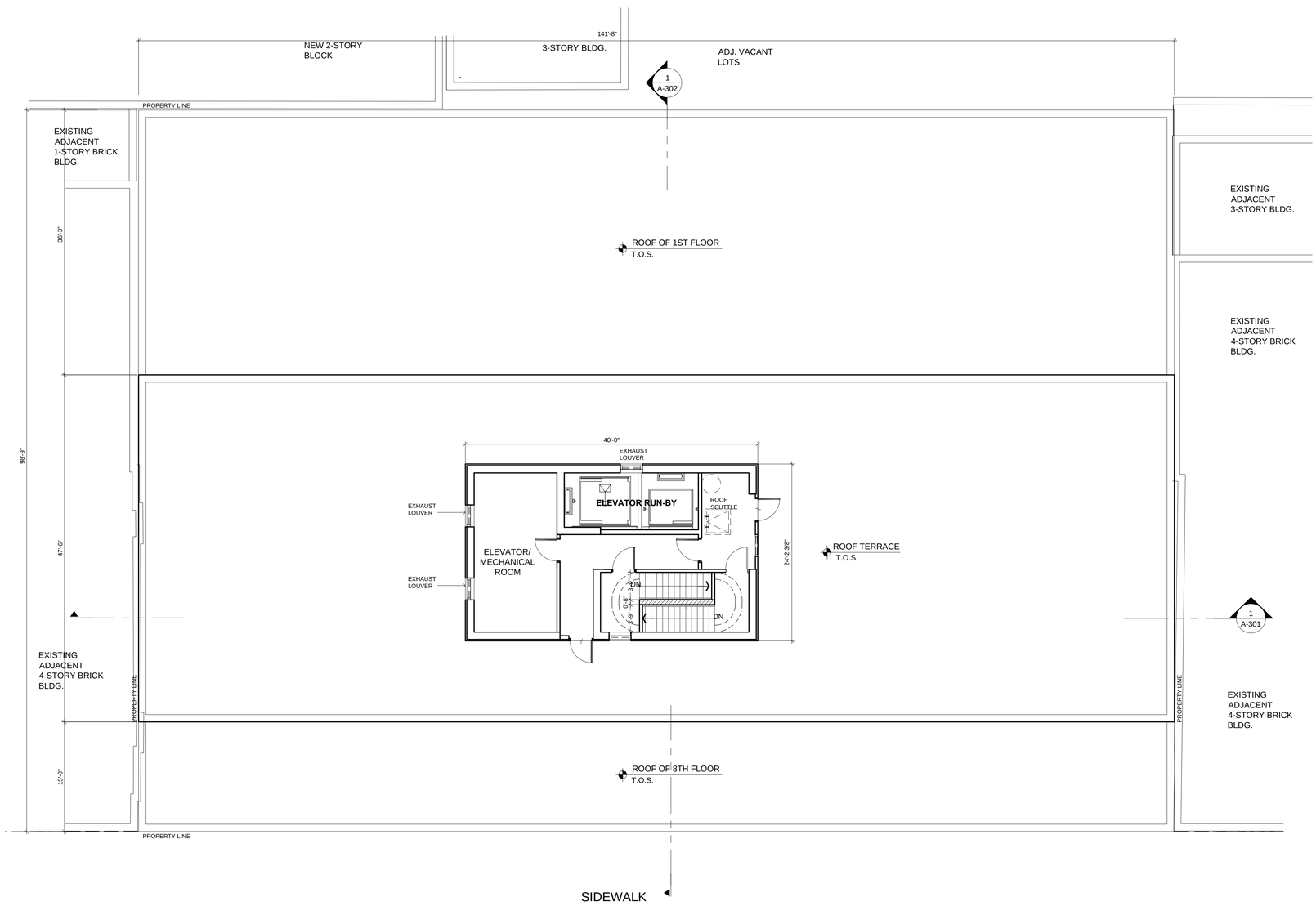
PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE
9th - 14th Floor Plan

SCALE: 1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

A
105

NYS LIC.# 21712



1 15th FLOOR- ELEVATOR/MECHANICAL ROOM

SCALE: 1/8" = 1'-0"

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48 West 37th St. New York, NY 10018
TEL.(212)290-1444 FAX.(212)290-1425

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New York, NY 10122
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No	Date:	Rev	Issue:

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KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE

15th Floor-Elevator Mechanical Room

SCALE: 1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

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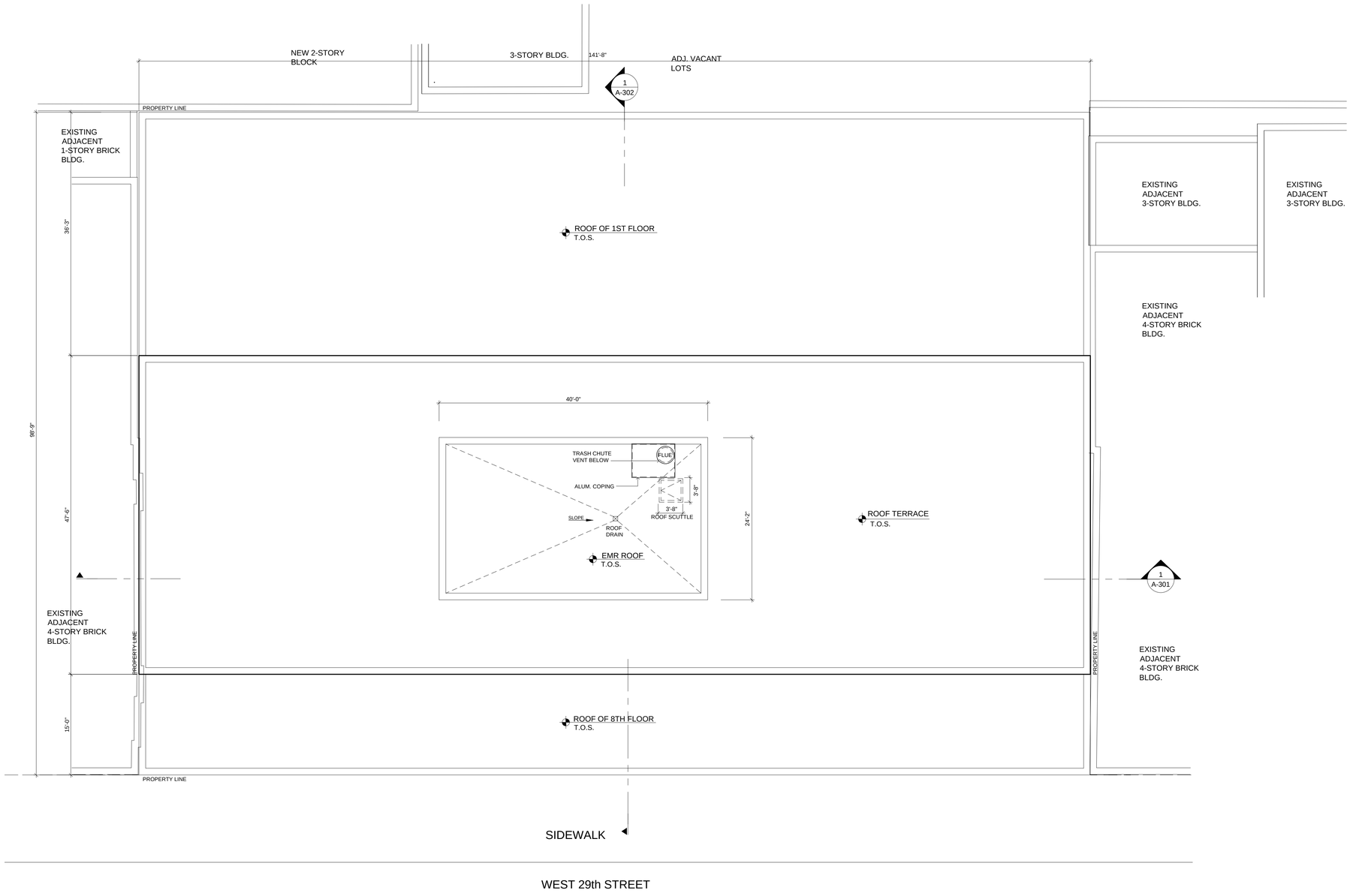
106

NYS LIC.# 21712



1 16th Floor- Roof & Bulkhead Plan

SCALE: 1/8" = 1'-0"

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48 West 37th St. New York, NY 10018
TEL.(212)290-1444 FAX.(212)290-1425

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744 Broad Street,14th Floor
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Tel : 973-242-2626 / Fax: 973-242-2676
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MRCE
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No	Date:	Rev	Issue:

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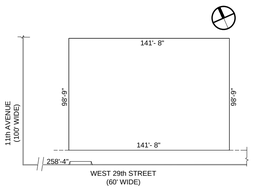

KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE

16th Floor - Roof & & Bulkhead Plan

SCALE: 1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

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107

NYS LIC.# 21712

1 SECTION

SCALE: 1/8" = 1'-0"

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No	Date:	Rev	Issue:

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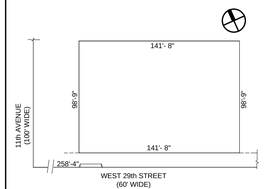


KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

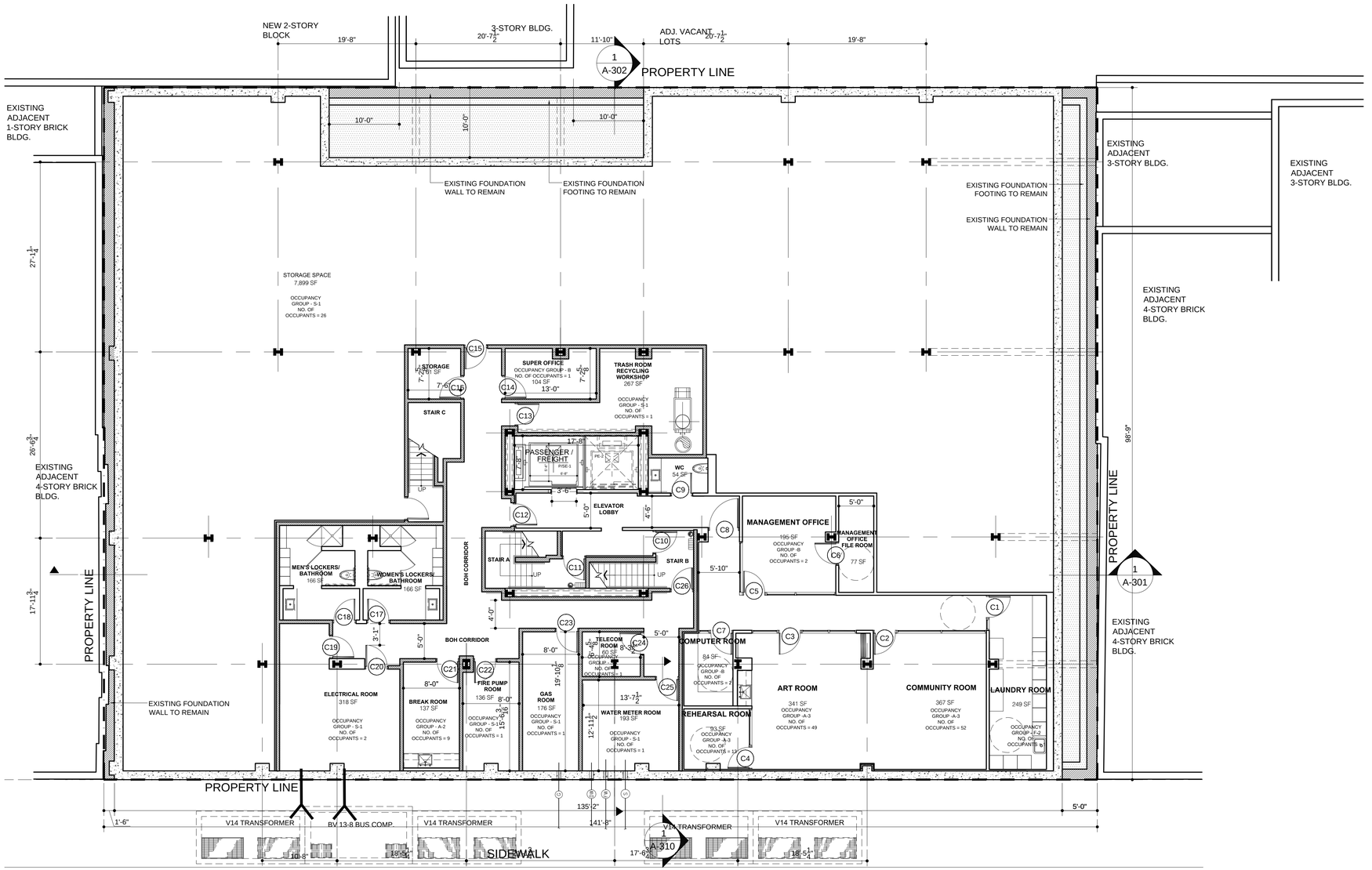
TITLE
Section

SCALE:1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

A
302

NYS LIC.# 21712

User: user-13 Project Name: 42nd and 10th File:F:\11.128.000_29th St-10th Ave\1_Current_Sheets\300_Sections\A-302_Cross Section.dwg Plot Date: January 5, 2012



1 Cellar Plan

SCALE: 1/8" = 1'-0"

NB # 121182031

ISMAEL LEYVA ARCHITECTS

48 West 37th St. New York, NY 10018
TEL.(212)290-1444
FAX.(212)290-1425

AXIS DESIGN GROUP
Structural Engineers

744 Broad Street,14th Floor
Newark, NJ 07102
Tel: 973-242-2626 / Fax: 973-242-2676
www.axisdgi.com

ETTINGER ENGINEERING ASSO.
MEP Engineer

505 Eighth Avenue
New York, NY 10018
Tel: 212-244-2410 / Fax: 212-643-1606
www.ettingerengineering.com

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Environmental Engineer

158 West 29th Street
New York, NY 10001
Tel: 212-675-3225 / Fax: 212-675-3224
www.flemingleeshue.com

MRCE
Geotechnical Engineer

Penn Plaza, 225 West 34th Street
New York, NY 10122
Tel: 917-339-9300 / Fax:917-339-9400
www.mrce.com

CERAMI & ASSOCIATES
Acoustic Engineer

404 Fifth Avenue
New York, NY 10018
Tel: 212-370-1776 / Cel: 347-291-4048
www.ceramiassociates.com

STEVE KINNAMAN AND ASSOCIATES
Vertical Transportation Consultant

116 W. 23rd Street, 5th Floor
New York, NY 10011
Tel: 908-812-1202
www.skaecg.com; steve@skaecg.com

VIRIDIAN ENERGY & ENVIRONMENTAL
Energy Consultant

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Cel: 203-921-6892
www.viridianec.com

No	Date:	Rev	Issue:
1	2/02/12		Schematic Design Issue
2	2/29/12		DOB Issue

NOTES:

CLIENT
WEST 30th STREET
HIGHLINE HOLDINGS, L.L.C.
c/o Related
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001

TITLE
Cellar Plan

SCALE:1/8" = 1'-0"
DATE: 2/29/2012
PROJECT No: 11.128.000

REGISTERED ARCHITECT ISMAEL LEYVA No. 021712 STATE OF NEW YORK

NYS LIC.# 21712

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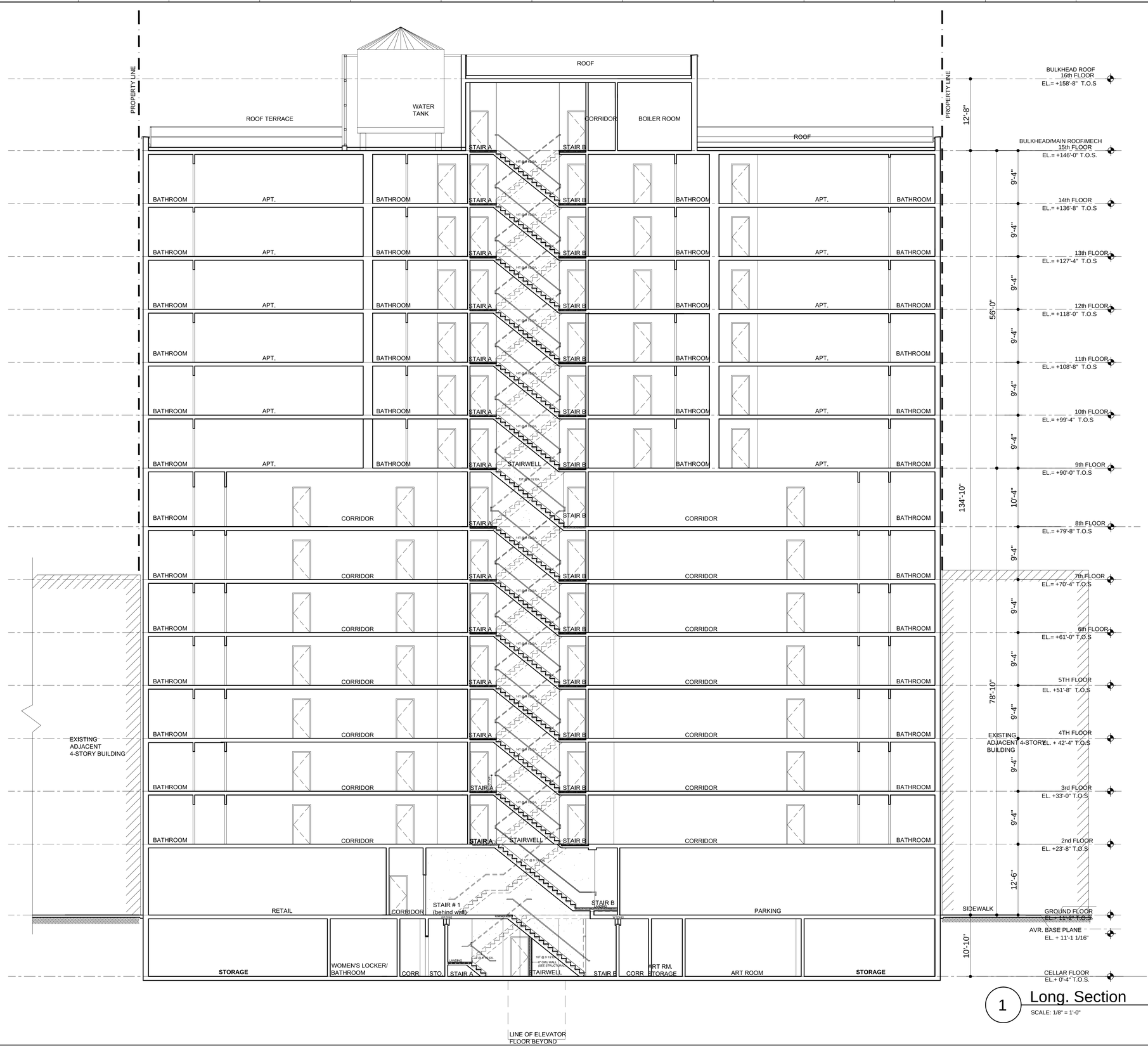
101.00

48 of 68



1 Long. Section

SCALE: 1/8" = 1'-0"

NB # 121182031

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48 West 37th St. New York, NY 10018
TEL.(212)290-1444
FAX.(212)290-1425

AXIS DESIGN GROUP
Structural Engineers
744 Broad Street,14th Floor
Newark, NJ 07102
Tel : 973-242-2626 / Fax: 973-242-2676
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No	Date:	Rev	Issue:
1	2/02/12		Schematic Design Issue
2	2/29/12		DOB Issue

NOTES:

CLIENT
WEST 30th STREET
HIGHLINE HOLDINGS, L.L.C.
c/o Related
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001

TITLE
Long. Section

SCALE:1/8" = 1'-0"
DATE: 2/29/2012
PROJECT No: 11.128.000

REGISTERED ARCHITECT ISMAEL LEYVA No. 021712 STATE OF NEW YORK

NYS LIC.# 21712

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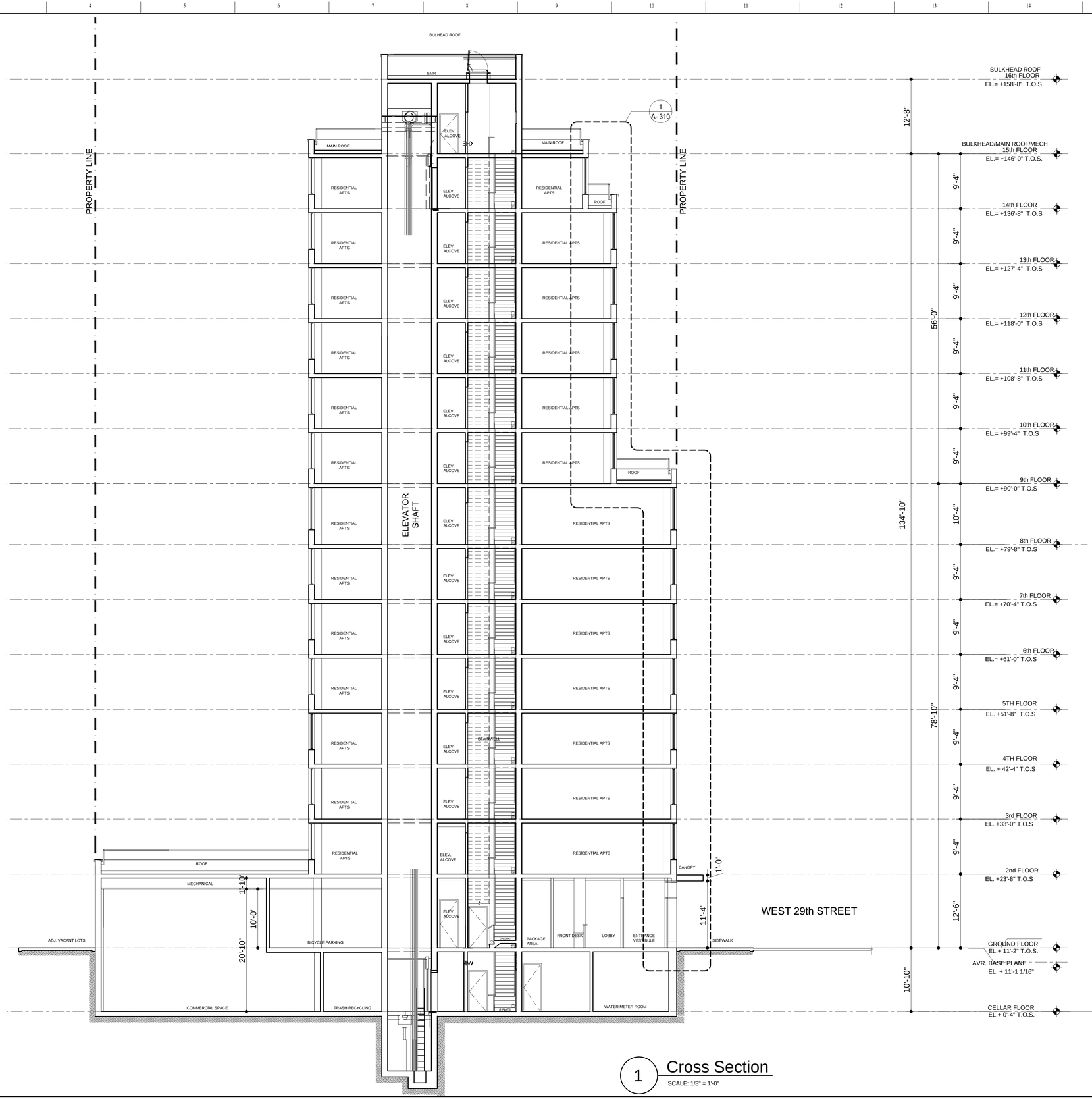
301.00

60 of 68



1 Cross Section

SCALE: 1/8" = 1'-0"

NB # 121182031

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48 West 37th St. New York, NY 10018
TEL.(212)290-1444
FAX.(212)290-1425

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Structural Engineers
744 Broad Street,14th Floor
Newark, NJ 07102
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No	Date:	Rev	Issue:
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2	2/29/12		DOB Issue

NOTES:

CLIENT
WEST 30th STREET
HIGHLINE HOLDINGS, L.L.C.
c/o Related
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001

TITLE
Cross Section-1

SCALE:1/8" = 1'-0"
DATE: 2/29/2012
PROJECT No: 11.128.000

REGISTERED ARCHITECT ISMAEL LEYVA No. 021712 STATE OF NEW YORK

NYS LIC.# 21712

A
302.00

61 of 68

ISMAEL LEYVA ARCHITECTS
48 WEST 37TH STREET
NY, NY 10018

30TH STREET AND 10TH AVENUE NEW YORK
(Phase II)
"AS OF RIGHT"

Block		701	
Tax Lot		16	
Zoning Map	8b		
Zoning Districts	C6-3		
Lot Area	C6-3		13,989 sf
ZR Article IX Appendix B	Sub Area B (Lot 16)	C6-3 - (R-9)	

FAR Permitted Summary

ZR 98-22		Area	FAR	Permitted FA	Provided FA	**Compliance**
	Lot 16 (Development Lot C6-3)	13,989	7.50	104,917.50 sf	104,911.37 sf	
	ZFA on C6-3 to be used on C6-4			Remaining ZFA (over Built ZFA)	**6.13 sf**	

Street Wall, Height and Set Back Requirements

ZR 98-423 (a) Min. 70% of Street Wall shall be located on Street Line up to Min. Base Height

Base/ Building Height		Minimum Base Height	Maximum Base Height	Maximum Building Height	Provided	**Compliance**
ZR 98-423 Table	Subarea B	60'	95'	135'	134'-10"	Complies

Lot Coverage	Subarea A & B	Required	Lot Area	Permitted	Provided	
ZR 98-423 (b) (3) (iii)	Max. Residential Lot Coverage	70%	13,989	9,792	8,854	Complies

Maximum Number of Dwelling Units						
ZR 23-22	1 Per 750 Residential FAR			136.8	127	Complies

Parking						
ZR 13-12	20% of Dwelling Units maximum			25	25	Complies
ZR 13-143	Maximum size, 200 sf per Parking spot			5,080		

Penthouse Rule						
ZR 98-423 (b) (3) (ii)	Max. coverage of the last 4 floors	85%	of GFA of the highest story directly below 8,854	7,526	6,729	Complies

FLOOR AREA DISTRIBUTION (Commercial Subarea B) C6-3

	FLOOR	USE	GROSS SF	2%	DEDUCTION SF	ZONING SF	FLOOR HEIGHT (ft.)	BUILDING HEIGHT (ft.)
CELLAR	C1 - RES	RES	2,374				12.50	12.50
	C1- COMMERCIAL	COMMERCIAL	0					
	C1- STORAGE	STORAGE	9,512					
	C1- MECHANICAL	MECHANICAL	2,103					
	TOTAL		13,989					
PODIUM	01 - RES	RES	1,807	1.5%	27	1,780	12.50	12.50
	01- COMMERCIAL	COMMERCIAL	2,350	1.5%	35	2,315		
	01- MECHANICAL	MECHANICAL	4,708					
	01- OPEN	OPEN	44					
	01- PARKING	PARKING	5,080					
	TOTAL		13,989			4,095		
TOWER BELOW 220'	02 - RES	RES	8,854	1.5%	133	8,721	10.00	22.50
	03 - RES	RES	8,854	1.5%	133	8,721	9.00	31.50
	04 - RES	RES	8,854	1.5%	133	8,721	9.00	40.50
	05 - RES	RES	8,854	1.5%	133	8,721	9.00	49.50
	06 - RES	RES	8,854	1.5%	133	8,721	9.00	58.50
	07 - RES	RES	8,854	1.5%	133	8,721	9.00	67.50
	08 - RES	RES	8,854	1.5%	133	8,721	11.00	78.50
	09 - RES	RES	6,729	1.5%	101	6,628	9.00	87.50
	10 - RES	RES	6,729	1.5%	101	6,628	9.00	96.50
	11 - RES	RES	6,729	1.5%	101	6,628	9.00	105.50
	12 - RES	RES	6,729	1.5%	101	6,628	9.00	114.50
	13 - RES	RES	6,729	1.5%	101	6,628	9.00	123.50
	14 - RES	RES	6,729	1.5%	101	6,628	10.00	133.50
	TOTALS		**130,330**			**104,911**		

Total Commercial	2,350	2,315
Total Residential	104,159	102,597

ISMAEL LEYVA ARCHITECTS
48W 37TH STREET
NY, NY 10018

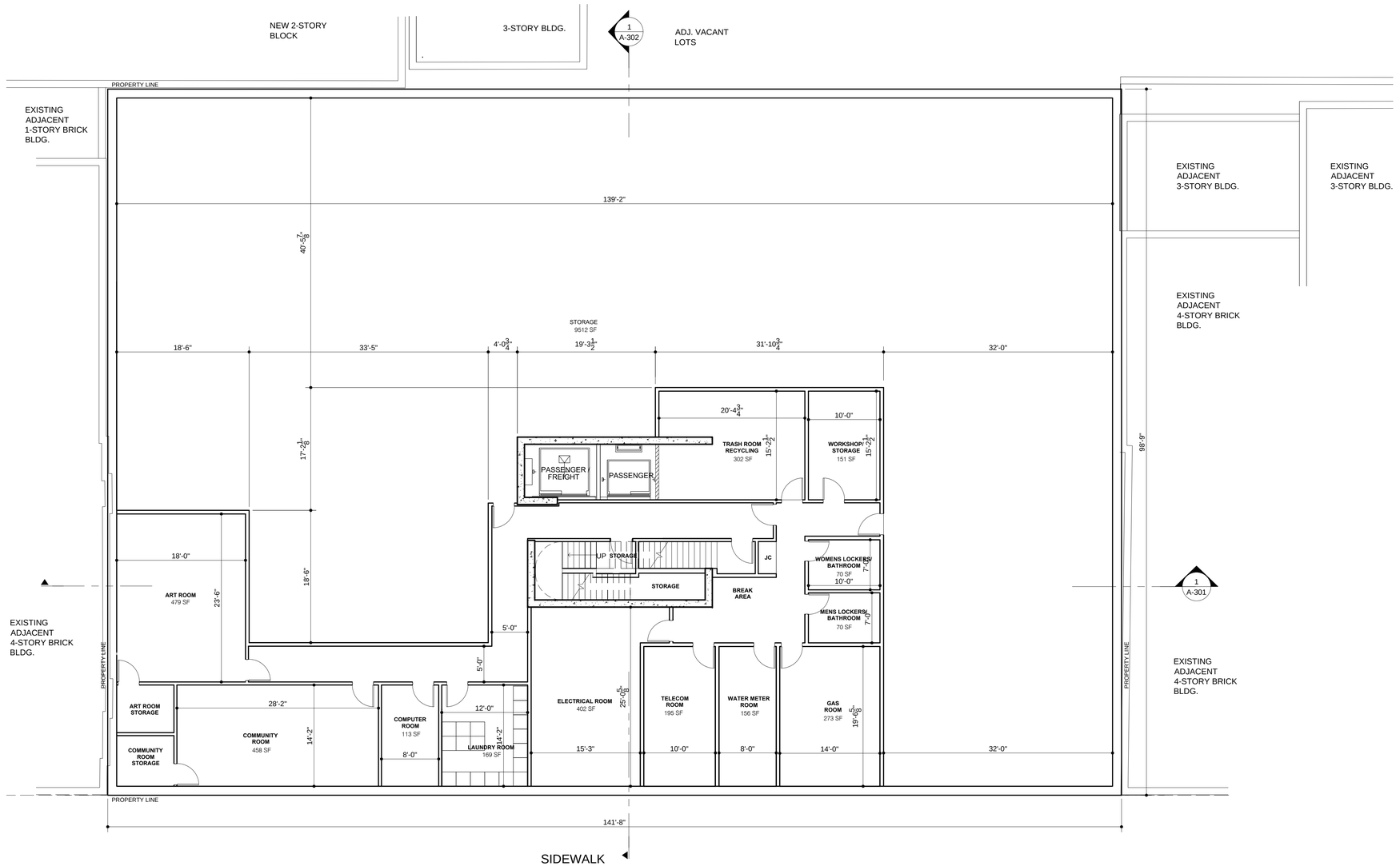
ISMAEL LEYVA
ARCHITECTS

30TH STREET AND 10TH AVENUE
(Phase II)

30th Street and Tenth Avenue Phase II Subarea B Apartment Distribution

UNIT TYPE	STARTING FLOOR	ENDING FLOOR	APT. #	NET AREA (SF.)	NO. OF UNITS /FL	NO. OF FLS	TOTAL UNITS/FL PLATE	LI	TOTAL UNITS OF ONE TYPE (1)	PERCENTAGE PROPOSED	TARGET PERCENTAGE
STUDIO	2	8	A	408	1	7	7				
	2	8	C	439	1	7	7		32	25.20%	25.00%
	2	8	F	431	1	7	7				
	2	8	J	427	1	7	7				
	7	8	H	400	1	2	2				
	7	8	I	416	1	2	2				
TOTAL				13,567			32		32		
1 BEDROOM	2	8	D	577	1	7	7				
	9	14	B	577	1	6	6		31		
	9	14	E	576	1	6	6				
	9	14	F	577	1	6	6			24.41%	25.00%
	9	14	H	541	1	6	6				
TOTAL				17,665			31		31		
									-	0.00%	0.00%
SUB-TOTAL				-			0		-		
2 BEDROOM											
	2	8	B	775	1	7	7				
(0 BR / 1 BA)	2	8	E	778	1	7	7				
	2	8	G	795	1	7	7				
	2	6	H	804	1	5	5				
	2	8	K	776	1	7	7		64	50.39%	50.00%
	2	8	L	791	1	7	7				
	9	14	A	775	1	6	6				
	9	14	D	775	1	6	6				
	9	14	E	775	1	6	6				
	9	14	H	776	1	6	6				
SUB-TOTAL				50,031			64				
TOTAL				50,031			64		64	100.00%	100.00%
TOTAL				81,263			**127**		**127**	100.00%	100.00%

STUDIO		13,567	424	32	13,567	32
1BR/1BA		17,665	570	31	17,665	31
2BR/2BA		50,031	782	64	50,031	64
TOTAL/AVG		81,263	640	127	81,263	127



1 CELLAR FLOOR PLAN

SCALE: 1/8" = 1'-0"

ISMAEL LEYVA ARCHITECTS, P.C.
48 West 37th St. New York, NY 10018
TEL.(212)290-1444 FAX.(212)290-1425

Axis Design Group
Structural Engineers

744 Broad Street,14th Floor
Newark, NJ 07102
Tel : 973-242-2626 / Fax: 973-242-2676
www.axisdg.com

ETTINGER ENGINEERING ASSO.
MEP Engineer

505 Eighth Avenue
New York, NY 10018
Tel: 212-244-2410 / Fax: 212-643-1606
www.ettingerengineering.com

-
Exterior Wall Consultant

Address
Address
Tel: /Fax:
www.

FLEMING LEE SHUE, INC.
Environmental Engineer

158 West 29th Street
New York, NY 10001
Tel: 212-675-3225 / Fax: 212-675-3224
www.flemingleeshue.com

MRCE
Geotechnical Engineer

Penn Plaza, 225 West 34th Street
New York, NY 10122
Tel: 917-339-9300 / Fax:917-339-9400
www.mrce.com

CERAMI & ASSOCIATES
Acoustic Engineer

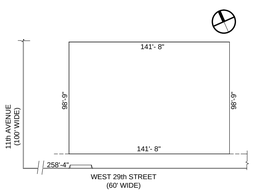
404 Fifth Avenue
New York, NY 10018
Tel: 212-370-1776 / Cel: 347-291-4048
www.ceramiassociates.com

-
Vertical Transportation Consultation

Address
Address
Tel: /Fax:
www.

No	Date:	Rev	Issue:

NOTES:



KEY PLAN
NOT TO SCALE

CLIENT
Related Companies
60 Columbus Circle, 19th Floor
New York, NY 10023

PROJECT
529 W. 29th Street
New York, NY 10001
(PHASE II)

TITLE
Cellar Floor Plan

SCALE: 1/8" = 1'-0"
DATE: 12/27/11
PROJECT No: 11.128.000

A
101

NYS LIC.# 21712

Appendix B

Remedial Investigation Report

Voluntary Cleanup Program

529 WEST 29TH STREET

NEW YORK, NEW YORK

Remedial Investigation Report

NYC VCP Site Number: 12CBCP038M
E-Designation Site Number: E-142

Prepared for:

West 30th Highline Holdings, L.L.C.
c/o The Related Companies L.P.
60 Columbus Circle
New York, NY 10023

Prepared by:

Fleming-Lee Shue
158 West 29th Street, 9th Fl.
10001, New York NY
212 675-3225

February 2012

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
CAMP	Community Air Monitoring Plan
COC	Contaminant of Concern
CPP	Citizen Participation Plan
CSM	Conceptual Site Model
DER-10	New York State Department of Environmental Conservation Technical Guide 10
FID	Flame Ionization Detector
GPS	Global Positioning System
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IRM	Interim Remedial Measure
NAPL	Non-aqueous Phase Liquid
NYC VCP	New York City Voluntary Cleanup Program
NYC DOHMH	New York City Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYS DOH ELAP	New York State Department of Health Environmental Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
QEP	Qualified Environmental Professional
RI	Remedial Investigation
RIR	Remedial Investigation Report
SCO	Soil Cleanup Objective
SPEED	Searchable Property Environmental Electronic Database

CERTIFICATION

I, Arnold F. Fleming, P.E., am a Qualified Environmental Professional, as defined in RCNY § 43-1402(ar). I have primary direct responsibility for implementation of the Remedial Investigation for the 529 West 29th Street Site, (NYC BVCP Site No. 12BVCP038M). I am responsible for the content of this Remedial Investigation Report, have reviewed its contents and certify that this RIR is accurate to the best of my knowledge and that it contains all available environmental information and data regarding the property.

Arnold F. Fleming_____

Qualified Environmental Professional Date Signature

EXECUTIVE SUMMARY

The Remedial Investigation Report (RIR) provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy pursuant to RCNY§ 43-1407(f). The remedial investigation (RI) described in this document is consistent with applicable guidance.

Site Location and Current Usage

The Site is located at 529-539 W 29th Street in the Chelsea section in Manhattan, New York and is identified as Block 701 and Lot 16 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 13,990-square ft. and is bounded by block 701, Lot 56, 58, 59, and 62 (partially) to the north. Lot 56 and 58 are vacant lots, Lot 59 is developed with a 3- to 7- story building, and lot 62 is developed with a 2- to 34-story building. To the south, the Site is bounded by West 29th Street. To the east, the Site is bounded by block 701, Lot 22, developed with a 4-story building. Block 701, Lot 1 – developed with a 4 to 9story building bounds the Site to the west. A map of the Site boundary is shown in Figure 2. Currently, the Site is a vacant lot. Over time, the neighborhood character is anticipated to develop into a residential/commercial mix, due to the Special West Chelsea District Rezoning.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of a residential high rise with parking and commercial uses on the ground floor. The 126 residential units are anticipated to be affordable Section 8 housing units. The project is being coordinated in conjunction with the Housing and Urban Development Authority (HUD). In order to qualify for the limited HUD funding that is available for affordable housing, the building must be ready for occupancy by August 2013.

The footprint of the development will cover substantially the entire lot; the layout of the proposed development can be seen on the site boundary map, Figure 2. The current zoning designation is C6-3, high-bulk commercial uses requiring a central location, allowing a commercial floor area ratio of 6.0 or a residential floor area ratio of up to 7.5. The proposed use is consistent with existing zoning for the property.

The proposed development will consist of a residential 14-story 130,000 square foot building (126 apartments – Floors 2-14), with one basement level and will occupy, substantially, the full footprint of Lot 16. The basement will house mechanical equipment, retail space as well as amenities (computer room and common room). The foundation depth will be approximately 13 feet (ft.) below grade. Parking will occupy approximately 50% of the grade level, with the lobby and small retail spaces occupying the remaining 50%.

Most of the Site will be excavated to a depth of approximately 14 ft., 1 foot below the water table. Excavations for two elevator pits will extend approximately 6 ft. deeper or to approximately 20 ft. below existing grade. Two areas, totaling 730 square ft. will be excavated to a depth of approximately 8 ft. so that the structure of adjacent buildings is not compromised. Also, an existing foundation wall around the perimeter of the lot that extends to a depth of approximately 10 ft. and is 18 inches wide will substantially be left in place. The total amount of material anticipated to be removed is approximately 191,479 cubic ft.

Summary of Past Uses of Site and Areas of Concern

The subject property consisted of tenement style buildings from before 1890 up until the property was redeveloped by the current structure in the mid 1900's. This building was historically occupied by the Metal Purchasing Company before it was converted into a parking garage.

No on-site Areas of Concern (AOCs) have been identified. Five off-site AOCs have been identified for this Site in the 2005 Phase I report.

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 4 soil borings in 2007 and 8 soil borings in 2011 across the entire project Site, and collected 8 soil samples in 2007 and 16 soil samples in 2011 for chemical analysis from the soil borings to evaluate soil quality;

3. Installed 2 temporary groundwater monitoring points in 2007 and 3 temporary groundwater monitoring points in 2011 throughout the Site to collect 2

groundwater samples in 2007 and 3 groundwater samples in 2011 for chemical analysis to evaluate groundwater quality;

4. Installed 3 soil vapor probes around the Site in 2011 and collected 3 samples for chemical analysis.

Summary of Environmental Findings

1. The elevation of the property ranges from 14 to 18 ft.
2. The depth-to-groundwater ranges from 10.16 to 11.34 ft.
3. The groundwater flow is generally from southeast to northwest.
4. The depth to bedrock at the Site is not known, but is definitely below the groundwater interface.
5. The stratigraphy consists of 2-8 ft. of urban fill material underlain by a minimum of 8 ft. of silty sand.

6. Soil samples collected during the 2011 remedial site investigation revealed the presence of several contaminants in excess of Track 1 Unrestricted Soil Clean-up Objectives (SCOs) and Track 2 Restricted Residential SCOs at all 8 locations sampled, most notably semi-volatile organic compounds (SVOCs: polycyclic aromatic compounds , PAHs) and metals. PAH levels exceeding Track 1 and Track 2 SCOs were detected in 3 of 8 sampling locations. Metal levels, including those for barium, lead, mercury and arsenic, exceeding Track 1 and Track 2 SCOs were detected in all shallow samples. At one deeper sample location, metals were detected at high levels, including barium (1170 ppm), lead (2860 ppm), mercury (0.94 ppm), and zinc (1340 ppm). Surface metal contamination can be attributable to the presence of historic fill material. Trace-level Track 1 SCO exceedances of PCBs and pesticides (4,4'-DDT) were detected in 2 of 8 samples. However, at location SB-6, PAHs were detected at an aggregate level of over 2,000 parts per million (ppm) within a deep, subsurface interval (12-14 ft.). The PAHs detected in this sample were at higher concentrations than those detected in the other 7 samples and higher than are typically found in urban fill. However, the SB-6 soil sample appeared to be native sandy silt with no obvious fill or other unnatural material or odor.

Rather, the specific PAH compounds detected in the sample from SB-6 are indicative of weathered creosote. Creosote was commonly used as a preservative on wood used to construct piers.

7. The results of the laboratory analysis of the groundwater samples established that Volatile Organic Compounds (VOCs), SVOCs, pesticides, PCBs were not present in groundwater above NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards (GQS). Dissolved metals including selenium, iron, magnesium, manganese and sodium were detected above GQS. This may be attributed to intrusion of saline or brackish water or road salting.

8. The results of the laboratory analysis of the soil vapor samples did not identify any volatile organic compounds at concentrations exceeding regulatory standards. Trace levels of methylene chloride, tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in the samples analyzed, but at levels that do not exceed 1.6 and 0.6 µg/m^3. These levels are well below those which trigger decision matrix actions as per the New York State Department of Health's Soil Vapor Intrusion Guidance Document.

REMEDIAL INVESTIGATION REPORT

1.0 SITE BACKGROUND

Fleming-Lee Shue, on behalf of West 30th Highline Holdings, L.L.C., has conducted a Remedial Investigation (RI) of the subject property to assess environmental conditions and incorporate any necessary remedial actions into its plan to redevelop the site. The subject property is a 0.32-acre parcel located at 529-539 W 29th Street in the Chelsea section of Manhattan, New York. The proposed use for the property is primarily Section 8 affordable residential housing, with a small portion of commercial use. The RI work was performed in two segments, on January 29, 2007 and on December 28, 2011.

This RIR summarizes the nature and extent of contamination and provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy that is protective of human health and the environment consistent with the use of the property pursuant to RCNY§ 43-1407(f). West 30th Highline Holdings, LLC is considering enrolling the redevelopment project in the NYC Brownfields Cleanup Program (VCP).

1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 529-539 W 29th Street in the Chelsea section in Manhattan, New York and is identified as Block 701 and Lot 16 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 13,990-square ft. and is bounded by block 701, Lot 56, 58, 59, and 62 (partially) to the north. Lot 56 and 58 are vacant lots, Lot 59 is developed with a 3- to 7- story building, and lot 62 is developed with a 2- to 34-story building. To the south, the Site is bounded by West 29th Street. To the east, the Site is bounded by Block 701, Lot 22, developed with a 4-story building. Block 701, Lot 1, developed with a 4- to 9-story building, bounds the Site to the west. A map of the Site boundary is shown in Figure 2. Currently, the Site is a vacant lot.

1.2 Proposed Redevelopment Plan

The proposed future use of the Site will consist of a residential tower with a commercial ground floor. The footprint of the development will cover substantially the entire lot; the layout

of the proposed development can be seen on the site boundary map, Figure 2. The current zoning designation is C6-3, high-bulk commercial uses requiring a central location, allowing a commercial floor area ratio of 6.0 or a residential floor area ratio of 7.5. The proposed use is consistent with existing zoning for the property.

The proposed development will consist of a residential 14-story 130,000 square foot building (126 apartments – Floors 2-14), with one basement level and will occupy, substantially, the full footprint of Lot 16. The basement will house mechanical equipment, retail space as well as amenities (computer room and common room). The foundation depth will be approximately 13 ft. below grade. Parking will occupy approximately 50% of the grade level, with the lobby and small retail spaces occupying the remaining 50%.

Most of the Site will be excavated to a depth of approximately 14 ft., 1 foot below the water table. Excavations for two elevator pits will extend approximately 6 ft. deeper or to approximately 20 ft. below existing grade. Two areas, totaling 730 square ft. will be excavated to a depth of approximately 8 ft. so that the structure of adjacent buildings is not compromised. Also, an existing foundation wall around the perimeter of the lot, which extends to a depth of approximately 10 ft. and 18 inches wide, will substantially be left in place. The total amount of material anticipated to be removed is approximately 191,479 cubic ft.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

According to the data available in OER's *SPEED* application, no schools, hospitals or day care facilities are located within a 250 to 500-foot radius. The area bordered by West 30th Street, 10th Avenue, West 26th Street and 8th Avenue is considered a NYS Environmental (EN) Zone, according to OER's *SPEED* application. This area is located about 475 ft. from the Site. The Site appears on the City of New York Department of City Planning Zoning Map 8b. According to this map, the property is designated C6-3, which is designated as a general central commercial district, but allows residential use. The use of the surrounding properties is mainly commercial with some residential uses as well. Figure 3 shows the surrounding land usage.

2.0 SITE HISTORY

2.1 PAST USES AND OWNERSHIP

The subject property consisted of tenement style buildings from before 1890 up until the property was redeveloped in the mid 1900's. This building was historically occupied by the Metal Purchasing Company before it was converted into a parking garage.

2.2 PREVIOUS INVESTIGATIONS

In January and February of 2007 FLS conducted a remedial investigation at the Site. The New York City Department of Environmental Protection (NYCDEP) has placed an "e" designation on this site, requiring that a subsurface investigation of the site be performed prior to re-development of the site for residential purposes. The overall redevelopment project includes multiple lots within Block 701, including lot 16 (the Site). The remedial investigation was designed to investigate the soil and groundwater quality on all of the lots proposed under the redevelopment site and to characterize the surface and subsurface soils and groundwater in areas where current and historic operations may have impacted the site. All investigations on the site were performed in accordance with NYCDEP "e" designation protocols. Previous investigations described below, include only the investigations that were performed on lot 16.

The RI included installation of soil borings and sampling of soil and groundwater using track-mounted and truck-mounted Geoprobe® units. Soil and groundwater sampling was conducted on January 29 through February 2 and February 5, 2007. Soil samples were collected from a total of four borings (SB14 through SB17) on Lot 16, (Figure 4). Groundwater samples were collected at two of the four boring locations (SB14, SB16). No visual or olfactory evidence of contamination was observed in any of the borings. Soil samples were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-volatile Organic Compounds (SVOCs), Pesticides, PCBs, and Target Analyte List (TAL) Metals. Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, Pesticides, PCBs, and Total and Dissolved TAL Metals. Analytical results for soil samples were compared to the NYSDEC Technical Administrative Guidance Memo (TAGM) Residential Soil Cleanup Objectives RSCOs, and to TOGS 1.1.1 Class GA Groundwater Standards for groundwater samples.

Soil: The analytical results for VOCs did not identify any analytes at concentrations exceeding the NYSDEC TAGM 4046 RSCOs. The analytical results for SVOCs identified several analytes at concentrations exceeding the NYSDEC TAGM 4046 RSCOs (Table 1). The type and levels of SVOCs identified in the samples are typical of urban fill material. These SVOCs were typically found in higher concentrations in the shallow soil samples then in the deeper samples. Pesticides, PCBs, and metals identified in shallow soils at concentrations exceeding the NYSDEC TAGM 4046 RSCOs. These compounds are believed to be associated with past site uses.

Groundwater: No VOCs, SVOCs, Pesticides or PCBs were detected in the groundwater samples at concentrations exceeding the TOGS 1.1.1 Class GA Groundwater Standards. Metals found at concentrations above the TOGS 1.1.1 Class GA Groundwater Standards (Table 2) are considered to be related to the urban fill.

2.3 SITE INSPECTION

A qualified FLS representative performed a Phase I Environmental Site Assessment (ESA) at the Site during April 2005. A review of historic documentation revealed that the property to the north, across West 30th Street had been used for metal enameling. Based upon surface topography, this site is located hydraulically side-gradient to the Site: therefore, the operations are not a concern to the Site.

The structure located at 515 West 30th Street (upgradient to the Site) was previously occupied by a chemical manufacturer. No further information regarding the historic operations was obtained through the historic documentation reviewed.

FLS observed one monitoring well in the sidewalk to the south of the parking garage located at 529-539 West 29th Street. Another two monitoring wells were located on the South Side of West 29th Street (side-gradient to the Site); in front of the Sean Kelly art gallery (528 West 29th Street). Review of the historic Sanborn fire insurance maps revealed that an unspecified number of gasoline underground storage tanks (USTs) were present at this property starting circa 1930. A closed gasoline fill port was observed in the center of the two wells on the adjacent property to the south. It is expected that the three monitoring wells were installed as part of a tank closure

which had been performed at this property. This site was not listed with a documented release in the regulatory database.

A 1 foot by 2 foot concrete patch was observed just south of the West 30th Street entrance to the parking garage. There is a potential that, based on the location and size of the patch, this patch was a hydraulic lift pit that had been previously closed.

2.4 AREAS OF CONCERN

The presence of historic fill is identified as on-site Areas of Concern (AOCs).

Several off-site AOCs have been identified for this Site in a 2005 Phase I report:

1. The historic junkyard and filling station operations on Lot 37, up-gradient from the Site.
2. No. 4 fuel oil was stored in a storage tank located in a vault in the basement of 502-504 West 30th Street (up/cross-gradient from the Site).
3. The historic auto repair operations beneath the high line, up-gradient from the Site.
4. The chemical manufacturer located at 515 West 30th Street (up-gradient to the Site).

The Phase 1 Report is presented in Appendix A.

3.0 PROJECT MANAGEMENT

3.1 PROJECT ORGANIZATION

The Qualified Environmental Profession (QEP) responsible for preparation of this RIR is Arnold, F. Fleming. The project manager is Kevin McGuinness. Various FLS staff were involved in the collection of the site data and the formulation of the RIR.

3.2 HEALTH AND SAFETY

All work described in this RIR was performed in full compliance with applicable laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements.

3.3 MATERIALS MANAGEMENT

All material encountered during the RI was managed in accordance with applicable laws and regulations. Soil cuttings were put back in the hole after taking samples. Purge water sampling was stored in covered 55 gallon Department of Transportation approved steel drums which were sealed at the end of each work day. Each drum was labeled with the date, waste type (purge water), and a point of contact. All other investigation derived waste (IDW) generated during the remedial investigation (e.g. acetate liners, gloves, etc.) was collected in garbage bags and disposed of in accordance with applicable laws and regulations.

4.0 REMEDIAL INVESTIGATION ACTIVITIES

FLS, on behalf of West 30th Highline Holdings, L.L.C. performed the following additional Remedial Investigative activities to complement the results of the 2007 investigation:

5. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
6. Installed 4 soil borings in 2007 and 8 soil borings in 2011 across the entire project Site, and collected 8 soil samples in 2007 and 16 soil samples in 2011 for chemical analysis from the soil borings to evaluate soil quality;
7. Installed 2 temporary groundwater monitoring points in 2007 and 3 temporary groundwater monitoring points in 2011 throughout the Site to collect 2 groundwater samples in 2007 and 3 groundwater samples in 2011 for chemical analysis to evaluate groundwater quality; and
8. Installed 3 soil vapor probes around the Site in 2011 and collected 3 samples for chemical analysis.

The locations of the soil borings, groundwater samples, and soil vapor samples are shown on Figure 4 (2007) and Figure 5 (2011).

4.1 GEOPHYSICAL INVESTIGATION

Geophysical surveys were conducted at four locations at the site in 2007. A geophysical survey was not conducted in 2011. In 2007, the borings were screened with a GPR unit to locate buried USTs and underground utilities on January 29. The results of the GPR survey are detailed in HTE's February 2, 2007 Remote Sensing Survey report, which is included as Appendix B.

4.2 BORINGS AND MONITORING WELLS

Drilling and Soil Logging

2007 Investigation

Borings were installed using a direct-push Geoprobe® sampling methodology by Hydrotech Environmental during the week of January 29th to February 2nd, and February 5th, 2007. A 2-inch

macrocore sampler with disposable acetate liners was used to obtain undisturbed soil cores until groundwater was encountered, at approximately 10 to 15 ft. below ground surface (ft bgs). Soil boring locations are shown on Figure 4 and soil boring logs are attached in Appendix C-1.

2011 Investigation

Aquifer Drilling and Testing Inc. (ADT) of New Hyde Park, a New York State licensed driller, advanced 8 soil borings using a Geoprobe® "Direct Push" rig. 5-foot macrocore samplers were driven to the prescribed depth of 20 ft bgs. Soils were retained from each borehole via macro-core acetate liners and logged according to a modified Burmeister soil classification system. The VOC field measurements were collected at discrete intervals along the macrocore sleeve using a photoionization detector (PID). After sampling was completed, soil cuttings were returned to each borehole and each borehole was grouted and patched. Prior to initiating any subsurface work, a “one-call” utility mark-out was done to identify nearby utilities and clear all soil boring and monitoring well locations.

Boring logs were prepared by a geologist and are attached in Appendix C-2. Figure 5 shows a map with the locations of the soil borings and monitor wells .

Groundwater Monitoring Well Construction

2007 Investigation

Direct-push groundwater sampling was performed by advancing a one-inch diameter groundwater sampling tool to 12 to 16 ft. below the groundwater interface (approximately 24 to 28 ft bg). The sampling depth corresponds to the top of the confined aquifer. When the bottom of the tool was at the desired depth, the outer cylinder was pulled back, exposing a perforated stainless-steel sample entry barrel (sampling compartment) covered with either a nylon or polyethylene filter material. Hydrostatic pressure then forces groundwater into the sampler. Quarter-inch inner diameter polyethylene tubing was inserted inside the hollow steel rod and sent down to the sample compartment. Groundwater samples were collected using either a check lift valve or a peristaltic pump depending on conditions encountered at the boring.

Groundwater collection sample locations are shown in Figure 4. The approximate depth at which groundwater was encountered is included in the boring logs which are attached in Appendix C-1.

2011 Investigation

Three soil borings (SB-1, SB-2, and SB-3) were converted to temporary monitoring wells (MW-1, MW-2 and MW- 3). After the borehole was completed, a 1.5 inch (Outer Diameter) PVC pipe with a 10 ft. of screen and 10 feet of riser was inserted to predetermined depth. Using a peristaltic pump, each monitoring well was developed to remove sediments and fine soils from the well screen. Each boring/sampling location was measured and surveyed from base point on site.

Groundwater collection sample locations are shown in Figure 5. The approximate depth at which groundwater was encountered is included in the boring logs which are attached in Appendix C-2.

4.3 SAMPLE COLLECTION AND CHEMICAL ANALYSIS

Following a review of the 2007 RI results for sampling performed on Lot 16, the NYC Office of Environmental Remediation (OER) requested the collection of additional site characterization data. The request, provided in a December 22, 2011 email to FLS, requested that the following activities be undertaken:

- 8 test borings should be achieved to a minimum depth of ~14-18 feet below grade (ft bg). 2 soil samples should be collected from each boring, one from surface level (0-2 ft bg) and one subsurface between 2 ft bg and the deepest excavation depth above the water table based on visual observations, PID readings, etc. If no impacts are noted, then the subsurface sample should be collected from the maximum excavation depth (14 ft bg for slab and 18 ft bg for pile caps) or at the soil/water interface if groundwater is encountered first.
- 3 triangulated groundwater samples should be collected via temporary wells (1 sample extraction per location). Low stress/flow groundwater sampling methodologies must be implemented (i.e. EPA Method). Also, analysis for both unfiltered and filtered metals should be undertaken per sample.

- 3-5 evenly spaced soil gas samples should be extracted from locations across the site. Screening points should be installed a minimum of 5 ft. below the surface, or 1 foot above the groundwater interface. Sampling should occur over a minimum duration of 2 hours.

The scope of the investigatory activities requested by OER was utilized to develop a letter work plan which was, in turn submitted to OER on December 27, 2011. A copy of the letter work plan is provided in Appendix D.

All media including soil, groundwater and soil vapor have been sampled and evaluated in the RIR. Discrete (grab) samples have been used for final delineation of the nature and extent of contamination and to determine the impact of contaminants on public health and the environment. The sampling performed and presented in this RIR provides sufficient basis for evaluation of remedial action alternatives, establishment of a qualitative human health exposure assessment, and selection of a final remedy.

Soil Sampling

2007 Sampling

The soil samples were screened for volatile organic vapors using an organic vapor meter (OVM) or PID. Two soil samples were collected from each boring and submitted for laboratory analysis. One sample collected at the surface between 0-2 ft. (below concrete slabs or paved surfaces) and, as no elevated PID readings were observed, at the proposed excavation depth or groundwater interface.

A total of 8 soil samples were collected for chemical analysis during this part of the RI. Data on soil sample collection for chemical analyses, including dates of collection and sample depths, is reported in Table 1. Figure 4 shows the location of samples collected in this part of the investigation.

2011 Sampling

At each boring, two sets of discrete samples were collected; one shallow (at 0-2 ft bg) and one deep. The deep samples were biased toward the areas of highest contamination based on field screening of soils or at the groundwater interface (12-14 ft bg). All equipment was decontaminated between boreholes using an Alconox detergent rinse. No QA/QC samples were collected.

A total of 16 soil samples were collected for chemical analysis during this part of the RI. Data on soil sample collection for chemical analyses, including dates of collection and sample depths, is reported in Table 3. Figure 5 shows the location of samples collected in this investigation.

Groundwater Sampling

2007 Sampling

Two soil borings (SB14 and SB16) were converted to temporary monitoring wells (SB14GW and SB16GW) and 2 groundwater samples were collected for chemical analysis during this part of the RI. Hydrostatic pressure forces groundwater into the sampler in the boring hole. Quarter-inch inner diameter polyethylene tubing was inserted inside the hollow steel rod and sent down to the sample compartment. Groundwater samples were collected using either a check lift valve or a peristaltic pump depending on conditions encountered at the boring.

2011 Sampling

Three soil borings (SB-1, SB-2, and SB-3) were converted to temporary monitoring wells (MW-1, MW-2 and MW- 3) and 3 groundwater samples were collected for chemical analysis during this part of the RI. Prior to sampling, each well was purged of three to five well volumes of water to obtain representative groundwater samples. After sampling, all non-disposable equipment was decontaminated with an Alconox detergent and rinsed with distilled-deionized water. No QA/QC samples were collected.

Groundwater sample collection data is reported in Table 4. Sampling logs, with information on purging and sampling of groundwater monitor wells, are included in Appendix E. Figure 5 shows the location of groundwater samples.

Soil Vapor Sampling

Soil vapor samples were collected in 2011 from three locations (SG-1, SG-2 and SG-3). Using a Geoprobe®, stainless steel soil vapor rods were installed to 5 ft bg. At each location, a steel expendable point was driven to predetermined depth and the rod was slowly retracted to create an open void space where soil gas could enter for sampling. A sampling cap and tubing

was attached to the end of the rods and gas was purged and collected via 6-liter SUMMA canister with a 2-hour flow regulator. No QA/QC samples were collected

Soil vapor sample locations are shown in Figure 5. Soil vapor data is reported in Table 5. Soil vapor sampling logs are included in Appendix F. The methodologies used for soil vapor assessment conform to the *NYS DOH Final Guidance on Soil Vapor Intrusion, October 2006.*

Chemical Analysis

The laboratory analytical results presented in this RIR have been performed in the following manner:

Factor	Description
Quality Assurance Officer	The chemical analytical quality assurance is directed by Kevin McGuinness
Chemical Analytical Laboratory	Chemical analytical laboratory(s) used in the RI is NYS ELAP certified and were Accutest Laboratories of Dayton, New Jersey, a state certified ELAP laboratory
Chemical Analytical Methods	Soil analytical methods: • TAL Metals by EPA Method 6010C (rev. 2007); • VOCs by EPA Method 8260C (rev. 2006); • SVOCs by EPA Method 8270D (rev. 2007); • Pesticides by EPA Method 8081B (rev. 2000); • PCBs by EPA Method 8082A (rev. 2000); Groundwater analytical methods: • TAL Metals by EPA Method 6010C (rev. 2007); • VOCs by EPA Method 8260C (rev. 2006); • SVOCs by EPA Method 8270D (rev. 2007);

	• Pesticides by EPA Method 8081B (rev. 2000); • PCBs by EPA Method 8082A (rev. 2000); Soil vapor analytical methods: • VOCs by TO-15 VOC parameters.

Results of Chemical Analyses

Laboratory data for soil, groundwater and soil vapor are summarized in Tables 3, 4, and 5, respectively. The laboratory data deliverables for the 2011 samples evaluated in this RIR are provided in digital form in Appendix G.

5.0 ENVIRONMENTAL EVALUATION

5.1 GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS

The Site is mapped on the *Weehawken Quadrangle, New Jersey-New York* 7.5 Minute Topographic Map, published in 2011 by the United States Geological Survey (USGS). Review of the topographic map indicates that the Site is located approximately 15 ft. above mean sea level.

Geology

The December 2011 FLS subsurface investigation indicated that there are two strata under the Site. The upper stratum is a miscellaneous fill with thicknesses ranging from 2 to 8 ft. comprised of sand, silt, and gravel with asphalt, bricks, ash, wood and concrete fragments. The stratum below the fill layer is native soil consisting of brown silty sand, in moderately moist and dense condition. The underlying native soil layer becomes less dense below the water table. Soil boring logs are presented as Appendix C-2. Soil samples were retained from the 0-2 ft bg and 12-14 ft bg intervals and submitted for laboratory analysis. All of the 0-2 ft samples were of fill material, which will be removed during site excavation. All of the 12-14 ft. samples were of what appeared to be native soils.

Hydrogeology

Findings of the FLS subsurface investigations indicate that groundwater was encountered at depths ranging from approximately 9 to 10 ft. bg. The local groundwater flow is assumed to be north/northwest toward the Hudson River.

Water level data are included in the boring logs which are attached in Appendix C-2. The average depth-to-groundwater is 10.64 ft. and the range in depth is 10.16 to 11.34 ft. Groundwater flow is from southeast to northwest.

5.2 SOIL CHEMISTRY

Soil samples collected in 2011 were analyzed by Accutest Laboratories of Dayton, New Jersey, a state certified ELAP laboratory. The analytical results were compared to the NY SCO Residential and Commercial w/CP-51 (10/10) (6 NYCRR 375-6 12/06) standards (Track 1 SCOs).

Soil/fill samples collected during the 2011 remedial site investigation revealed the presence of several contaminants in excess of Track 1 Unrestricted Soil Clean-up Objectives (SCOs) and Track 2 Restricted Residential SCOs at all 8 locations sampled, most notably semi-volatile organic compounds (SVOCs)/polycyclic aromatic compounds (PAHs), and metals. PAH levels exceeding Track 1 and Track 2 SCOs were detected in 3 of 8 sampling locations (SB-1, SB-7, SB-8). Metal levels, including those for barium, lead, mercury and arsenic, exceeding Track 1 and Track 2 SCOs were detected in all 8 locations sampled. Surface metal contamination can be attributable to historic fill material presence. Trace-level Track 1 SCO exceedances of PCBs and pesticides (4,4'-DDT) were detected in 2 of 8 samples (SB-4 and SB-6). In nearly all instances, contamination exceeding Track 1 SCOs was relegated to a shallow, surface depth interval (0-2 ft.). However, at location SB-6, PAHs were detected at an aggregate level of over 2,000 parts per million (ppm) within a deep, subsurface interval (12-14 ft.). The PAHs detected in this sample were at higher concentrations than those detected in the other 7 samples and higher than are typically found in urban fill. However, the SB-6 soil sample appeared to be native sandy silt with no obvious fill or other unnatural material or odor. Rather, the specific PAH compounds detected in the sample from SB-6 are indicative of weathered creosote. Creosote was commonly used as a preservative on wood used to construct piers. Metals were also detected at high levels within this location at the 12-14 ft. interval, including barium (1170 ppm), lead (2860 ppm), mercury (0.94 ppm), and zinc (1340 ppm).

The data collected during the RI is sufficient to delineate the vertical and horizontal distribution of contaminants in soil/fill at the project Site. A summary table of chemical analyses performed on soil samples is included as Table 3.

5.3 GROUNDWATER CHEMISTRY

None of the three samples collected during the 2011 remedial site investigation detected the presence of volatile organic compounds (VOCs), SVOCs, pesticides, or PCBs in appreciable quantities (i.e. at levels above NYSDEC TOGS 1.1.1 Class GA Ambient Groundwater Quality Standards (GQS)) in groundwater. Unfiltered metals analysis revealed the presence of several metals at concentrations exceeding GQS standards, including lead, selenium, iron, magnesium, manganese and sodium. Dissolved (filtered) metals analysis also revealed the presence of the afore-mentioned, but at substantially lower levels. Of note, lead was undetectable in dissolved groundwater data. The rest of the metals present in dissolved groundwater may be attributed to intrusion or road salting, as they are saline indicators.

The data collected during the RI is sufficient to delineate the distribution of contaminants in groundwater at the Site. A summary table of the chemical analyses performed on groundwater samples is included in Table 4. Exceedances of applicable groundwater standards are shown.

5.4 SOIL VAPOR CHEMISTRY

The results of the laboratory analysis of the soil vapor samples did not identify any volatile organic compounds at concentrations exceeding regulatory standards. Trace levels of methylene chloride, tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in the samples analyzed, but at levels far below those which trigger decision matrix actions as per the New York State Department of Health's Soil Vapor Intrusion Guidance Document.

The soil gas samples were analyzed for VOCs by Accutest Laboratories of Dayton, New Jersey, a state certified ELAP laboratory. The sSoil gas analytical results were compared to values presented in the NYS DOH Final Guidance on Soil Vapor Intrusion (October 2006). The results of the comparison to those values are found in Table 5. The analytical results are further described below.

The data collected during the RI are sufficient to delineate the distribution of contaminants in soil vapor at the Site. A summary table of data for chemical analyses performed on soil vapor samples is included in Table 5.

5.5 PRIOR ACTIVITY

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

5.6 IMPEDIMENTS TO REMEDIAL ACTION

There are no known impediments to remedial action at this property.

Appendix C

Soil-Materials Management Plan

Appendix C

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 Remedial Action Report (RAR). Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Satisfaction.

1.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.), if not directly loaded into trucks for offsite disposal, 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 offsite 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 onsite, if any, 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 RAP;
- 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 onsite will not be performed without prior OER approval.

1.5 Offsite 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 offsite disturbance. Offsite queuing will be minimized.

Outbound truck transport routes are shown on figures on Figure 8 of the RAWP. 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 offsite 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 Offsite

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

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken offsite 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 offsite 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 offsite transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from onsite will be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 Materials Reuse Onsite

While none is anticipated, soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused onsite. The soil cleanup objectives for onsite reuse are listed in the RAWP. “Reuse onsite” 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 Engineering 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 RAWP.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried onsite. 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 (if any), 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 RAR; 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.

1.9 Import of Backfill Soil from Offsite Sources

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

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), if any is used, 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 offsite 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. Appropriate erosion and sediment control measures, as identified in this RAP (silt fences and barriers, and hay bale checks) will be taken. Because the Site is at grade and will be excavated below grade, offsite migration

of storm-water/sediment is less of an issue. To ensure that there is no offsite issues, barriers will be installed around the entire perimeter of the Site at the initiation of excavation/site preparation activities. The excavation contractor will excavate the full Site to a minimum of 0.5 feet below adjoining sidewalk grade before initiating any further activities. Once the full Site grade is lowered, there will be no further risks of storm-water/sediment runoff from Site activities. The ability of the lowered Site to ensure that no runoff occurs, will be inspected once a week and after every significant rain event to ensure that there are no issues.

There are no anticipated discharge locations, but if there are any, they will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. The results of any inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Any necessary repairs will be made immediately. Any accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Any undercutting or erosion of the silt fence anchor will be repaired immediately with appropriate backfill materials. The 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 onsite 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 Full List volatiles and semi-volatiles, pesticides/PCBs, and TAL metals, as appropriate.

1.13 Odor, Dust and Nuisance Control

Odor Control

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

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

Dust Control

Dust management during invasive onsite 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 Closure 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.

1.14 Import of Clean Cover

Any soil may be imported to the Site will be uncontaminated, clean soil that meets the lesser of the appropriate NYSDEC 6 NYCRR Part 375-6.8 Restricted Use Class SCOs and the NYSDEC 6 NYCRR Part 375-6.8 groundwater protection SCO.

The imported uncontaminated, clean soil will be from an approved source/facility and will be evaluated by the PE/QEP to ensure:

1) That a segregated stockpile is properly maintained at the source and will not be comingled with any other material prior to importing and grading the clean soil material at the Site;
2) That the material does not include any solid waste, including construction and demolition material, as it's prohibited;
3) That screening for evidence of contamination by visual, olfactory and PID soil screening practices prior to testing at the source as well as upon importing to the Site for grading is completed; and
4) That a maximum five-part composite sample will be collected from the segregated stockpile at the source at a minimum frequency of one sample per 250 cubic yards and analyzed for the following Full List parameters:
    - VOCs by EPA Method 8260C (rev. 2006)
    - SVOCs by EPA Method 8270D (rev. 2007)
    - Pesticides by EPA Method 8081B (rev. 2000)

- PCBs by EPA Method 8082A (rev. 2000)
- TAL Metals by EPA Method 6010C (rev. 2007)

Upon receipt of the segregated stockpile analytical results collected at the source, a Clean Soil Sampling Report will be submitted to OER for review/approval prior to importing. The report will include the following:

1) Summary of number of samples collected and analyzed, tabulated data and comparison to the selected Site Use SCOs;
2) Analytical data sheets and chain of custody documentation;
3) Summary of number tons (number cubic yards);
4) Photographs from the segregated stockpile at the source with sample point locations identified;
5) An affidavit from the source/facility on company letterhead stating that the segregated stockpile for TBD tons (TBD cubic yards) has been properly maintained at the source and complies with the requirements listed above; and
6) A copy of source/facility NYSDEC permit;

Appendix D

Vapor Barrier Specs

PRODUCT INFORMATION

Preprufe® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites.

Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it –** prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered watertight laps** and detailing
- **Provides a barrier to water, moisture and gas –** physically isolates the structure from the surrounding ground
- **BBA Certified** for basement Grades 2, 3, & 4 to BS 8102:1990
- **Zero permeance** to moisture
- **Solar reflective –** reduced temperature gain
- **Simple and quick to install –** requiring no priming or fillets
- **Can be applied to permanent formwork –** allows maximum use of confined sites
- **Self protecting –** can be trafficked immediately after application and ready for immediate placing of reinforcement
- **Unaffected by wet conditions –** cannot activate prematurely
- **Inherently waterproof, non-reactive system:**
  - not reliant on confining pressures or hydration
  - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant –** effective in most types of soils and waters, protects structure from salt or sulphate attack

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

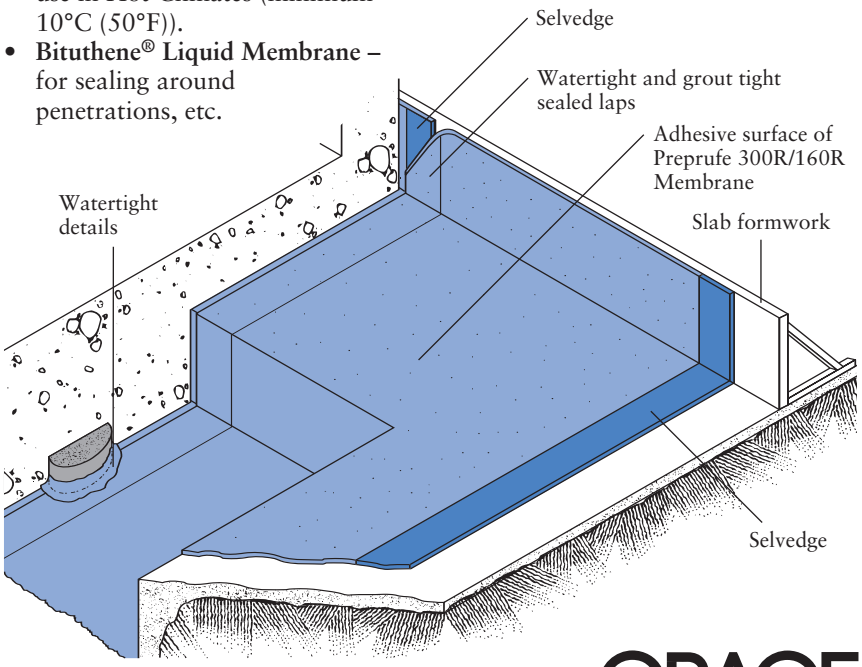
Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

- **Preprufe 300R –** heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R –** thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT –** for covering cut edges, roll ends, penetrations and detailing (temperatures between -4°C (25°F) and +30°C (86°F)).
- **Preprufe Tape HC –** as above for use in Hot Climates (minimum 10°C (50°F)).
- **Bituthene® Liquid Membrane –** for sealing around penetrations, etc.

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted sand or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.



BBA BRITISH BOARD OF AGREMENT CERTIFICATE No. 97/3325

GRACE Construction Products

Installation

The most current application instructions, detail drawings and technical letters can be viewed at www.graceconstruction.com. Technical letters are provided for the following subjects to assist in the installation of Preprufe:

- Chemical Resistance
- Minimizing Concrete Shrinkage and Curling
- Rebar Chairs on Preprufe 300R Membrane
- Removal of Formwork Placed Against Preprufe Membranes
- Winter Lap Sealing and the use of Preprufe Tape LT

For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 1.2 m (4 ft) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

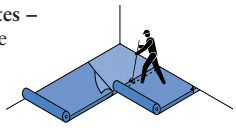
All surfaces – It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 12 mm (0.5 in.). Grout around all penetrations such as utility conduits, etc. for stability.

Horizontal – The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. The surface does not need to be dry, but standing water must be removed.

Vertical – Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 12 mm (0.5 in.) out of alignment.

Membrane Installation

Preprufe can be applied at temperatures of -4°C (25°F) or above. When installing Preprufe in cold or marginal weather conditions <13°C (55°F) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application.

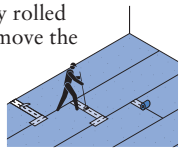


Horizontal substrates – Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 75 mm (3 in.) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

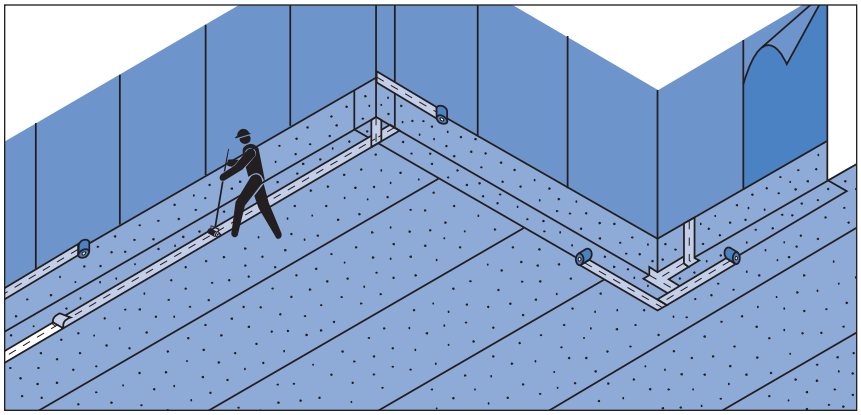
Refer to Grace Tech Letters for information on suitable rebar chairs for Preprufe.

Vertical substrates – Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Secure the top of the membrane using a batten such as a termination bar or similar 50 mm (2 in.) below the top edge. Fastening can be made through the selvedge so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner. Any additional fasteners must be covered with a patch of Preprufe Tape.



Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges – Overlap all roll ends and cut edges by a minimum 75 mm (3 in.) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap and roll firmly. Immediately remove printed plastic release liner from the tape.



Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit www.graceconstruction.com. This Manual gives comprehensive guidance and standard details for:

- internal and external corners
- penetrations
- tiebacks
- columns
- grade beam pilecaps
- tie-ins
- terminations

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by jet washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (12 mm (0.5 in.) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 150 mm (6 in.) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe R Membrane and Tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

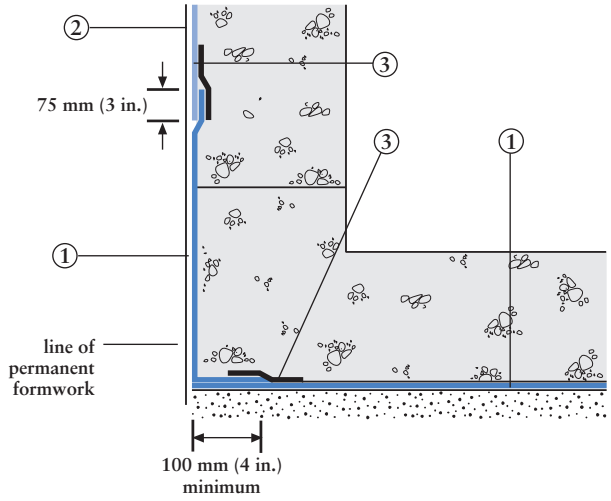
A minimum concrete compressive strength of 10 N/mm^2 (1500 psi) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

As a guide, to reach the minimum compressive strength stated above, a structural concrete mix with an ultimate strength of 40 N/mm^2 (6000 psi) will typically require a cure time of approximately 6 days at an average ambient temperature of -4°C (25°F), or 2 days at 21°C (70°F).

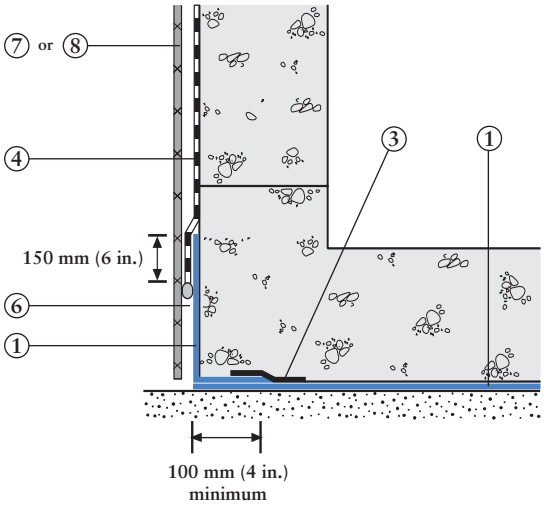
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at www.graceconstruction.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

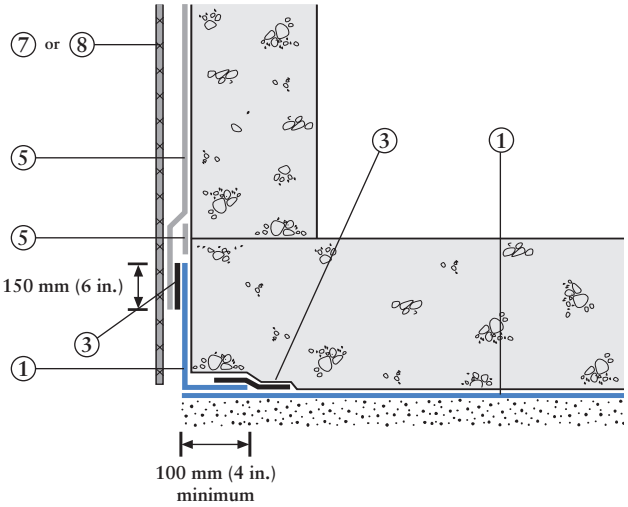
Wall base detail against permanent shutter



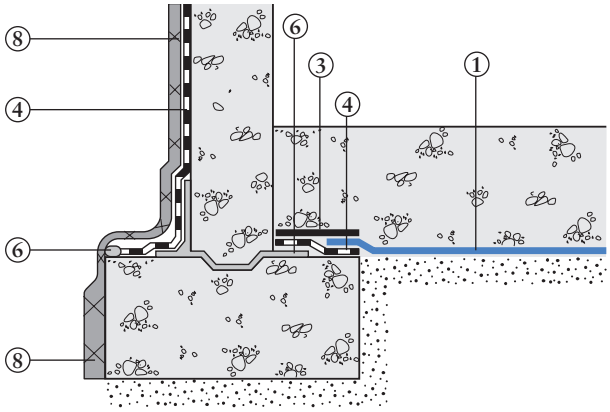
Bituthene wall base detail (Option 1)



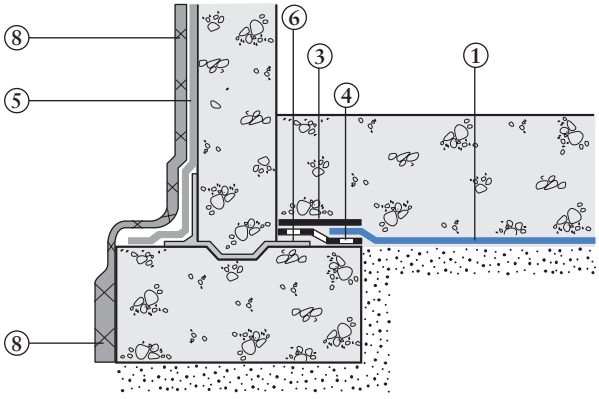
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



1 Preprufe 300R
2 Preprufe 160R
3 Preprufe Tape
4 Bituthene
5 Procor
6 Bituthene Liquid Membrane
7 Protection
8 Hydroduct®

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	1.2 mm (0.046 in.)	0.8 mm (0.032 in.)	
Roll size	1.2 m x 30 m (4 ft x 98 ft)	1.2 m x 35 m (4 ft x 115 ft)	100 mm x 15 m (4 in. x 49 ft)
Roll area	36 m^2 (392 ft^2)	42 m^2 (460 ft^2)	
Roll weight	50 kg (108 lbs)	42 kg (92 lbs)	2 kg (4.3 lbs)
Minimum side/end laps	75 mm (3 in.)	75 mm (3 in.)	75 mm (3 in.)

*LT denotes Low Temperature (between -4°C (25°F) and +30°C (86°F))
HC denotes Hot Climate (>+10°C (50°F))

Ancillary Products

Bituthene Liquid Membrane – 5.7 liter (1.5 US gal) or 15.1 liter (4 US gal)

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	1.2 mm (0.046 in.) nominal	0.8 mm (0.032 in.) nominal	ASTM D3767
Low temperature flexibility	Unaffected at -23°C (-10°F)	Unaffected at -23°C (-10°F)	ASTM D1970
Resistance to hydrostatic head, minimum	70 m (231 ft)	70 m (231 ft)	ASTM D5385, modified[1]
Elongation, minimum	300%	300%	ASTM D412, modified[2]
Tensile strength, film, minimum	27.6 MPa (4000 psi)	27.6 MPa (4000 psi)	ASTM D412
Crack cycling at -23°C (-10°F), 100 cycles	Unaffected	Unaffected	ASTM C836
Puncture resistance, minimum	990 N (221 lbs)	445 N (100 lbs)	ASTM E154
Peel adhesion to concrete, minimum	880 N/m (5.0 lbs/in.) width	880 N/m (5.0 lbs/in.) width	ASTM D903, modified[3]
Lap peel adhesion	440 N/m (2.5 lbs/in.) width	440 N/m (2.5 lbs/in.) width	ASTM D1876, modified[4]
Permeance to water vapor Transmission, maximum	0.01 perms (0.6 ng/(Pa × s × m^2))	0.01 perms (0.6 ng/(Pa × s × m^2))	ASTM E96, method B
Water absorption, maximum	0.5%	0.5%	ASTM D570
Methane permeability	9.1 mls/m^2/day	N/A	University of London, QMW College[3]
Permeability[5] (hydraulic conductivity)	K=<1.4 x 10^{-11}cm.s^{-1}	K=<1.4 x 10^{-11}cm.s^{-1}	ASTM D5084-90

Footnotes:
1. Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 3 mm (0.125 in.) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
2. Elongation of membrane is run at a rate of 50 mm (2 in.) per minute.
3. Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.
4. The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).
5. Result is lower limit of apparatus. Membrane therefore considered impermeable.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

For Technical Assistance call toll free at 866-333-3SBM (3726).

Visit our web site at www.graceconstruction.com

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W. R. Grace & Co.-Conn. 62 Whittemore Avenue Cambridge, MA 02140

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GRACE
Construction Products

Preprufe®

Pre-applied waterproof membranes that develop an adhesive bond to poured concrete to prevent water migration. For use below slabs and on basement walls.

Description

Preprufe® waterproof membranes are composite sheets comprising a robust HPDE backing, a pressure sensitive adhesive and a trafficable weather resistant coating.

Uniquely, the membrane develops a continuous adhesive bond to concrete poured against it. This prevents water migration between the structure and the membrane, substantially reducing the risk of leaks.

Applications

- Water and vapour proofing all basement grades to BS 8102:1990.
- Waterproofing civil engineering sub - structures.
- Methane, carbon dioxide and radon gas protection in excess of the standard membrane requirements in BRE Reports 211 (Radon) and 212 (Methane and Carbon Dioxide).

Independent Assessments

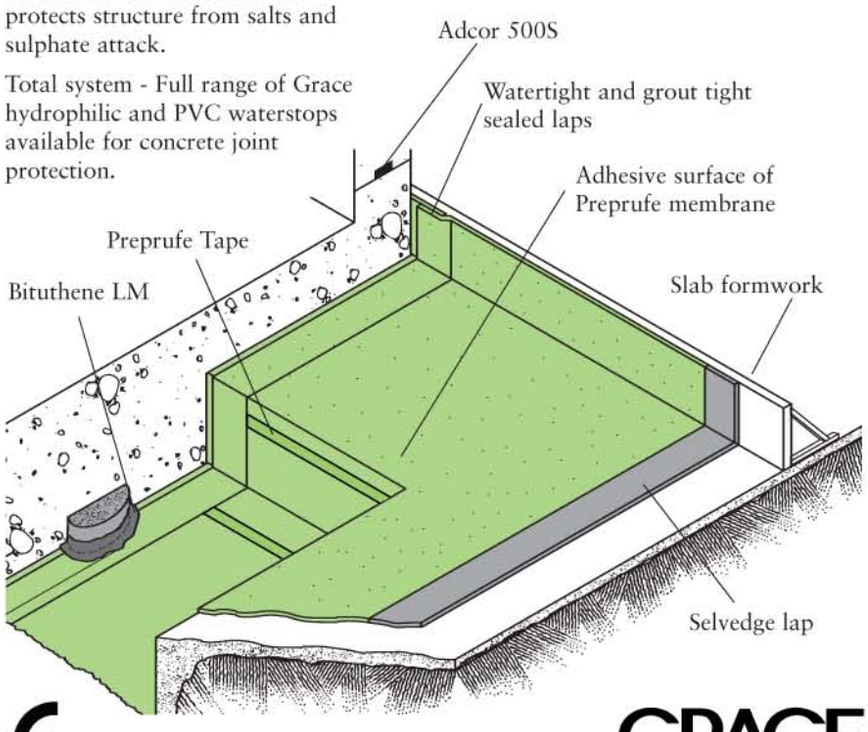
- BBA Certificate No. 97/3325.
- Mott MacDonald Special Services Report May 2001.
- International Certifications.

Advantages

- Versatile - can be used beneath foundation slabs and with single or double-sided formwork systems.
- Seals adhesively to concrete - the only technology proven to resist water migration.
- Lightweight, flexible - easy to handle and install without special corner pieces.
- No butt joints - all joints have bonded 'selvedge' or Preprufe Tape overlaps for increased leak protection.
- Inert - unaffected by groundwater contaminants, ponded water or wet/dry cycling.
- Remains sealed to structure - even if ground settles.
- Smooth surface membrane - site contamination easily removed.
- Excellent chemical resistance - protects structure from salts and sulphate attack.
- Total system - Full range of Grace hydrophilic and PVC waterstops available for concrete joint protection.

System Components

- Preprufe® 160R - used typically with concrete slab sections up to 350 mm thickness and vertically with single and double sided formwork systems.
- Preprufe® 300R - used typically with concrete slab sections greater than 350 mm thickness. Superior damage resistance.
- Preprufe® Tape - incorporating Preprufe coating for continuous concrete adhesion at taped edges and details.
- Bituthene® LM - high performance liquid membrane for detailing terminations at pile caps and pipe penetrations.
- Adcor® 500S - hydro-expansive waterstop for concrete construction joints.



Details shown are typical illustrations only and not working drawings. For assistance with working drawings and additional technical advice please contact Grace Technical Services

BBA BRITISH BOARD OF AGRÉMENT CERTIFICATE No. 97/3325

NBS Plus

CE 0836

GRACE Construction Products

Application

Material Storage

Sequence deliveries to avoid delays, but minimise on-site storage. Select a safe, covered secure location for material storage. Store materials for each day's use in a location that won't require movement a second time. Do not double-stack pallets of waterproofing on the job site. Store protection boards flat and off the ground. Provide cover on top and all sides.

Substrate Preparation

Suitable substrates include:

- concrete blinding
- well compacted sand on rolled crushed stone
- rigid insulation
- clay heave boards
- permanent formwork
- removable formwork
- 19 mm plywood
- Hydroduct drainage sheets
- Adjacent sub-structures

Substrates should be uniform with no gaps or voids greater than 12mm. Where these exist fill with a material of sufficient strength to support the membrane. All substrates must be free of loose aggregate and sharp protrusions. Where possible, avoid sloping or rounded concrete blinding.

In crushed stone applications, it is important to create a sound and solid substrate around "through slab" penetrations to eliminate movement during the concrete pour. Excessive movement may jeopardise the waterproofing integrity around the penetration. Grout around the penetration prior to installing the membrane for stabilisation.

The surface does not need to be dry, but standing water must be removed. Substrates must have sufficient rigidity not to move during the concrete pour. Boarded substrates must be close butted to provide support and not more than 12 mm out of alignment.

Installation - General

Tools /materials required:

Heavy duty lap roller

Stanley /Utility knives

Tape measure

Cotton cleaning cloths

Plywood or similar cutting board

Thin metal straight edge

Chalk line

Broom

2 metre long pipe or heavy broom handle

Hot air heat gun

Grace MR2 paddle for mixing Bituthene LM

Round nose trowel or spatula

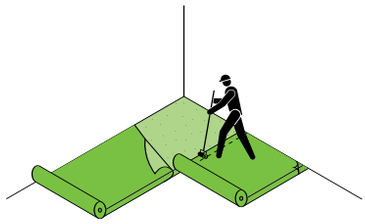
Required protection and/or drainage boards and other ancillary products

Preprufe membranes are supplied in rolls 1.2m wide with a self adhesive selvedge on one edge to enable fully bonded laps between adjacent rolls. All other laps must be taped with Preprufe Tape.

Minimum application temperature +5°C.

When installing Preprufe in cold or marginal weather conditions (<13°C) the use of Preprufe Tape LT is recommended at <u>all</u> laps and detailing. Preprufe Tape LT should be applied to clean dry surfaces and the release liner must be removed immediately after application.

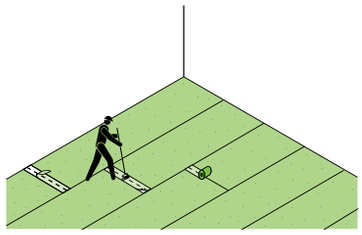
Installation - Horizontal



Place the membrane with the removeable plastic release liner uppermost. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed. Accurately position subsequent sheets to overlap the previous sheet 75mm along the selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly. On completion of the installation, **ensure complete removal of the plastic release liner from all membrane and tape.**

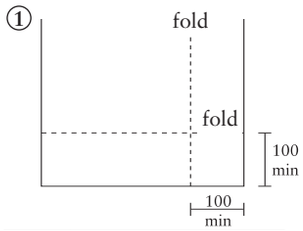
End Laps and Cut Edges

Overlap all roll ends and cut edges by a minimum 75mm and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape centred over the lap and roll firmly. Refer also to Preprufe Standard Details.

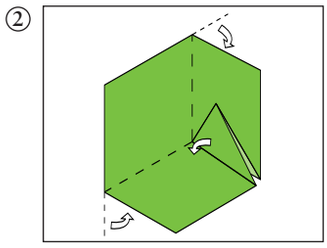


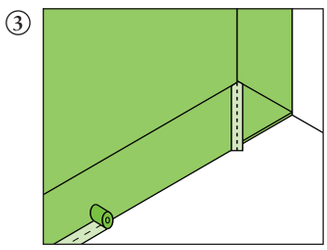
Corners

Internal and external corners should be formed as shown in the diagrams returning the membrane a minimum of 100mm and sealing with Preprufe Tape. Ensure that the apex of the corner is covered and sealed with Tape and **roll firmly**. Crease and fold the membrane to ensure a close fit to the substrate profile and avoid hollows.

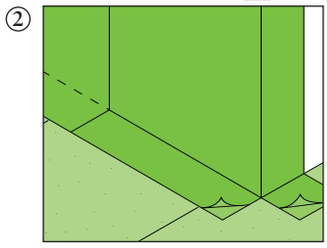


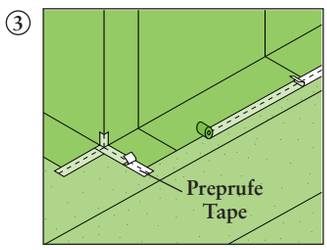
Internal

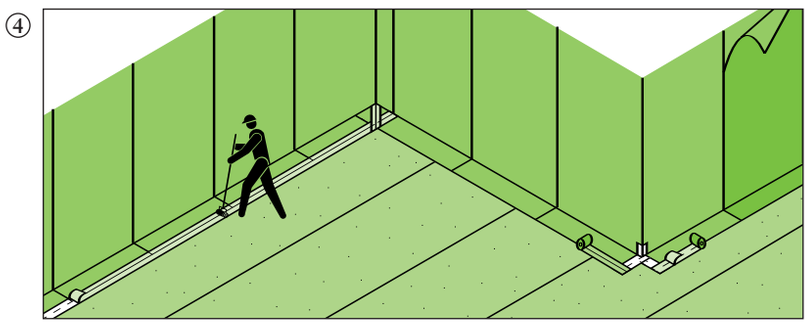




External







Internal & External Corners

Internal & external corners should be formed as shown in the diagrams below. Ensure that all laps are 100 mm minimum, taped with Preprufe Tape and well rolled. Crease and fold the membrane to ensure a close fit to the substrate profile.

Penetrations

To seal around penetrations such as service pipes, pile heads, lightning conductors, etc. mark and cut membrane tight to the penetration. If the membrane is not aligned within 12mm of the penetration, apply Preprufe Tape lapped onto the membrane and butted tight to the penetration. For pipe penetrations, wrap the pipe with Preprufe Tape. Mix and apply Bituthene LM around the penetrations using a fillet to provide a watertight seal between the Preprufe membrane and Tape. Refer also to Preprufe Standard Details.

Membrane Repair

Inspect the membrane for damage before installation of reinforcement steel, shuttering and final placement of concrete. Clean by jet washing if required.

Wipe the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. For minor repairs,

apply Preprufe Tape centrally over the damaged area and roll firmly. For larger repairs use a patch of Preprufe and tape all edges with Preprufe Tape. Remove plastic release liner from Tape.

Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and overband with Preprufe Tape and roll firmly.

Installation - Vertical

Apply the membrane with the thick white plastic face against the substrate. Mechanically fasten the membrane vertically using flat headed fixings appropriate to the substrate. The membrane may be installed in any convenient length. Secure the top of the membrane using a batten or fixing 50mm below the top edge. Use fixings at typically 600 mm centres to secure the membrane flat against the substrate. Fixings can be made through the selvedge, this allows firmly rolled overlaps, which are covered by the subsequent strip of Preprufe. Any exposed fixings should be patched with Preprufe Tape. Ensure the underside of

the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly. On completion of the installation, **completely remove the plastic release liner from all membrane and tape.**

Formwork Lining

Preprufe can be pre-applied to vertical formwork. Contact Grace for further guidance.

Removal of Formwork

Preprufe membranes can be applied to removable single and double sided formwork, slab perimeter formwork, pile caps, etc. Once concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond with Preprufe.

A minimum concrete compressive strength of 10 N/mm^2 is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in loss of adhesion between the membrane and concrete.

Wall Waterproofing Options

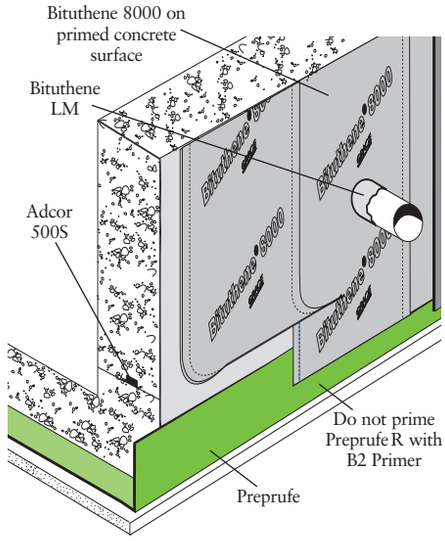
Grace also offers alternatives to pre-applying Preprufe to vertical formwork.

For conventional application to walls after formwork removal use either:

- Bituthene® 8000 - self adhesive sheet waterproofing membrane
- Procor® 75 - spray applied liquid waterproofing membrane.

Selection of the most cost-effective solution will depend on the construction programme, type of formwork system, wall height etc.

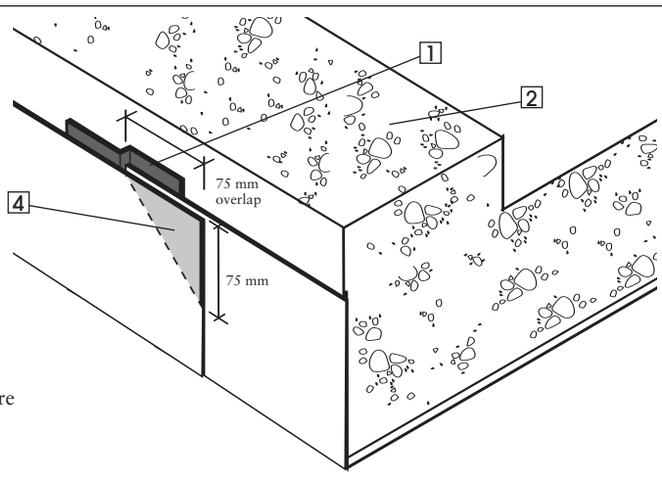
See separate data sheets for further information.



Bituthene 8000 post applied to walls in conjunction with Preprufe® below slabs

Preprufe Preparation When Bituthene Is Used on Walls

Inspect the Preprufe around the perimeter edge of the concrete slab. Identify any exposed non-selvedge overlaps in Preprufe. To ensure continuity of the fully bonded system, carefully cut and remove a 75 mm triangular piece of the top flap of Preprufe only, as shown shaded in the standard detail, Slab Perimeter Detail - non selvedge lap'.



Slab Perimeter Detail

1. Taped non-selvedge lap
2. Poured Concrete
3. Remove formwork
4. Cut and remove shaded piece before applying Bituthene

Supply

Preprufe®	300R	160R	Tape LT* or HC*
Thickness (nominal)	1.2 mm	0.8 mm	0.7 mm
Roll size	1.2 x 30.0 m	1.2 x 35.0 m	100 mm x 15.0 m
Roll area	36.0 m^2	42 m^2	
Roll weight	50 kgs	42 kgs	2 kgs
Minimum edge/end laps	75 mm	75 mm	75 mm

*LT denotes for temperature between -4^{0}C and +30^{0}C

*HC denotes for temperature between +10^{0}C and +40^{0}C

Ancillary Products

Adcor® 500S	5 m rolls
Bituthene® LM	5.7 litre
Paddle MR2 (80mm dia) for mixing	Unit
Lap Roller	Unit

Typical Properties

	Preprufe 300R	Preprufe 160R
Thickness (mm)	1.2	0.8
Adhesion to concrete (N/mm)	2.88	2.88
Shear strength of joints (N/mm)	9.52	9.52
Hydrostatic head resistance (m) ASTM D 5385 mod.	> 70	> 70
Water resistance (EN 1928)	pass at 60 kPa	
Puncture resistance (N)	990	445
Water vapour transmission rate (g/m^2/24 hrs)	0	0
Methane permeability (mls/m^2/24 hrs)	9.1	34.8
Radon transmission (m/s)	<21 x 10^{-9}	21 x 10^{-9}

Ancillary Products

Adcor® 500S
Hydrophilic waterstop for construction joints and pipe entries.

AT System – Co-extruded PVC waterstops for movement joints.

Bituthene Protection Board - protection against damage from backfill.

Limitations of Use

- Do not use Preprufe between concrete infilled hollow block walls.
- It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane.

NBS Specification Clause

Refer to clause J40 297

Health & Safety

There is no requirement for a Material Safety Data Sheet for Preprufe. For health and safety questions on this product please contact Grace.

For Bituthene LM, read the product label and Material Safety Data Sheet (MSDS) before use. Users must comply with all risk and safety phrases.

MSDS's can be obtained from Grace Construction Products or from our web site at www.graceconstruction.com.

CE 0836

Grace Construction Products Ltd
Ajax Avenue, Slough
Berkshire SL1 4BH United Kingdom
06 **06/F005**

EN 13967
Preprufe 160R and 300R
Waterproofing Membranes, Type T
Watertightness : Pass at 60 kPa

web Visit our web site at www.graceconstruction.com

Grace Construction Products Ltd, Ajax Avenue, Slough, Berkshire SL1 4BH United Kingdom Tel +44 (0)1753 692929 Fax +44 (0)1753 691623

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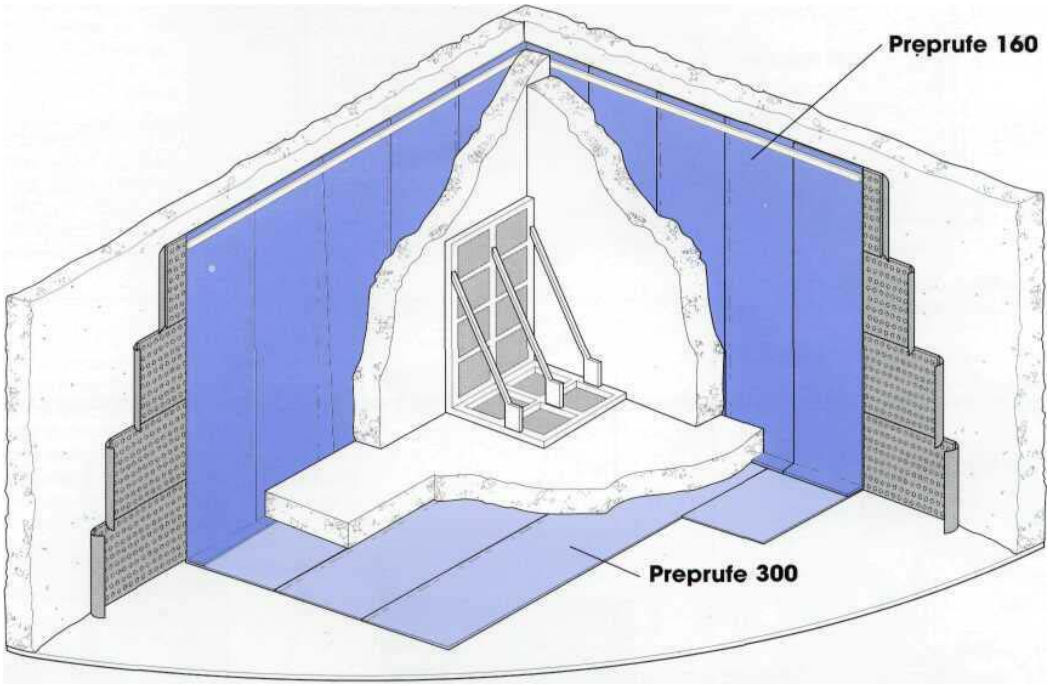
GRACE Construction Products

P R O D U C T I N F O R M A T I O N

Preprufe®

Unique pre-applied waterproofing membranes that bond to poured concrete.



Principal Applications

- Basement Waterproofing - provides protection to Grades 2, 3, & 4 as defined by British Standard 8102:1990
- Sub-slab Methane Protection

System Advantages

- Forms permanent mechanical bond to poured concrete
- Prevents water tracking between membrane and structure
- Unaffected by settlement of substrate below suspended slabs
- Eliminates requirement for protection boards, etc.
- Simple application, no priming or fillets
- Maximises use of confined sites
- Year round application advantages

The Preprufe™ System

Preprufe membranes are unique multi-layered composite sheets comprising a thick HDPE film, a highly aggressive pressure sensitive adhesive and a weather resistant protective coating.

The Preprufe System includes:

- Preprufe 300 - tough, heavy duty grade for horizontal use below slabs and rafts. Surface treated to allow foot traffic and the placing of steel reinforcement using appropriate spacers or chairs.
- Preprufe 160 - lighter grade for vertical tanking against permanent formwork
- Preprufe Tape - for overbanding roll ends, cut edges, and detailing
- Bituthene Liquid Membrane - for sealing around penetrations, etc.

Preprufe™ membranes are applied horizontally to smooth prepared concrete or well rolled sand blinding, or vertically to temporary works or adjoining structures. Reinforced concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe™ adhesive layers then work together to form a continuous and permanent bond to the concrete cast against it.

Preprufe membranes are supplied in rolls 1.2m wide with a selvedge on one side to provide sealed laps for continuity between rolls. The rolls of Preprufe and Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

GRACE
Construction Products

Application

Substrate Preparation

All Surfaces - It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 12mm. Hydroduct drainage composites provide an excellent surface for the membrane with the additional benefit of positive sub structure drainage.

Horizontal Blinding - Substrate should be monolithic concrete or well compacted sand blinding on granular fill as specified by the structural engineer. The blinding must be free of loose aggregate and sharp protrusions. An angular profiled blinding is recommended rather than a sloping or rounded substrate. The surface does not need to be dry but standing water must be removed to prevent overlaps being contaminated and waterproofing properties compromised.

Vertical sheet piling - Use concrete or 19mm plywood to face up sheet piling and provide support to the membrane. Sheets must be close butted to provide support and not more than 12mm out of alignment.

Membrane Installation

Preprufe membranes shall be laid with adjacent rolls overlapped and overbanded where necessary and firmly rolled to ensure complete adhesion and watertight continuity between layers. Preprufe can be applied at temperatures of -4°C or above. To facilitate application during cold or damp conditions, the selvedge and tape adhesive may need gentle warming using a gas torch or similar to remove moisture or condensation and improve initial adhesion.

Preprufe 300 - Unroll the membrane black film side to the substrate. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 75mm along the black selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from dust before attempting to overlap.

Peel back the plastic release liner from between the overlaps as the two layers are bonded together.

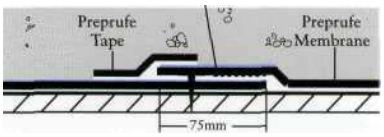
Ensure a continuous bond is achieved without creases and roll firmly. Completely remove the plastic liner to expose the white protective coating. Any initial tack will quickly disappear.

Preprufe 160 - Mechanically fasten the membrane vertically using appropriate fixings to suit the substrate. The membrane may be installed in any convenient length. Secure the top of the membrane using a batten or fixing 50mm below the top edge. Fixings can be made through the black selvedge so that the membrane lays flat and allows good well rolled overlaps. Immediately remove the plastic release liner. Ensure the underside of the succeeding sheet is clean, dry and free from dust before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll Ends & Cut Edges - Overlap roll ends and cut edges by a minimum 75mm and wipe the area with a damp cloth to ensure the area is clean and free from dust. Allow to dry and apply Preprufe Tape centred over the lap and roll firmly. Remove plastic release liner from Tape. Double sided Bitutape can be used between laps to bond exposed flap when Preprufe is applied against removable formwork or where required for increased lap security.

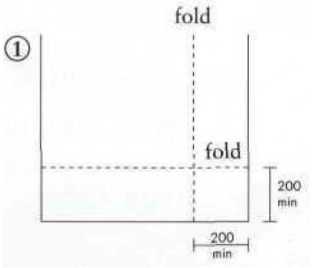
Roll end or cut edge detail

Bitutape 30mm can be used to bond exposed flap when applied against removable formwork or for increased lap security

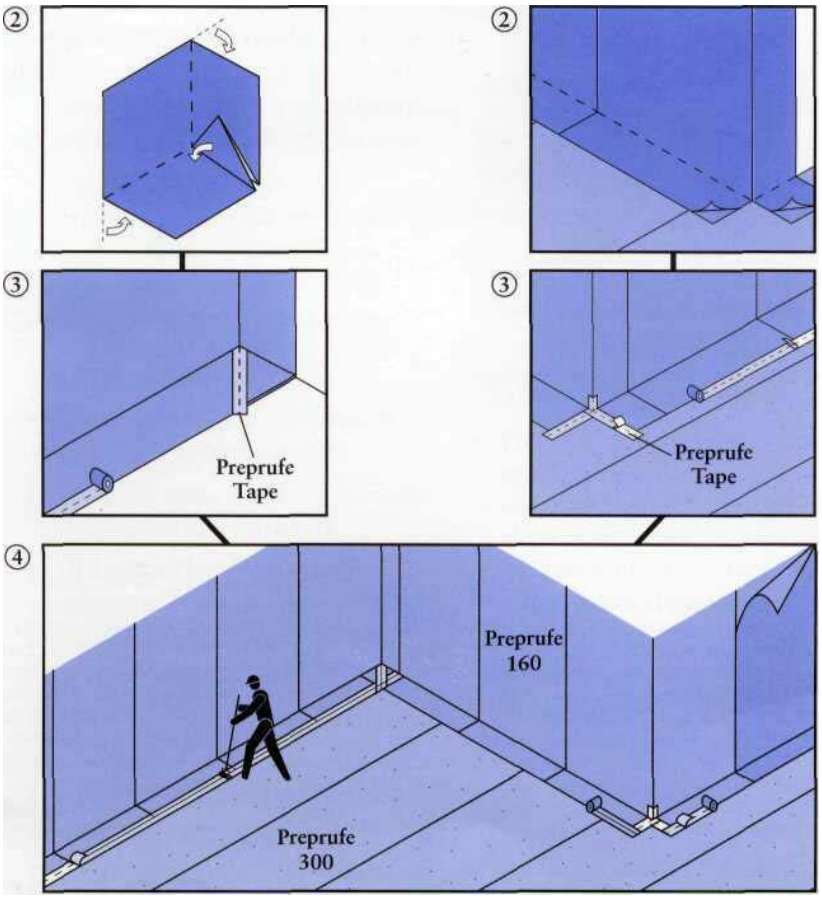


Corners

Internal and external corners should be formed as shown in the diagrams returning the membrane a minimum of 200mm and sealing with Preprufe Tape. Ensure that the apex of the corner is covered and sealed with Tape and roll firmly. Crease and fold the membrane to ensure a close fit to the substrate profile and avoid hollows. Double sided Bitutape may be used between overlaps to assist application and increase security.



Internal External



Penetrations

Use the following steps to seal around unavoidable penetrations such as service pipes, piles, lightening conductors, pits etc.

1. Scribe membrane tight to the penetration. If the membrane is not within 12mm of the penetration, apply Preprufe Tape to cover the gap.
2. Wrap the penetration with Preprufe Tape by positioning the Tape 12mm above the membrane.
3. Mix and Apply Bituthene Liquid Membrane around the penetrations using a fillet to provide a watertight seal between the Preprufe membrane and Tape.

Bituthene Tie-ins

If the Preprufe membrane ties into other Bituthene membranes or where the waterproofing and concrete placement will be in more than one lift, leave an additional 300mm flap of Preprufe exposed. Complete the detail after the concrete is poured.

Membrane Repair

Inspect the membrane before installation of reinforcement, shuttering and finally placement of concrete.

In the event of damage, repair by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Apply Preprufe Tape centrally over the damaged area and roll firmly. Any areas of exposed black adhesive should be overbanded with Preprufe Tape. Remove plastic release liner from Tape.

Where an exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and overband with fresh Preprufe Tape and roll firmly. Alternatively, use a soft gas torch or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe membrane and Tape.

Cast concrete within 40 days of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane.

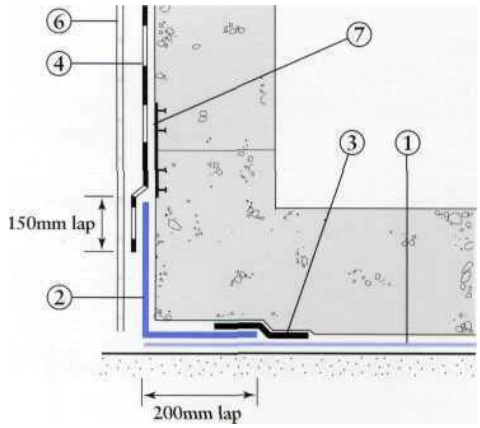
Removal of Formwork

Preprufe membranes can be applied to removable shuttering, such as slab perimeters, lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient Compressive strength to develop the surface bond.

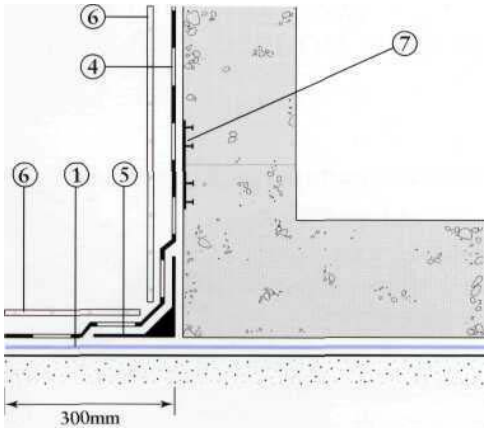
A minimum concrete Compressive strength of 10 N/mm^2 is recommended prior to stripping formwork supporting Preprufe membranes.

Premature stripping may result in loss of adhesion between the membrane and concrete. As a guide, to reach the minimum Compressive strength stated above, a structural concrete mix with an ultimate strength of 40 N/mm^2 will typically require a cure time of approximately 6 days at an average ambient temperature of 4°C, or 2 days at 21°C. For further guidance, please consult our Technical Services Department.

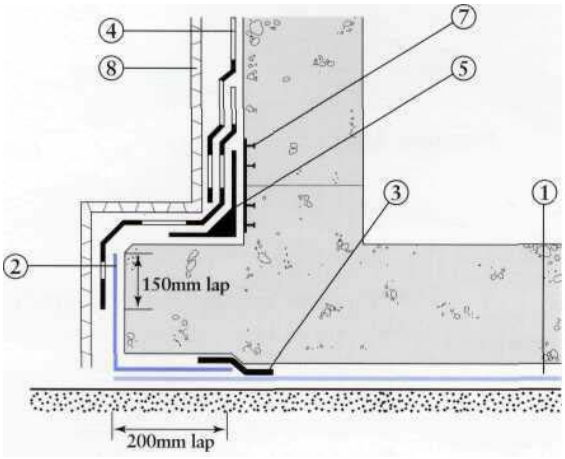
Wall base detail



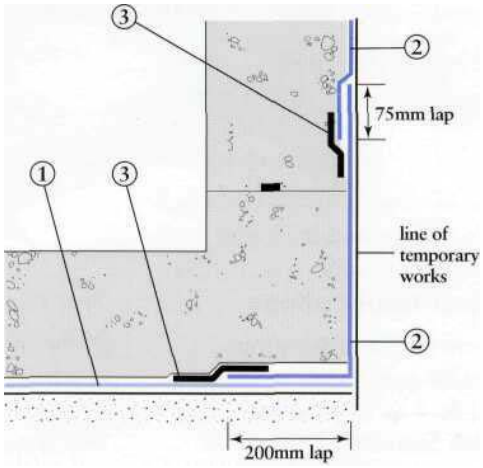
Alternative wall base detail for early shutter



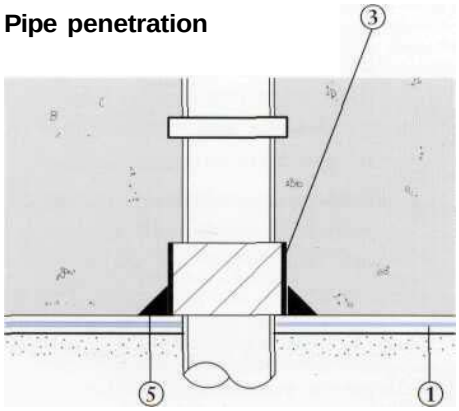
Wall base with toe detail showing drainage



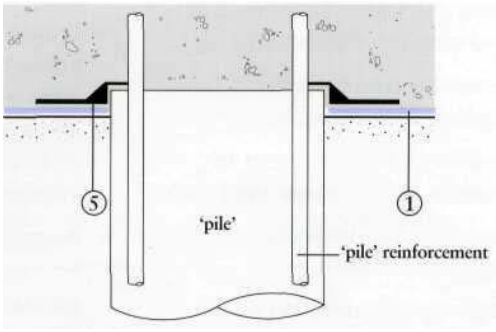
Wall base detail against temporary works



Pipe penetration



Pile detail



1 Preprufe 300
2 Preprufe 160
3 Preprufe Tape
4 Bituthene 3000
5 Bituthene Liquid Membrane
6 Servipak Protection
7 Serviseal Waterstop as required
8 Hydroduct Drainage

Details shown are typical illustrations and not working details. For assistance with detailing and problem solving please contact our Technical Department.

Supply

Bituthene Preprufe	300	160	Tape
Thickness (nominal)	1.4	1.0	1.0
Roll size	1.22 x 30.4m	1.22 x38.1m	100mm x 15.2m
Roll area	37.0m^2	46.5m^2	1.52m^2
Roll weight	62kgs	56kgs	2kgs
Minimum edge laps	75mm	75mm	NA
Minimum end laps	75mm	75mm	50mm

Physical Properties

Property	Typical Value		Test Method
	300	160	
Colour	Black with white protective coating and surface treatment	Black with white protective coating	
Thickness	1.42 mm	1.07 mm	ASTM D3767 Method A
Peel adhesion to concrete	880 N/m		ASTM D903 Modified[1]
Lap adhesion	528 N/m		ASTM D1876 Modified[2]
Methane Permeability	9.1mls/m^2/day	N/A	University of London, QMW College
Resistance to hydrostatic head	70m		ASTM D5385 Modified[3]
Low temperature flexibility	Unaffected at -23°C		ASTM D1970
Puncture resistance	990 N minimum	445 N minimum	ASTM E 154
Tensile strength, film	27600 kPa		ASTM D412
Elongation	300%		ASTM D412 Modified[4]
Moisture Vapour Transmission	0.38 g/m^2/24 hours		ASTM E96-94

Footnotes:

1. Concrete is cast against the white treated surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of the membrane to the concrete is measured at a rate of 50 mm per minute at room temperature.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 50 mm per minute at -4°C.
3. Hydrostatic head tests are performed by casting concrete against the membrane with a lap. The cured block is placed in a chamber where water is introduced to the membrane surface up to a head of 70 m.
4. Rate of separation: 50mm per minute

Ancillary Products

Bituthene Liquid Membrane (LM)	5.7 litre & 15.1 litre packs
Bitutape 30mm wide	12 m roll
Servicised Paddle MR2 (80mm dia) for mixing Bituthene LM	Unit
Servicised Lap Roller	Unit

Specification Clauses

Bituthene Preprufe 300 or 160 shall be applied with its adhesive face presented to receive fresh concrete to which it will mechanically adhere. Only ancillary, complementary or Bituthene membranes shall be bonded to Bituthene Preprufe. All Bituthene Preprufe system materials shall be supplied by Grace Construction Products and fixed strictly in accordance with their instructions.

Specimen performance and formatted clauses are also available.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

GRACE Construction Products

Appendix E

Construction Health and Safety Plan

529 West 29th Street
New York, New York 10001
OER Project # 12EH-N229M

CONSTRUCTION HEALTH AND SAFETY PLAN

Prepared For:
West 30th Highline Holdings, L.L.C.
c/o The Related Companies L.P.
60 Columbus Circle
New York, NY 10023
FLS Project Number: 10022-011-1

Submitted to:
New York City Office of Environmental Remediation
253 Broadway, 14th Floor
New York, NY 10007

Environmental Management & Consulting
158 West 29th Street, 9th Floor
New York, New York 10001
http://www.flemingleeshue.com

MAY 2012

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1.0 INTRODUCTION

Fleming-Lee Shue, Inc. (FLS) has prepared this Construction Health and Safety Plan (CHASP) on behalf of West 30th Highline Holdings, L.L.C. for the 529 West 29th Street Site (Site).The Site consists of Tax Lot 16 on Block 701 in New York, New York County, New York. The Site is located at 529-539 West 29th Street between 10th Avenue and 11th Avenue (Figure 1).

The purpose of this CHASP is to identify the real and potential hazards associated with environmental activities related to and conducted during the planned construction and to stipulate appropriate health and safety procedures, particularly where hazardous materials are potentially present. The procedures and guidelines contained in this document are intended to minimize exposure to chemical, physical and biological hazards that may be present in the soil, groundwater, or air and to reduce the potential for accidents and injuries.

This CHASP is based on the premise that accidents are preventable and that accident prevention is the responsibility of all individuals on the project team. Usually accidents are the result of dangerous actions, conditions and/or equipment. Therefore, the goal of this CHASP is to prevent all accidents by developing a sense of safety, health awareness, and safe work habits in field and construction personnel, and by ensuring that the safety requirements of this CHASP are fulfilled. Strict adherence to these health and safety guidelines will reduce, but not eliminate, the potential for injury on the sites.

The procedures described in this document were developed in accordance with the provisions of Occupational Safety and Health Administration (OSHA) rule 29 CFR 1910.120 and FLS' experience with similar projects. All Site workers must read and comprehend this generic CHASP before entering the construction area. The Health and Safety Officer (HSO) or designee will ensure that personnel have reviewed the CHASP and will provide an opportunity to ask health and safety questions during attendance at a pre-construction safety meeting. Field personnel will sign the acknowledgment form (Attachment I) maintained on-site at the construction office by the HSO. The recommended health and safety guidelines in this document may be modified, if warranted, by additional information obtained prior to, or during construction. The HSO will also maintain copies of pertinent health and safety records for all field personnel.

The Occupational Safety and Health Act (1970) requires:

- Employers shall furnish each employee with a place of employment free from recognized hazards that are causing or likely to cause death or serious physical harm.
- Employers must comply with occupational health and safety standards and rules, regulations and orders pursuant to the Act, that are applicable to company business and operations.
- All employees must comply with occupational health and safety standards and regulations under the Act, which are applicable to their actions and situations.
- Employees are encouraged to contact their immediate superior for information that will help them understand their responsibilities under the Act.

1.1 Site Development Plan

The redevelopment project includes multiple lots within Block 701, including lot 16. The proposed future use of the Site will consist of a residential high rise with commercial ground floors. The proposed development will consist of a residential 14-story 120,000 sq. ft. building (127 apartments – Floors 2-14), with one basement level and will occupy the full footprint of Lot 16. The basement will house mechanical equipment as well as amenities (computer room, common room, etc.). The foundation depth will be approximately 13 feet below grade. Parking will occupy approximately 50% of the grade level, with the lobby and small retail spaces occupying the remaining 50%. The whole development will consist of three residential towers between 13 and 36 stories. The basements of the towers will be used for parking, mechanical, storage, and residential amenities. The first floor of the towers will be used for commercial purposes (retail and art galleries), residential lobby, and residential amenities. The remainder of the buildings will be used for residential space.

1.2 Site Description and Previous Investigation Results

1.2.1 Site Description

The Site consists of Tax Lot 16 on Block 701 in New York, New York County, New York and is located at 529-539 W 29th Street. Figure 1 shows the Site location. The Site is 13,990-square feet and is bounded by block 701, Lot 56, 58, 59, and 62 (partially) to the north. Lot 56 and 58 are vacant lots, Lot 59 is developed with a 3- to 7- story building, and lot 62 is developed with a 2- to 24-story building. To the south, the site is bounded by West 29th Street, and by block 701, Lot 22 – developed with a 4-story building, to the east. Block 701, Lot 1 – developed with a 4-story building bounds the site to the west.

Historically, the Site consisted of tenement style buildings from before 1890 up until the property was redeveloped by the current structure in the mid 1900's. This building was historically occupied by the Metal Purchasing Company before it was converted into a parking garage. Currently, the Site is a vacant lot.

1.2.2 Previous Site Investigation Results

1.2.2.1 Phase I Environmental Site Assessment (ESA) (April 2005).

FLS performed a Phase I ESA for the Site in April 2005. The Phase I ESA indicated several recognized environmental conditions pertaining to the Site:

- Review of historic documentation revealed that the adjacent property to the north, north of West 30th Street had been used for metal enameling. Based upon surface topography, this site is located hydraulically side-gradient to the Site; therefore, these operations are not a concern to the Site.

- A four foot by six foot asphalt patch was observed in the fenced parking lot located at 333-335 10th Avenue. Review of the historic Sanborn fire insurance maps revealed that this site had been used as a gasoline filling station. This patch may be associated with maintenance of the parking area or with an underground storage tank (UST) removal. No releases associated were listed in the regulatory database, and are therefore not a concern to the Site.

- The historic junkyard and filling station operations of Lot 37, up-gradient from the Site, may have potentially impacted subsurface conditions on the Site.

- No. 4 fuel oil was stored in a storage tank located in a vault in the basement of 502-504 West 30th Street (up/cross-gradient from the Site). Review of the regulatory database revealed this building was listed as a Petroleum Bulk Storage (PBS) Aboveground Storage Tank (AST) facility under PBS facility number 2-402001 due to the presence of one 5,000-gallon fuel oil AST. These operations may have potentially impacted subsurface conditions on the Site.

- The historic auto repair operations up-gradient from the Site, beneath the high line, have the potential to have impacted the Site soils and groundwater.

- The demolished building located at 502 West 30th Street (up/cross-gradient from the Site) was occupied by a printing company during the mid 1950's and a wholesale gas supplier during the late 1960's most likely compressed gas). It is likely that the printing company used the 502 West 30th Street building for printing. The 502 West 30th Street structure had a basement that was occupied by electrical equipment, heating equipment, and a 5,000-gallon No. 4 fuel oil AST.

The historic printer is not a concern to the Site since it is likely that the printing equipment would have been located on the upper floors of the 502 West 30th Street building, and any releases associated with the printing operation (incidental spills, leaking equipment, etc.) would have needed to migrate through the floor(s) into the basement and through the foundation of the structure in order to impact subsurface soils and groundwater. Additionally, any routine releases associated with the printing operations (release of wash water, excess materials, etc.) would have been discharged into a drain that was connected to the New York City Department of Environmental Protection (NYCDEP) combined sanitary/storm water collection system. These operations are therefore not a concern to the Site.

- Review of historic documentation revealed that the structure located at 515 West 30th Street (up-gradient to the Site) was previously occupied by a chemical manufacturer. No further information regarding the historic operations was obtained through the historic documentation reviewed. These operations have the potential to have impacted the Site soils and groundwater.

- FLS observed one monitoring well in the sidewalk to the south of the Site. Another two monitoring wells were located on the South Side of West 29th Street (cross-gradient to the Site); in front of the Sean Kelly art gallery (536-528 West 29th Street). Review of the historic Sanborn fire insurance maps revealed that an unspecified number of gasoline underground storage tanks (USTs) were present at this property starting circa 1930. A closed gasoline fill port was observed in the center of the two wells on the adjacent property to the south. It is expected that the three monitoring wells were installed as part of a tank closure which had been performed at this property. This site was not listed with a documented release in the regulatory database, and is therefore not a concern to the Site.

- A one-foot by two-foot concrete patch was observed at the adjacent property to the north of the Site (cross-gradient). Based on the location and size of the patch, this patch may have been a hydraulic lift pit that had been previously closed, and may have potentially impacted subsurface conditions on the Site.

1.2.2.2 FLS March 2012 Remedial Investigation Report

The Remedial Investigation characterized the environmental conditions at the Site. The findings were documented in the March 2012 Remedial Investigation Report. The findings are summarized herein:

- The stratigraphy consists of 2-8 feet of urban fill underlain by a minimum of 8 feet of silty sand.

- The results of the laboratory analysis of samples of the fill material identified polycyclic aromatic hydrocarbons (PAHs) and metals at concentrations exceeding the NYS Unrestricted Use Soil Cleanup Criteria.

- The results of the laboratory analysis of the groundwater samples identified elevated concentrations of metals.

- The results of the laboratory analysis of the soil vapor samples did not identify any volatile organic compounds at concentrations exceeding regulatory standards.

2.0 POTENTIAL CHEMICAL AND PHYSICAL HAZARDS

2.1 Potential Chemical Hazards

This CHASP focuses on the following chemicals of concern:

- SVOCs
  PAHs:
  - Benzo(a)anthracene
  - Benzo(a)pyrene
  - Benzo(b)fluoranthene
  - Benzo(k)fluoranthene
  - Chrysene
  - Dibenzo(a,h)anthracene
  - Indeno(1,2,3-cd)pyrene
- Metals
  - Lead
  - Manganese
  - Mercury
  - Zinc

Attachment II lists the Recognized and Suspected Health Hazards and permissible exposure limits for the chemicals known to be present at the Site. Material Safety Data Sheets (MSDS) for these chemicals are also included in Attachment II. The chemical hazards will be minimized by limiting exposure of personnel to hazardous conditions and by the use of personnel protective equipment (PPE).

2.2 Physical Hazards

Physical hazards potentially present at the site include, but are not limited to, the following:

- Slips, trips, and falls (uneven terrain, excavations, and slippery surfaces) hazards;
- Environmental (heat/cold) stress;
- Noise hazards; and
- Use of heavy equipment.

Physical hazards associated with lockout/tag-out, scaffolds, confined spaces and other construction equipment are addressed in Sections 3.9 and 4 of this CHASP. A discussion of heat stress and cold stress and related illnesses is provided in Attachment III.

2.3 Biological Hazards

General biological hazards present at the site include, but are not limited to, the following:

- Bites or stings from insects (particularly ticks) resulting in skin inflammation, disease, or allergic response; and
- Allergens and toxins from plants and animals, producing dermatitis, rhinitis, or asthma.

3.0 HEALTH AND SAFETY PROTOCOL

3.1 Site/Work Hazard Evaluation

Upon review of contaminant levels, physical and biological hazards, exposure routes and the nature of the construction tasks, it has been determined that Level D protection will be used during construction activities. Personal protection levels are described in more detail in Section 3.6 and air monitoring is discussed in Section 5.

3.2 Project Team Organization

All personnel who participate in field activities will be required to attend a Health and Safety meeting prior to the commencement of field activities. The project team organization is shown on Table 1, and the roles are described below.

Health and Safety Officer (HSO)

- Administers all aspects of the occupational health and safety program;

- Develops programs and technical guidance to identify and remove physical, chemical, and biological hazards from facilities, operations, and sites;
- Assists management and supervisors in the health and safety training of employees;
- Conducts inspections to identify unhealthy or unsafe conditions or work practices;
- Investigates all accidents and takes action to eliminate accident causes;
- Monitors to determine the degree of hazard;
- Determines the protection levels and equipment required to ensure the safety of personnel;
- Evaluates on-site conditions (i.e., weather and chemical hazard information) and recommending to the project manager and/or the field coordinator, modifications to the work plan and personnel protection levels;
- Monitors performance of all personnel to ensure compliance with the required safety procedures;
- Ensures that all personnel have been trained in proper site-safety procedures including the use of PPE, and have read and signed the Acknowledgment Form (Attachment I);
- Conducts daily briefings as necessary;
- Halts work if necessary;
- Ensures strict adherence to the Site CHASP; and
- Reviews personnel medical monitoring participation.

Project Manager

- Familiar with health and safety regulations related to area of responsibility.
- Directs and coordinates health and safety activities within area of responsibility.
- Ensures arrangements for prompt medical attention in case of serious injury
- Requires all employees supervised to use individual protective equipment and safety devices.
- Ensures that safety equipment is available, maintained, used, and stored correctly.

- Instructs and trains all persons within area of responsibility in health and safety requirements.
- Conducts frequent and regular health and safety inspections of work area. Directs correction of unsafe conditions.
- Conducts weekly safety briefings with all supervisors and/or workers.
- Requires all subcontractors and subcontractor personnel to comply with health and safety regulations.

All Employees

The minimum personnel qualifications for each individual participating in field activities are:

- OSHA-specific medicals including, but not limited to, audiometric testing under the hearing conservation program and medical approval for the use of respirators;
- Participation in the FLS Occupational Health Monitoring Program;
- Successful completion of the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4]);
- Additionally, it is strongly recommended that all field personnel be trained in first aid and Cardio-Pulmonary Resuscitation (CPR);
- Be familiar with and comply with proper health and safety practices;
- Use the required safety devices and proper personal protective safety equipment; and
- Notify HSO/supervisor immediately of unsafe conditions/acts, accidents, and injuries.

3.3 Training

Knowledge of the safety rules supplemented by compliance is essential to safety. New employees will be provided orientation training and will be furnished information and literature covering the company health and safety policies, rules, and procedures. This orientation training must be provided prior to the employee's visit to the Site.

All employees will have successfully completed the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4]).

Employees must read the CHASP and project-specific Work Plan, which contains the applicable regulations/standards for their job.

Prior to beginning work on-Site, and weekly thereafter, the HSO will lead safety training sessions and/or "tailgate" training meetings. These meetings will be conducted to provide information and training on new equipment, new procedures, new chemicals, refresher/remedial training in specific areas, or meet annual requirements. Such training may be held in conjunction with the safety briefings/meetings addressed elsewhere in this program.

If necessary, the HSO will ensure that employees are scheduled and provided specialized training as required. Examples of specified training include (but are not limited to):

- Safe handling/use of flammables, poisons, or toxics;
- Respirator care/use;
- Hazard communication (hazardous chemicals);
- Slip, trip and fall hazards and fall protection;
- Blood-borne Pathogens (Non-Medical).

Specialized training will be documented in the employees' personnel records and/or in a master training record.

3.4 Subcontractor Compliance

The provisions of these health and safety responsibilities apply to subcontractors and their employees working for FLS. Failure to fulfill this requirement is a failure to meet the conditions of the contract.

3.5 Personal Hygiene

Eating, drinking and the use of tobacco products in the work area are prohibited. The use by site personnel of alcohol or other non-prescription drugs that could impair the ability to function at the work site is prohibited. The use of some prescription drugs may impair the ability to function and can create safety problems on-site. Field personnel taking prescription medication should alert the HSO in case of an emergency. Beards or facial hair that could interfere with the use of a respirator are not permitted. Dermal contact with groundwater should be avoided. This includes avoiding walking through puddles, pools, and mud, sitting or leaning on or against drums, equipment, or on the ground. Field personnel should wash their hands before eating, smoking, using the toilet, etc. Field personnel should wash their hands and face and shower (daily) as soon as possible after leaving the site.

3.6 Levels of Personal Protection

Personal protective equipment (PPE) must be worn as required for each job in all operations where there is an exposure to hazardous conditions.

3.6.1 Level D

Level D applies to work in areas where the possibility of contact with potentially contaminated groundwater and soil exists. The protective equipment required for Level D includes, but is not limited to, the following:

- Work clothes or coveralls;
- Safety boots, with steel toe;
- Safety glasses;
- Hard hat;
- Reflective vest;
- Disposable latex gloves;
- Hearing protection, to be used as needed

3.6.2 Level C

Level C is selected only when the type of material and the concentration are known, and pose a moderate level of respiratory risk to the site worker. Level C is required when PID readings indicate a consistent level of 5 ppm or above of total volatile organics in the worker breathing zone. Level C protection will include, but is not limited to, the following:

- Protective clothing and other equipment required for Level D;
- Full-face air purifying respirator (APR) with high efficiency particulate/organic vapor cartridges (ultra-twin with GMCH cartridges);
- Saranex-coated disposable coveralls with hoods; and
- Boot covers.

3.7 General Workplace Safety Rules

- Report unsafe conditions, accidents, injuries, or incidents to the HSO and Project Manager.

- Use eye and/or face protection where there is danger from flying objects or particles, (such as when grinding, chipping, burning and welding, etc.) or from hazardous chemical splashes.

- Dress properly. Loose clothing and jewelry shall not be worn.

- Keep all equipment in safe working condition. Never use defective tools or equipment.
- Report any defective tools or equipment to immediate supervisor.
- Properly care for and be responsible for all PPE.
- Do not leave materials in aisles, walkways, stairways, work areas, roadways, or other points of egress.
- Practice good housekeeping at all times.
- Training on equipment is required prior to unsupervised operation.
- During work, pause every few minutes and assess surrounding conditions.
- Crossing highways and major roadways is not recommended. Expect movement of cars and buses at any time along any roadway, regardless of traffic signals, stop signs, yield signs, etc.
- When walking on right-of-ways or road-shoulders, keep a sharp lookout in both directions.
- For personal safety, be cognizant of your surroundings and ensure that equipment is properly secured.

3.8 Housekeeping

- Proper housekeeping is the foundation for a safe work environment. It definitely helps prevent accidents and fires, as well as creating a professional appearance in the work area.
- Material will be piled or stored in a stable manner so that it will not be subject to falling.
- Combustible scrap, debris, and garbage shall be removed from the work area at frequent and regular intervals.
- Stairways, walkways, exit doors, in front of electrical panels, or access to fire fighting equipment will be kept clear of materials, supplies, trash, and debris.

3.9 Fire Prevention

- All firefighting equipment shall be conspicuously located, accessible, and inspected periodically, and maintained in operating condition. An annual service check and monthly visual inspections are required for fire extinguisher.

- All employees must know the location of fire fighting equipment in the work area and have knowledge of its use and application.

3.10 *Industrial Hygiene and Occupational Health*

- Toilet facilities shall be provided as required for the number of workers.
- A first aid kit and portable eyewash station shall be kept on site.
- An adequate supply of potable water shall be provided.
- The use of a common drinking cup is prohibited.
- When no medical facility is reasonably accessible (time and distance) to the worksite, a person who has a valid certificate of first aid training will be available at the worksite to render first aid.
- Employees must be protected against exposure to hazardous noise levels by controlling exposure or by use of proper PPE.

3.11 Construction Equipment Safety Rules

A discussion of health and safety issues related FLS employees performing work in the vicinity of common construction elements, such as electrical; compressed gas cylinders; ladders; aerial lifts; cranes; welding and brazing; tools; safety railings and other fall protection; scaffolds; excavations and trenches; motor vehicles and mechanized equipment, is provided in Attachment IV.

4.0 INDIVIDUAL SAFETY AND HEALTH PROGRAMS LISTING

OSHA standards specify various individual programs that may be applicable to work performed on construction sites. Highlights of these programs are provided below, and specific written programs or procedures may be included into this written program, attached, or developed separately.

4.1 Hazard Communication Program

If employees are exposed to or work with hazardous chemicals at the job site, this program is required. Important elements of the written program are required to include a master listing of chemicals; maintaining material safety data sheets on each chemical; and training of employees on the program, the chemicals exposed to, and material safety data sheets.

4.2 Confined Space Entry Program

If employees enter a confined space that contains or has the potential to contain an atmospheric or physical hazard, this program is required. Either the ANSI Z117.1-1989 Safety Requirements for Confined Spaces program or the OSHA General Industry Permit Require Confined Spaces program must be used as guidance to develop the company's program. Primary elements of the program are identification of applicable confined spaces, testing/ monitoring, control or elimination of hazards, protective equipment, entry authorization, attendants, training, and rescue. **No FLS employee is authorized to enter a confined space without the above training and notification to the project manager or HSO.**

4.3 Respiratory Protection Program

If employees are exposed to hazardous/toxic chemical, paint or other gases, vapors, fumes, dusts, or mists above the permissible exposure limit, and/or employees wear respirators, this program is required. Program elements are written program for the selection, maintenance, care, and use of respirators; fit testing, training, and employee evaluation for use.

4.4 Occupational Noise Exposure / Hearing Conservation Program

If employees are exposed to noise levels above the permissible noise exposures, protection against the effects of noise and an effective hearing conservation program are required. Such a program would include elements such as written program, noise monitoring, hearing evaluations and follow-on testing, personal protective equipment (hearing protection), and maintenance of medical records.

4.5 Emergency Response Plan

If employees are engaged in emergency response to a hazardous substance/chemical release, an emergency response plan must be developed and implemented to handle anticipated emergencies. Program elements include a written response plan, identification and training of responding employees, medical surveillance and consultation, and post response operations.

4.6 Asbestos Control Program

If employees are exposed to asbestos fibers during construction activities, then an initial monitoring for asbestos exposure must be made. If the monitoring results are above the permissible exposure limit (PEL), this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, personnel protective equipment, and training.

4.7 Lead Exposure Program

If employees are exposed to lead during construction activities, then an initial monitoring for lead exposure must be made. If the monitoring results are above the permissible exposure limit (PEL), this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, personnel protective equipment, and training.

4.8 Dust Suppression Plan

The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

1. Applying water on haul roads.
2. Wetting equipment and excavation faces.
3. Spraying water on buckets during excavation and dumping.
4. Hauling materials in properly sealed or watertight containers.
5. Restricting vehicle speeds to 10 mph.
6. Covering excavated areas and material after excavation activity ceases.
7. Reducing the excavation size and/or number of excavations.
8. Applying a dust suppressant, such as calcium chloride, in high vehicle traffic areas.

To evaluate the effectiveness of the dust suppression measures, air monitoring utilizing real-time dust-monitoring equipment will be performed. The requirements for air monitoring during post-remediation soil disturbance activities are presented in Section 5.

5.0 WORK AREA AIR MONITORING

In addition to the worker breathing zone air monitoring described in Section 3.1, air quality at the work area will also be monitored
During soil excavation, particulate monitoring will be performed using a real-time particulate monitor that will monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

Object to be measured: Dust, Mists, Aerosols
Size range: <0.1 to 10 microns
Sensitivity: 0.001 mg/m3
Range: 0.001 to 10 mg/m3
Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust.

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. The action level will be established at 150 ug/m3 over the integrated period not to exceed 15 minutes.

6.0 DECONTAMINATION

6.1 Site/Work Area Organization

A typical site work area will consist of an exclusion zone where the actual field activity will take place; a decontamination zone; and a command post located outside the decontamination area and exclusion zones.

Levels of personal protection in the exclusion zone will vary depending on air monitoring data, and will be specified by the Site HSO.

6.2 Personnel Decontamination

Decontamination (decon) of personnel consists of physically removing soil or contaminants using the correct procedures for washing and removal of PPE. Decon will take place in the designated decontamination zone using the following steps, if applicable:

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

7.0 EMERGENCY AND CONTINGENCY PLAN

Emergency communications will be maintained during all on-site field activities. The emergency route to the hospital is depicted on Figure 2 and emergency contacts and their phone numbers are presented in Table 2.

A first aid kit will be available on-site at all times for any minor on-site injuries. Emergency medical assistance or ambulance can be reached by calling 911 for more severe injuries.

All OSHA recordable injuries and illnesses will be reported using OSHA Form 301 (Attachment V).

Figures

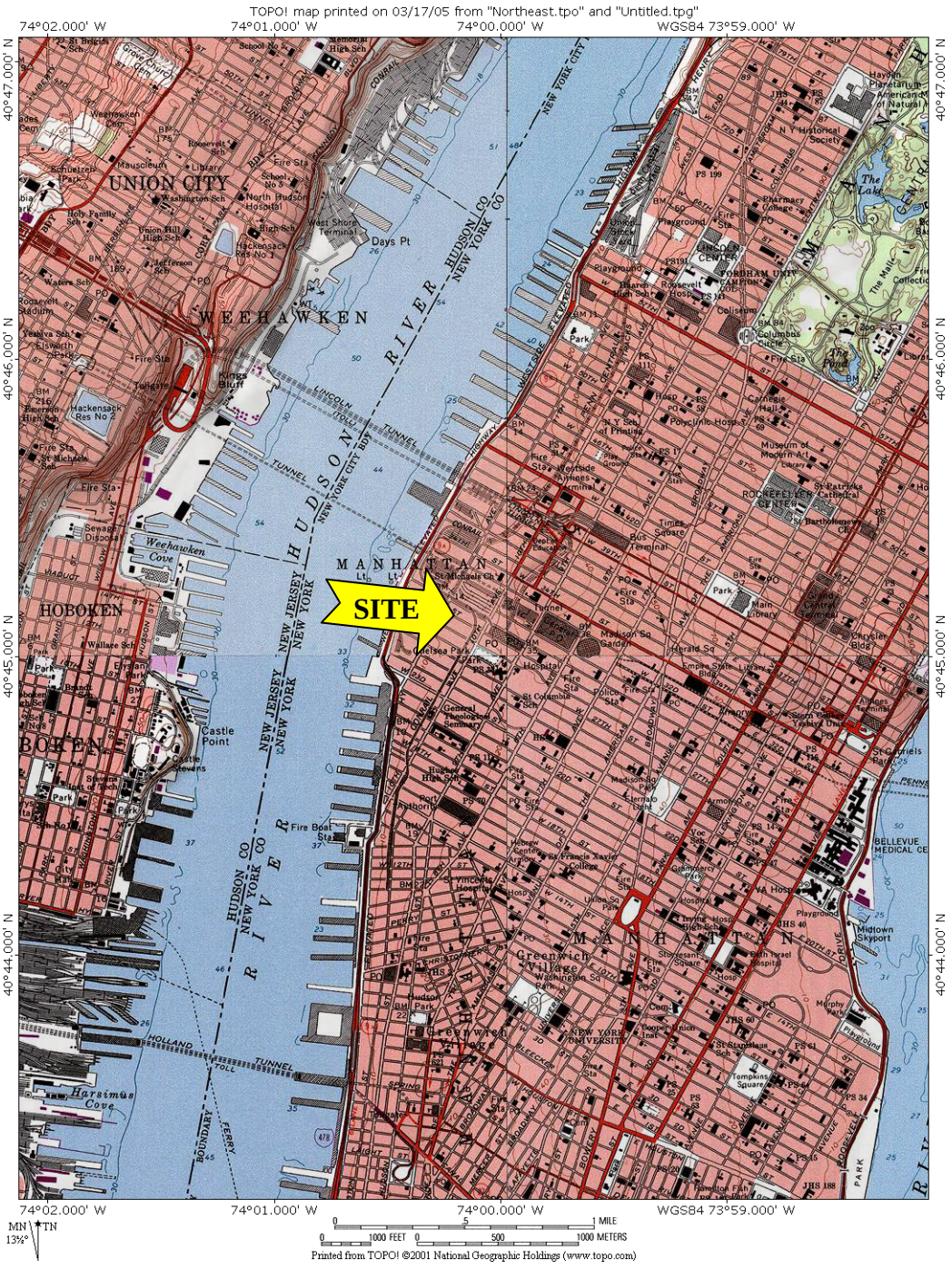
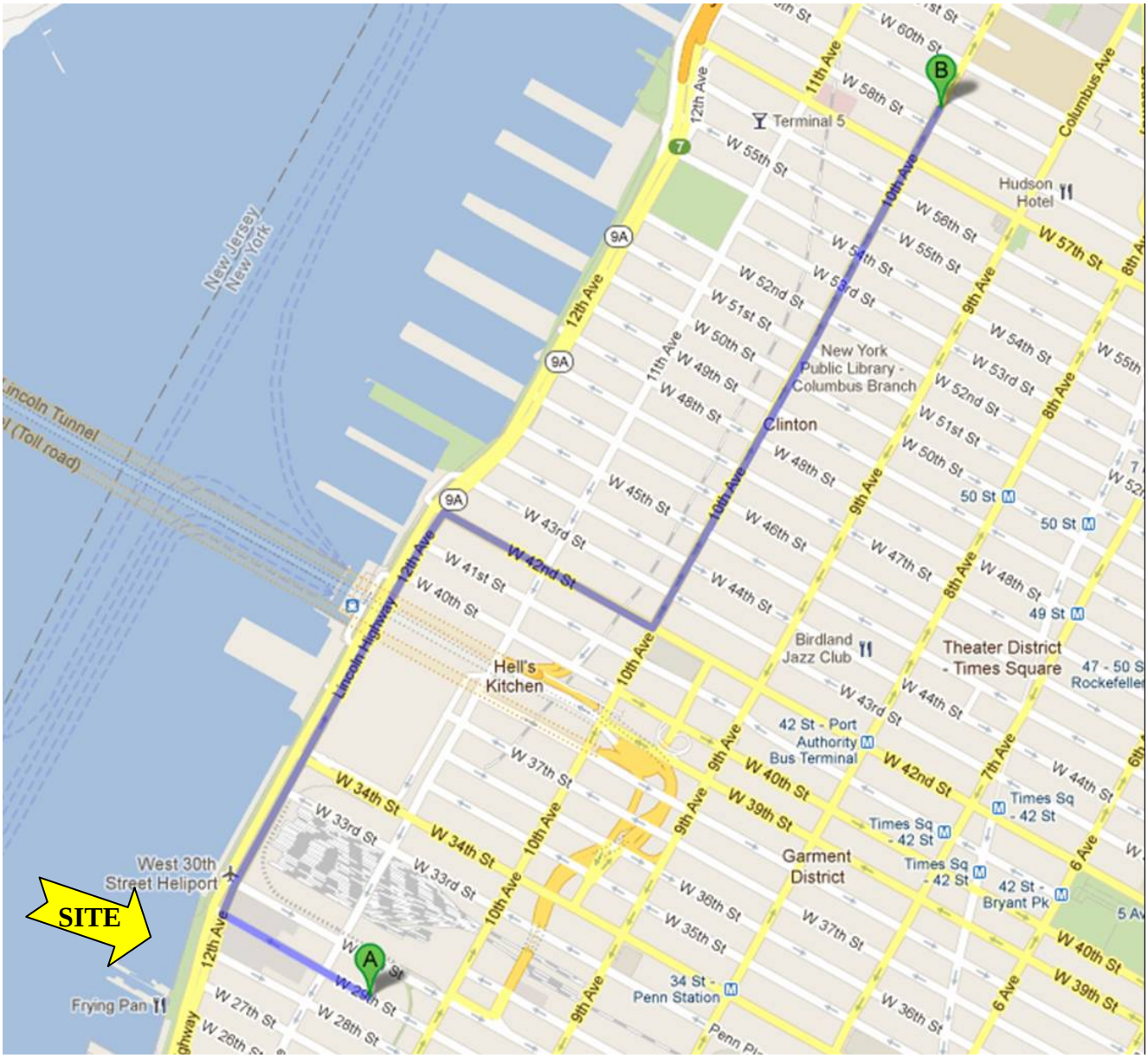


FIGURE 1 - SITE LOCATION

529 West 29th Street Site
529-539 West 29th Street
New York, N.Y. 10001

FIGURE 2
ROUTE TO THE HOSPITAL

Roosevelt Hospital - 1000 Tenth Avenue - New York, NY 10019 - (212) 523-4000



Begin at West 29th Street and 10th Avenue.

1. Start out going NORTHWEST on W 29TH ST toward 12TH AVE.
2. Turn RIGHT onto NY-9A S/12TH AVE/WEST SIDE HWY. Continue to follow NY-9A S/WEST SIDE HWY.
3. Turn RIGHT onto W 42ND ST.
4. Turn LEFT onto 10TH AVE.
5. Turn LEFT onto W 12TH ST.
6. End at Destination on your RIGHT at 1000 10TH AVE.

Fleming Lee Shue

Tables

TABLE 1
Project Team Organization

PERSONNEL	**RESPONSIBILITIES**
Mr. Arnold Fleming, P.E.	President, FLS
Mr. Kevin A. McGuinness, PG, LSRP	Senior Geologist/Project Manager
Mr. Bill Maniquez	HSO

TABLE 2
Emergency Contacts and Phone Numbers

Company	Individual Name	Title	Contact Number
West 30th Highline Holdings L.L.C.			
	Jim Harris	Project Manager	212-801-3732 (office) 917-476-8177 (cell)
FLS	Kevin McGuinness	PM/QC Officer	212-675-3225 (office)
	Bill Maniquez	HSO	212-675-3225 (office) 646-584-2319 (cell)
Police/Fire Department			911

Attachment I

HASP Acknowledgement

HASP ACKNOWLEDGMENT FORM

The following personnel have read the site-specific HASP and are familiar with its provisions.

Print Name	*Signature*	*Company*	*Function*	*Date*

Attachment II

MSDS for COC

MATERIAL SAFETY DATA SHEET

EM SCIENCE

|1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer.....:
EM SCIENCE
A Division of EM Industries
P.O. Box 70
480 Democrat Road
Gibbstown, N.J. 08027

Preparation Date.: 10/25/96

Information Phone Number.: 856-423-6300
Hours: Mon. to Fri. 8:30-5
Chemtrec Emergency Number: 800-424-9300
Hours: 24 hrs a day

Catalog Number(s):

BX0207

Product Name:
1,2-Benzanthracene
Synonyms:
Benzo (A) Anthracene
Chemical Family:
Aromatic Hydrocarbon
Formula:
$C_{18}H_{12}$
Molecular Weight.:
228.29

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS #	Appr %
1,2-Benzanthracene	56-55-3	100%

|3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
SUSPECT CANCER HAZARD. MAY CAUSE CANCER.
HARMFUL IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN.
IRRITATING TO SKIN, EYES AND MUCOUS MEMBRANES.
MAY CAUSE DAMAGE TO KIDNEY, URETER, BLADDER.
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Appearance:
Light yellow powder

POTENTIAL HEALTH EFFECTS (ACUTE AND CHRONIC)

Symptoms of Exposure:
Harmful if inhaled, swallowed, or absorbed through the skin. Irritating on contact with skin, eyes or mucous membranes. May cause damage to kidney, ureter, bladder. Chronic exposure may cause alteration of genetic material.

Medical Cond. Aggravated by Exposure:
Urinary conditions

Routes of Entry:
Inhalation, ingestion or skin contact.

Carcinogenicity:
Suspected human carcinogenic substance. Suspect Cancer Hazard.
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

4. FIRST AID MEASURES

Emergency First Aid:
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.
Skin: Immediately flush thoroughly with large amounts of water.
Eyes: Immediately flush thoroughly with water for at least 15 minutes.
Inhalation: Remove to fresh air; give artificial respiration if breathing has stopped.
Ingestion: If conscious, drink water and induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Remove contaminated clothing and wash before reuse.

5. FIRE FIGHTING MEASURES

Flash Point (F): Noncombustible
Flammable Limits LEL (%): N/A
Flammable Limits UEL (%): N/A
Extinguishing Media:
Foam, Carbon dioxide, Water spray

Fire Fighting Procedures:
Wear self-contained breathing apparatus and protective clothing.

Fire & Explosion Hazards:
Thermal decomposition produces highly toxic fumes.

6. ACCIDENTAL RELEASE MEASURES

Spill Response:
Evacuate the area of all unnecessary personnel. Wear suitable protective equipment listed under Exposure / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Take up and containerize for proper disposal as described under Disposal. Comply with Federal, State, and local regulations on reporting releases. Refer to Regulatory Information for reportable quantity and other regulatory data.

7. HANDLING AND STORAGE

Handling & Storage:
Keep container tightly closed. Store in a cool, dry, well-ventilated area. Do not breathe vapor or dust. Do not get in eyes, on skin, or on clothing.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT:
Ventilation, Respiratory Protection, Protective Clothing, Eye Protection:
Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure. Material must be handled or transferred in an approved fume hood or with equivalent ventilation. Protective gloves must be worn to prevent skin contact (Viton or equivalent) Safety glasses with side shields must be worn at all times. Impervious protective clothing should be worn to prevent skin contact.

Work/Hygenic Practices:
Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

EXPOSURE GUIDELINES

OSHA - PEL:

	TWA		STEL		CL		
Component	PPM	MG/M3	PPM	MG/M3	PPM	MG/M3	Skin
1,2-Benzanthracene							

ACGIH - TLV:

	TWA		STEL		CL		
Component	PPM	MG/M3	PPM	MG/M3	PPM	MG/M3	Skin
1,2-Benzanthracene							

If there are no exposure limit numbers listed in the Exposure Guidelines chart, this indicates that no OSHA or ACGIH exposure limts have been established.

9. PHYSICAL AND CHEMCIAL PROPERTIES

Boiling Point (C 760 mmHg) : 435C Sublimes
Melting Point (C) : 160C
Specific Gravity (H_20 = 1) : N/A
Vapor Pressure (mm Hg) : N/A
Percent Volatile by vol (%): N/A
Vapor Density (Air = 1) : N/A
Evaporation Rate (BuAc = 1): N/A
Solubility in Water (%) : Insoluble
Appearance :
Light yellow powder

10. STABILITY AND REACTIVITY

Stability: Yes

Hazardous Polymerization:
Does not occur

Hazardous Decomposition:
CO_x

Conditions to Avoid:
None indicated

Materials To Avoid:

( ) Water
(X) Acids
(X) Bases
( ) Corrosives
(X) Oxidizers
( ) Other:

11. TOXICOLOGICAL INFORMATION

Toxicity Data

ivn-mus LDLo: 10 mg/kg

Toxicological Findings:
Tests on laboratory animals indicate material may produce adverse mutagenic effects and cause tumors.
Cited in Registry of Toxic Effects of Chemical Substances (RTECS)

12. DISPOSAL CONSIDERATIONS

EPA Waste Numbers: U018

Treatment:
Specified Technology - Incineration to a level below TCA (Total Constituent Analyses) levels. Contact your local permitted waste disposal company (TSD) for permissible treatment site.
ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

13. TRANSPORT INFORMATION

DOT Proper Shipping Name:
Environmentally Hazardous Substance, Solid, n.o.s. (1,2-Benzanthracene)

DOT ID Number :
UN3077

14. REGULATORY INFORMATION

TSCA Statement:
The CAS number of this product is listed on the TSCA Inventory.

Component	SARA EHS (302)	SARA EHS TPQ (lbs)	CERCLA RQ (lbs)
1,2-Benzanthracene			10

Component	OSHA Floor List	SARA 313	DeMinimis for SARA 313 (%)
1,2-Benzanthracene	Y	Y	0.1

If there is no information listed on the regulatory information chart, this indicates that the chemical is not covered by the specific regulation listed.

15. OTHER INFORMATION

Comments:
None

NFPA Hazard Ratings:

```
Health          : 3
Flammability    : 0
Reactivity      : 0
Special Hazards :
```

Revision History: 1/1/84 7/18/87 1/24/91 3/1/91 11/19/93 3/10/95

| = Revised Section

N/A = Not Available

N/E = None Established

The statements contained herein are offered for informational purposes only and are based upon technical data that EM Science believes to be accurate. It is intended for use only by persons having the necessary technical

skill and at their own discretion and risk. Since conditions and manner of use are outside our control, we make NO WARRANTY, EXPRESS OR IMPLIED, OR MERCHANTABILITY, FITNESS OR OTHERWISE.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006
Version 4.1 Revision Date 11.06.2010
Print Date 18.06.2010
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product name	:	Benzo[*a*]pyrene
Product Number	:	B1760
Brand	:	Sigma
Company	:	Sigma-Aldrich (Shanghai) Trading Co.,Ltd 22A-B Century Ba-Shi Building, 398 Huai Hai Zhong Road 200020 SHANGHAI CHINA
Telephone	:	+862161415566
Fax	:	+862161415567
Emergency Phone #	:	+8615921213336
E-mail address	:	china@sial.com

2. HAZARDS IDENTIFICATION

Classification of the substance or mixture

According to Regulation (EC) No1272/2008
Carcinogenicity (Category 1B)
Germ cell mutagenicity (Category 1B)
Reproductive toxicity (Category 1B)
Skin sensitization (Category 1)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

According to European Directive 67/548/EEC as amended.
May cause cancer. May cause heritable genetic damage. May impair fertility. May cause harm to the unborn child. May cause sensitization by skin contact. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Label elements

Pictogram

Signal word Danger

Hazard statement(s)

H317	May cause an allergic skin reaction.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P280	Wear protective gloves.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P501	Dispose of contents/container to an approved waste disposal plant.

Hazard symbol(s)

T	Toxic
N	Dangerous for the environment

R-phrase(s)

R45	May cause cancer.
R46	May cause heritable genetic damage.
R60	May impair fertility.
R61	May cause harm to the unborn child.
R43	May cause sensitization by skin contact.
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S-phrase(s)

S53	Avoid exposure - obtain special instructions before use.
S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S60	This material and its container must be disposed of as hazardous waste.
S61	Avoid release to the environment. Refer to special instructions/ Safety data sheets.

Restricted to professional users.

Other hazards - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 3,4-Benzpyrene
3,4-Benzopyrene
Benzo[def]chrysene

Formula : $C_{20}H_{12}$

Molecular Weight : 252,31 g/mol

CAS-No.	EC-No.	Index-No.	Classification	Concentration
Benzo[a]pyrene				
50-32-8	200-028-5	601-032-00-3	Carc. 1B; Muta. 1B; Repr. 1B; Skin Sens. 1; Aquatic Acute 1; Aquatic Chronic 1; H317, H340, H350, H410, H360Fd T, N, Carc.Cat.2, Mut.Cat.2, Repr.Cat.2, R45 - R46 - R60 - R61 - R43 - R50/53	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

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.

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 exposure - obtain special instructions before use.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. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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.

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Eye protection
Face shield and safety glasses 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

Safety data

pH	no data available
Melting point	177 - 180 °C - lit.
Boiling point	495 °C - lit.
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1,35 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 5,97

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

11. TOXICOLOGICAL INFORMATION

Acute toxicity
no data available

LD50 Subcutaneous - rat - 50 mg/kg

Skin corrosion/irritation
Skin - mouse - Mild skin irritation

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
Chronic exposure may cause dermatitis.

May cause sensitization by inhalation.

Germ cell mutagenicity
May alter genetic material.
In vivo tests showed mutagenic effects

Carcinogenicity

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

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Benzo[a]pyrene)

2B - Group 2B: Possibly carcinogenic to humans (Benzo[a]pyrene)

IARC: 1 - Group 1: Carcinogenic to humans (Benzo[a]pyrene)

2B - Group 2B: Possibly carcinogenic to humans (Benzo[a]pyrene)

Reproductive toxicity
May cause congenital malformation in the fetus.
Presumed human reproductive toxicant

May cause reproductive disorders.

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Potential health effects

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

Signs and Symptoms of Exposure
burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

Additional Information
RTECS: DJ3675000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 0,25 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 0,02 mg/l - 72 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 48 h Bioconcentration factor (BCF): 3.208

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects
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

ADR/RID
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[a]pyrene)

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. (Benzo[a]pyrene)
Marine pollutant: No

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[a]pyrene)

15. REGULATORY INFORMATION

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

16. OTHER INFORMATION

Text of H-code(s) and R-phrase(s) mentioned in Section 3

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H317	May cause an allergic skin reaction.
H340	May cause genetic defects.
H350	May cause cancer.
H360Fd	May damage fertility. Suspected of damaging the unborn child.
H410	Very toxic to aquatic life with long lasting effects.
Muta.	Germ cell mutagenicity
Repr.	Reproductive toxicity
N	Dangerous for the environment
T	Toxic
R43	May cause sensitization by skin contact.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R60	May impair fertility.
R61	May cause harm to the unborn child.
Repr.Cat.2	Toxic to Reproduction Category 2

Further information

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.

C/D/N ISOTOPES INC.
88 Leacock Street
Pointe-Claire, Quebec H9R 1H1
Toll-Free (Canada & USA): 1-800-565-4696
Tel.: 1-514-697-6254 • Fax: 1-514-697-6148
www.cdnisotopes.com

MATERIAL SAFETY DATA SHEET

Sheet No. 1440

SECTION 1: PRODUCT IDENTIFICATION

Catalog No.: D-2360
Product Name: Benzo[*b*]fluoranthene-d_{12}
CAS No.: 93951-98-5

SECTION 2: CHEMICAL INFORMATION (UNLABELLED)

Chemical Name: BENZO[*b*]FLUORANTHENE
CAS No.: 205-99-2
Synonyms: 3,4-Benzfluoranthene; Benz[*e*]acephenanthrylene

SECTION 3: HAZARDS IDENTIFICATION

Known Hazards: POSSIBLE CARCINOGEN, POSSIBLE MUTAGEN

SECTION 4: FIRST AID MEASURES

Skin Contact: Wash with water.
Ingestion: Medical assistance for gastric lavage.
Inhalation: Remove to fresh air, artificial respiration or oxygen if necessary.

SECTION 5: FIRE FIGHTING MEASURES

Extinguishing Media: Carbon dioxide, dry chemical powder, foam.
Special Fire Fighting Equipment: Wear a self-contained breathing apparatus and protective clothing.
Unusual Fire and Explosion Hazards: Possible carcinogen.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Spill Clean-up Methods: Provide adequate ventilation. Carefully scoop up and transfer to a closed container.

SECTION 7: HANDLING AND STORAGE

Usage/Handling Precautions: Strong fumehood
Storage Conditions: Store at room temperature. Adequate ventilation. Avoid all contact. Protect from light.

SECTION 8: EXPOSURE CONTROL / PERSONAL PROTECTION

Respiratory Protection: Self-contained breathing apparatus or chemical cartridge.
Hand Protection: Chemical-resistant gloves, solvent-resistant gloves.
Eye Protection: Wear safety goggles.
Other Protective Equipment: Protective clothing.
Other Protective Measures: Provide safety showers and eyewash station near workplace.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White-pale yellow solid

Melting Point (°C): 165-167
Water Solubility (%): < 0.1
Volatiles (%): Low

Flash Point (°C): Not available.
Autoignition Temperature (°C): Not available.

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable.
Incompatibility (Materials to Avoid): Strong oxidizing agents.
Hazardous Decomposition Products: CO/CO_2 on combustion.

SECTION 11: TOXICOLOGICAL INFORMATION

Acute and Chronic Health Hazards

Dermal TDL_0: 88 mg/kg (mouse)
SCU TDL_0: 72 mg/kg (mouse)
TLV: None verified. Avoid all contact.

Effects of Overexposure: Irritation (eyes, respiratory, skin). Carcinogen. Mutagen.

SECTION 12: ECOLOGICAL INFORMATION

Data not yet available.

SECTION 13: DISPOSAL CONSIDERATIONS

Disposal Procedures: Via licensed disposal company. Dispose of according to federal and local regulations.

SECTION 14: TRANSPORT INFORMATION

Non-hazardous for transport.

SECTION 15: REGULATORY INFORMATION

TLV: None verified. Avoid all contact.

SECTION 16: OTHER INFORMATION

This product is not radioactive. The data given for this product are those of the corresponding unlabelled product indicated in Section 2, unless specifically indicated otherwise. Safety data for the labelled compounds are generally unavailable but the hazards and properties are assumed to be similar or identical to those of the unlabelled compounds. While the information set forth is believed to be accurate, C/D/N ISOTOPES INC. extends no warranties with respect hereto and disclaims all liabilities from reliance thereon. All judgements as to the suitability of the data presented with respect to the use of this product are the responsibility of the purchaser and intended user.

Date: February 1, 2012

C/D/N ISOTOPES INC. Vincent Guay

Vincent Guay, Ph.D.

Material Safety Data Sheet
Benzo[k]fluoranthene, 99+% (tlc)

MSDS# 54641

Section 1 - Chemical Product and Company Identification

MSDS Name:	Benzo[k]fluoranthene, 99+% (tlc)
Catalog Numbers:	AC279730000, AC279732500
Synonyms:	8,9-Benzofluoranthane.
Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	207-08-9
Chemical Name:	Benzo[k]fluoranthene, 99+% (TLC)
%:	99%
EINECS#:	205-916-6

Hazard Symbols: T

Risk Phrases: 45

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! May be fatal if swallowed. May be fatal if absorbed through the skin. Toxic. Carcinogen. May cause lung damage. Causes eye and skin irritation. Causes digestive and respiratory tract irritation. Cancer hazard. May be fatal if inhaled. Target Organs: Lungs, respiratory system.

Potential Health Effects

Eye:	Causes eye irritation.
Skin:	Causes skin irritation. May be fatal if absorbed through the skin.
Ingestion:	May be fatal if swallowed. Causes gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation:	May be fatal if inhaled. Causes respiratory tract irritation.
Chronic:	May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower

eyelids. Get medical aid immediately.

Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: Call a poison control center. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

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. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: Not available

Flash Point: Not available

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: Not published

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not breathe dust, mist, or vapor. Do not get on skin or in eyes. Do not ingest or inhale.

Storage: Store in a cool, dry place. Store in a tightly closed container.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[k]fluoranthene, 99+% (TLC)	none listed	none listed	none listed

OSHA Vacated PELs: Benzo[k]fluoranthene, 99+% (TLC): None listed

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

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: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State:	Solid
Color:	yellow
Odor:	Not available
pH:	Not available
Vapor Pressure:	Not available
Vapor Density:	Not available
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	480 deg C @ 760.00mm Hg (896.00°F)
Freezing/Melting Point:	216 - 218 deg C
Decomposition Temperature:	Not available
Solubility in water:	Not available
Specific Gravity/Density:	
Molecular Formula:	C20H12
Molecular Weight:	252.32

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	Incompatible materials, dust generation.
Incompatibilities with Other Materials	Not available
Hazardous Decomposition Products	Carbon monoxide, carbon dioxide.
Hazardous Polymerization	Has not been reported.

Section 11 - Toxicological Information

RTECS#:	CAS# 207-08-9: DF6350000
LD50/LC50:	RTECS: Not available.
Carcinogenicity:	Benzo[k]fluoranthene, 99+% (TLC) - California: carcinogen, initial date 7/1/87 NTP: Suspect carcinogen IARC: Group 2B carcinogen
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Not available

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: Not regulated as a hazardous material
Hazard Class:
UN Number:
Packing Group:
Canada TDG
Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

USA RQ: CAS# 207-08-9: 5000 lb final RQ; 2270 kg final RQ

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T

Risk Phrases:

R 45 May cause cancer.

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).

WGK (Water Danger/Protection)

CAS# 207-08-9: Not available

Canada

Canadian WHMIS Classifications: Not available

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# 207-08-9 is not listed on Canada's Ingredient Disclosure List.

US Federal

TSCA

CAS# 207-08-9 is not listed on the TSCA Inventory. It is for research and development use only.

Section 16 - Other Information

MSDS Creation Date: 9/02/1997

Revision #6 Date 7/20/2009

Material Safety Data Sheet

Version 4.1
Revision Date 01/17/2012
Print Date 04/13/2012

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Chrysene
Product Number	:	BCR269
Brand	:	Fluka
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
Carcinogen, Mutagen

GHS Classification
Germ cell mutagenicity (Category 2)
Carcinogenicity (Category 1B)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H341	Suspected of causing genetic defects.
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

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

NFPA Rating

Health hazard: 0
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{18}H_{12}$
Molecular Weight : 228.29 g/mol

Component		Concentration
Chrysene		
CAS-No.	218-01-9	-
EC-No.	205-923-4	
Index-No.	601-048-00-0	

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
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. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

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

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. - Carbon oxides

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.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature: 2 - 8 °C

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans			
Chrysene	218-01-9	TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

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, 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 point/freezing point	Melting point/range: 252 - 254 °C (486 - 489 °F)
Boiling point	448 °C (838 °F)
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	no data available
Density	no data available
Water solubility	insoluble
Partition coefficient: n-octanol/water	log Pow: 5.73
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

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
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
LD50 Intraperitoneal - mouse - > 320 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

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

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Chrysene)
NTP:	Known to be human carcinogen (Chrysene)
	Reasonably anticipated to be a human carcinogen (Chrysene)
NTP:	Known to be human carcinogen (Chrysene)
	Reasonably anticipated to be a human carcinogen (Chrysene)

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	May be harmful if swallowed.
Skin	May be 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 daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 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

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

Very toxic to aquatic life with long lasting effects.

no data available

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)
Not dangerous goods

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. (Chrysene)
Marine pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

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, Mutagen

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
Chrysene	218-01-9	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Chrysene	218-01-9	2007-09-28

16. OTHER INFORMATION

Further information

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.

MATERIAL SAFETY DATA SHEET

Date Printed: 04/13/2012
Date Updated: 05/07/2009
Version 1.4

Section 1 - Product and Company Information

Product Name	1,2:5,6-DIBENZANTHRACENE, 97% (NO BULK ORDERS ALLOWED)
Product Number	D31400
Brand	ALDRICH
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,2:5,6-DIBENZANTHRACENE	53-70-3	Yes

Formula	C22H14
Synonyms	1,2:5,6-Benzanthracene * DB(a,h)A * 1,2,5,6-Dba * 1,2,5,6-Dibenzanthraceen (Dutch) * 1,2:5,6-Dibenzanthracene * 1,2:5,6-Dibenz(a)anthracene * Dibenzo(a,h)anthracene * 1,2:5,6-Dibenzoanthracene * RCRA waste number U063
RTECS Number:	HN2625000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). 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.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.004 MG/M3
Poland		NDSCh	-
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance: Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	278.35 AMU	
pH	N/A	
BP/BP Range	524 °C	760 mmHg
MP/MP Range	262 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Lungs. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Intratracheal
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 4160 MG/KG
Exposure Time: 26W
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Skin
Dose: 1200 MG/KG
Exposure Time: 50W
Frequency: I
Result: Tumorigenic:Tumors at site or application. Tumorigenic:Carcinogenic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 445 UG/KG
Result: Skin and Appendages: Other: Tumors. Tumorigenic:Carcinogenic by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Intravenous
Dose: 40 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Liver:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 80 MG/KG
Result: Kidney, Ureter, Bladder:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Multiple
Dose: 40 MG/KG
Exposure Time: 12D
Frequency: I
Result: Tumorigenic:Tumors at site or application. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Guinea pig
Route of Application: Subcutaneous
Dose: 250 MG/KG
Exposure Time: 24D
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application. Lungs, Thorax, or Respiration:Tumors.

Species: Guinea pig
Route of Application: Intravenous
Dose: 30 MG/KG
Result: Tumorigenic:Tumors at site or application. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Pigeon
Route of Application: Intramuscular
Dose: 6 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors. Tumorigenic:Tumors at site or application.

Species: Frog
Route of Application: Intrarenal
Dose: 12 MG/KG
Result: Kidney, Ureter, Bladder:Kidney tumors. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Implant
Dose: 14 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 78 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse

Route of Application: Oral
Dose: 4520 MG/KG
Exposure Time: 36W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Gastrointestinal:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 200 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 6 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 6 MG/KG
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 400 MG/KG
Exposure Time: 40W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Implant
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder:Tumors. Tumorigenic:Tumors at site or application.

Species: Rat
Route of Application: Subcutaneous
Dose: 135 MG/KG
Exposure Time: 9W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 400 MG/KG
Exposure Time: 10W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic:Tumors at site or application.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

CHRONIC EXPOSURE - MUTAGEN
Result: Laboratory experiments have shown mutagenic effects.

Species: Human
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Human
Dose: 100 UMOL/L
Cell Type: fibroblast
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 10 MG/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 100 NMOL/L
Cell Type: HeLa cell
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 54 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Route: Intratracheal
Dose: 25500 UG/KG
Exposure Time: 16H
Mutation test: Micronucleus test

Species: Rat
Route: Oral
Dose: 200 MG/KG
Mutation test: Morphological transformation.

Species: Rat
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Rat
Route: Intratracheal
Dose: 25560 UG/KG
Mutation test: DNA

Species: Rat
Route: Intratracheal
Dose: 51150 UG/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 500 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Dose: 4250 UG/L (+S9)
Cell Type: lymphocyte
Mutation test: Mutation in microorganisms

Species: Mouse
Dose: 500 UG/L
Cell Type: fibroblast
Mutation test: Morphological transformation.

Species: Mouse
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 6 UMOL/L
Cell Type: liver
Mutation test: DNA

Species: Mouse
Route: Skin
Dose: 40 UMOL/KG
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: Other mutation test systems

Species: Hamster
Dose: 56400 NMOL/L (+S9)
Cell Type: lung
Mutation test: Mutation in microorganisms

Species: Hamster
Dose: 2500 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 25 UG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L

Exposure Time: 24H
Cell Type: fibroblast
Mutation test: DNA damage

Species: Hamster
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Hamster
Dose: 5 MG/L
Cell Type: kidney
Mutation test: DNA damage

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: DNA

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: Other mutation test systems

Species: Hamster
Dose: 1 MMOL/L
Cell Type: fibroblast
Mutation test: Cytogenetic analysis

Species: Hamster
Route: Intraperitoneal
Dose: 900 MG/KG
Exposure Time: 24H
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 500 UG/L
Cell Type: lung
Mutation test: Mutation in mammalian somatic cells.

Species: Mammal
Dose: 2 NMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Dannish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous

substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 45-50/53
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 53-45-60-61
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: Yes

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

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 Inc., 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

ULTRA Scientific · 250 Smith Street · North Kingstown, RI, USA 02852 · 401-294-9400

Product #: P-730 **Last Update: 4/27/2009**

Section I Product Identification

Name: Indeno[1,2,3-cd]pyrene Solution

Solvent : methylene chloride (dichloromethane)

Section II Composition / Information on Ingredients

Component	CAS#	% by Wt.	LD50	OSHA PEL	ACGIH TLV	RTECS #	Codes
methylene chloride (dichloromethane)	000075-09-2	99.99246	2136 mg/kg oral rat	25 ppm	50 ppm	PA8050000	DFGH
indeno[1,2,3-cd]pyrene	000193-39-5	0.00754	N/A	N/A	N/A	NK9300000	DFH

Codes: A-OSHA regulated carcinogen; B-IARC Group 1 carcinogen; C-IARC Group 2A carcinogen; D-IARC Group 2B carcinogen; E-NTP Group 1 carcinogen; F-NTP Group 2 carcinogen; G-SARA Title III compound; H-California Proposition 65 compound.

Section III Hazards Identification

Contains carcinogen(s) or cancer suspect agent(s)

Irritant

All chemicals should be considered hazardous - direct physical contact should be avoided.

Section IV First Aid Measures

Inhalation:	If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.
Skin Contact:	In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.
Eye Contact:	In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.
Ingestion:	If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V Fire Fighting Measures

Fire and Explosion Hazard Data for Solvent

Fire Hazard: non-combustible

Extinguishing Media: Carbon dioxide, dry chemical powder, or water spray.

Section VI Accidental Release Measures

Ventilate area of the leak or spill. Wear appropriate personal protective equipment as specified in Section VIII. A leaking bottle, vial, or ampule may be placed in a plastic bag, and normal disposal procedures followed. Take up spilled material with sand or other non-combustible absorbant material, and place in an appropriate container for later disposal. Flush spill area with water.

Section VII Handling and Storage

Store at Room Temperature (18-25°C)

Keep in a tightly closed container, and store in a corrosion proof area.

This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Solvent

Melting Pt.: -96.7°C	Boiling Pt.: 39.8°C	Density: 1.326
Vapor Pressure: 350 mmHg @ 20°C	Vapor Density: 2.9	Water Solubility: insoluble
Appearance: colorless liquid	Odor: chloroform-like odor	Flash Point: none
Auto-Ignition Temperature: 1139°F	LEL: 15.5	UEL: 66.4

Section X Stability and Reactivity

Reactivity Data for Solvent

Stability: stable

Incompatibilities: strong oxidizers, caustics, active metal powder

Hazardous Decomposition Products: phosgene, HCl, CO

Hazardous Effects of Polymerization: none

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Toxic, liquids, organic, n.o.s. (dichloromethane)

UN Number: UN2810 Shipping Class: 6.1 Packing Group: III

Section XV Regulatory Information

Warning: This product contains chemicals known to the state of California to cause cancer.

EU Directives Classification

R: 40

Risk Statements: Limited evidence of a carcinogenic effect.

S: 23-24/25-36/37

Safety Statements: Do not breathe gas/fumes/vapour/spray. Avoid contact with skin and eyes. Wear suitable protective clothing and gloves.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

Material Safety Data Sheet

PAH Contaminated Soil

ACC# 17974

Section 1 - Chemical Product and Company Identification

MSDS Name: PAH Contaminated Soil
Catalog Numbers: SRS103100
Synonyms: API separator sludge
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
Not available	Soil	78-99	unlisted
120-12-7	Anthracene	0-2	204-371-1
129-00-0	Pyrene	0-2	204-927-3
132-64-9	Dibenzofuran	0-2	205-071-3
205-99-2	Benzo(b)fluoranthene	0-2	205-911-9
206-44-0	Fluoranthene	0-2	205-912-4
208-96-8	Acenaphthylene	0-2	205-917-1
218-01-9	1,2-benzphenanthrene	0-2	205-923-4
50-32-8	Benzo(a)pyrene	0-2	200-028-5
56-55-3	1,2-Benzanthracene	0-2	200-280-6
83-32-9	Acenaphthene	0-2	201-469-6
85-01-8	Phenanthrene	0-2	201-581-5
86-73-7	Fluorene	0-2	201-695-5
87-86-5	Pentachlorophenol	0-2	201-778-6
91-20-3	Naphthalene	0-2	202-049-5
91-57-6	2-methylnaphthalene	0-2	202-078-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: not available solid.
Warning! May cause allergic skin reaction. Causes eye and skin irritation. May cause cancer based on animal studies.
Target Organs: Eyes, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Naphthalene can cause cataracts, optical neuritis, and cornea injuries. Ingestion of large quantities may cause severe hemolytic anemia and
Inhalation: Causes respiratory tract irritation. May cause effects similar to those described for ingestion.
Chronic: May cause cancer according to animal studies. Prolonged exposure to respirable crystalline quartz may cause delayed lung injury/fibrosis (silicosis).

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.
Ingestion: 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.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

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.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: Not published.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling: Wash hands before eating. Use with adequate ventilation. Avoid contact with skin and eyes. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a cool, dry place.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Soil	none listed	none listed	none listed
Anthracene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Dibenzofuran	none listed	none listed	none listed
Benzo(b)fluoranthene	none listed	none listed	none listed
Fluoranthene	none listed	none listed	none listed
Acenaphthylene	none listed	none listed	none listed
1,2-benzphenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

Benzo(a)pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
1,2-Benzanthracene	none listed	none listed	none listed
Acenaphthene	none listed	none listed	none listed
Phenanthrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).
Fluorene	none listed	none listed	none listed
Pentachlorophenol	0.5 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.5 mg/m3 TWA 2.5 mg/m3 IDLH	0.5 mg/m3 TWA
Naphthalene	10 ppm TWA; 15 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	10 ppm TWA; 50 mg/m3 TWA 250 ppm IDLH	10 ppm TWA; 50 mg/m3 TWA
2-methylnaphthalene	none listed	none listed	none listed

OSHA Vacated PELs: Soil: No OSHA Vacated PELs are listed for this chemical. Anthracene: No OSHA Vacated PELs are listed for this chemical. Pyrene: No OSHA Vacated PELs are listed for this chemical. Dibenzofuran: No OSHA Vacated PELs are listed for this chemical. Benzo(b)fluoranthene: No OSHA Vacated PELs are listed for this chemical. Fluoranthene: No OSHA Vacated PELs are listed for this chemical. Acenaphthylene: No OSHA Vacated PELs are listed for this chemical. 1,2-benzphenanthrene: No OSHA Vacated PELs are listed for this chemical. Benzo(a)pyrene: No OSHA Vacated PELs are listed for this chemical. 1,2-Benzanthracene: No OSHA Vacated PELs are listed for this chemical. Acenaphthene: No OSHA Vacated PELs are listed for this chemical. Phenanthrene: No OSHA Vacated PELs are listed for this chemical. Fluorene: No OSHA Vacated PELs are listed for this chemical. Pentachlorophenol: 0.5 mg/m3 TWA Naphthalene: 10 ppm TWA; 50 mg/m3 TWA 2-methylnaphthalene: No OSHA Vacated PELs are listed for this chemical.

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 gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: not available
Odor: none reported
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density: Not available.
Molecular Formula: Mixture
Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures.
Incompatibilities with Other Materials: None reported.
Hazardous Decomposition Products: No data available.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 120-12-7: CA9350000
CAS# 129-00-0: UR2450000; UR2450100
CAS# 132-64-9: HP4430000
CAS# 205-99-2: CU1400000
CAS# 206-44-0: LL4025000
CAS# 208-96-8: AB1254000; AB1254200
CAS# 218-01-9: GC0700000
CAS# 50-32-8: DJ3675000
CAS# 56-55-3: CV9275000
CAS# 83-32-9: AB1000000
CAS# 85-01-8: SF7175000
CAS# 86-73-7: LL5670000
CAS# 87-86-5: SM6300000; SM6314000; SM6321000
CAS# 91-20-3: QJ0525000
CAS# 91-57-6: QJ9635000
LD50/LC50:
CAS# 120-12-7:

Oral, mouse: LD50 = 4900 mg/kg;

CAS# 129-00-0:
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, rat: LC50 = 170 mg/m3;
Inhalation, rat: LC50 = 170 mg/m3;
Oral, mouse: LD50 = 800 mg/kg;
Oral, rat: LD50 = 2700 mg/kg;

CAS# 132-64-9:

CAS# 205-99-2:

CAS# 206-44-0:
Oral, rat: LD50 = 2 gm/kg;
Skin, rabbit: LD50 = 3180 mg/kg;

CAS# 208-96-8:
Oral, mouse: LD50 = 1760 mg/kg;

CAS# 218-01-9:

CAS# 50-32-8:

CAS# 56-55-3:

CAS# 83-32-9:

CAS# 85-01-8:
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1.8 gm/kg;

CAS# 86-73-7:

CAS# 87-86-5:
Draize test, rabbit, eye: 100 uL/24H Mild;
Inhalation, mouse: LC50 = 225 mg/m3;
Inhalation, mouse: LC50 = 225 mg/m3;
Inhalation, rat: LC50 = 355 mg/m3;
Inhalation, rat: LC50 = 200 mg/m3;
Inhalation, rat: LC50 = 335 mg/m3;
Oral, mouse: LD50 = 36 mg/kg;
Oral, mouse: LD50 = 117 mg/kg;
Oral, mouse: LD50 = 30 mg/kg;
Oral, rabbit: LD50 = 200 mg/kg;
Oral, rat: LD50 = 27 mg/kg;
Oral, rat: LD50 = 27 mg/kg;
Oral, rat: LD50 = 50 mg/kg;
Skin, rat: LD50 = 96

CAS# 91-20-3:
Draize test, rabbit, eye: 100 mg Mild;
Inhalation, rat: LC50 = >340 mg/m3/1H;
Oral, mouse: LD50 = 316 mg/kg;
Oral, rat: LD50 = 490 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rat: LD50 = >2500 mg/kg;

CAS# 91-57-6:
Oral, rat: LD50 = 1630 mg/kg;

Carcinogenicity:
CAS# 120-12-7:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 129-00-0:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').
- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 132-64-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 205-99-2:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 206-44-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 208-96-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 56-55-3:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

CAS# 83-32-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 85-01-8:

- **ACGIH:** A1 - Confirmed Human Carcinogen (as benzene soluble aerosol) (listed as 'Coal tar pitches').

- **California:** Not listed.
- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

CAS# 86-73-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 87-86-5:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90
- **NTP:** Not listed.
- **IARC:** Not listed.

CAS# 91-20-3:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/19/02
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

CAS# 91-57-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 206-44-0: waste number U120.
CAS# 218-01-9: waste number U050.
CAS# 50-32-8: waste number U022.
CAS# 56-55-3: waste number U018.
CAS# 91-20-3: waste

Section 14 - Transport Information

US DOT	Canada TDG

Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

Soil is not listed on the TSCA inventory. It is for research and development use only.
CAS# 120-12-7 is listed on the TSCA inventory.
CAS# 129-00-0 is listed on the TSCA inventory.
CAS# 132-64-9 is listed on the TSCA inventory.
CAS# 205-99-2 is not listed on the TSCA inventory. It is for research and development use only.
CAS# 206-44-0 is listed on the TSCA inventory.
CAS# 208-96-8 is listed on the TSCA inventory.
CAS# 218-01-9 is listed on the TSCA inventory.
CAS# 50-32-8 is listed on the TSCA inventory.
CAS# 56-55-3 is listed on the TSCA inventory.
CAS# 83-32-9 is listed on the TSCA inventory.
CAS# 85-01-8 is listed on the TSCA inventory.
CAS# 86-73-7 is listed on the TSCA inventory.
CAS# 87-86-5 is listed on the TSCA inventory.
CAS# 91-20-3 is listed on the TSCA inventory.
CAS# 91-57-6 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 129-00-0: Effective 6/1/87, Sunset 6/1/97 CAS# 91-20-3: Effective 6/1/87, Sunset 6/1/97

Chemical Test Rules

CAS# 91-20-3: Testing required by manufacturers, processors

Section 12b

CAS# 91-20-3: Section 4

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 120-12-7: 5000 lb final RQ; 2270 kg final RQ CAS# 129-00-0: 5000 lb final RQ; 2270 kg final RQ CAS# 132-64-9: 100 lb final RQ; 45.4 kg final RQ CAS# 205-99-2: 1 lb final RQ; 0.454 kg final RQ CAS# 206-44-0: 100 lb final RQ; 45.4 kg final RQ CAS# 208-96-8: 5000 lb final RQ; 2270 kg final RQ CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ CAS# 56-55-3: 10 lb final RQ; 4.54 kg final RQ CAS# 83-32-9: 100 lb final RQ; 45.4 kg final RQ CAS# 85-01-8: 5000 lb final RQ; 2270 kg final RQ CAS# 86-73-7: 5000 lb final RQ; 2270 kg final RQ CAS# 87-86-5: 10 lb final RQ; 4.54 kg final RQ CAS# 91-20-3: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 129-00-0: 1000 lb TPQ (lower threshold); 10000 lb TPQ (upper thre shold)

SARA Codes

CAS # 120-12-7: acute.
CAS # 129-00-0: acute, chronic.
CAS # 206-44-0: acute.

CAS # 50-32-8: acute, chronic.
CAS # 56-55-3: chronic.
CAS # 83-32-9: acute.
CAS # 85-01-8: acute.
CAS # 91-20-3: acute, chronic, flammable.
CAS # 91-57-6: acute.

Section 313

This material contains Anthracene (CAS# 120-12-7, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Dibenzofuran (CAS# 132-64-9, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Benzo(b)fluoranthene (CAS# 205-99-2, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Fluoranthene (CAS# 206-44-0, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains 1,2-benzphenanthrene (CAS# 218-01-9, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Benzo(a)pyrene (CAS# 50-32-8, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains 1,2-Benzanthracene (CAS# 56-55-3, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Phenanthrene (CAS# 85-01-8, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

This material contains Pentachlorophenol (CAS# 87-86-5, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

This material contains Naphthalene (CAS# 91-20-3, 0-2%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 132-64-9 is listed as a hazardous air pollutant (HAP).

CAS# 87-86-5 is listed as a hazardous air pollutant (HAP).
CAS# 91-20-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 87-86-5 is listed as a Hazardous Substance under the CWA. CAS# 91-20-3 is listed as a Hazardous Substance under the CWA. CAS# 120-12-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 129-00-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 205-99-2 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act. CAS# 208-96-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act. CAS# 56-55-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 83-32-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 85-01-8 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 86-73-7 is listed as a Priority Pollutant under the Clean Water Act. CAS# 87-86-5 is listed as a Priority Pollutant under the Clean Water Act. CAS# 91-20-3 is listed

as a Priority Pollutant under the Clean Water Act. CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 83-32-9 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 87-86-5 is listed as a Toxic Pollutant under the Clean Water Act. CAS# 91-20-3 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 120-12-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 129-00-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 132-64-9 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 205-99-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 206-44-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

CAS# 208-96-8 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 56-55-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 83-32-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

CAS# 85-01-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, (listed as Coal tar pitches), Massachusetts.

CAS# 86-73-7 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 87-86-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-20-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-57-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

WARNING: This product contains Benzo(b)fluoranthene, a chemical known to the state of California to cause cancer. WARNING: This product contains 1,2-benzphenanthrene, a chemical known to the state of California to cause cancer. WARNING: This product contains Benzo(a)pyrene, a chemical known to the state of California to cause cancer. WARNING: This product contains 1,2-Benzanthracene, a chemical known to the state of California to cause cancer. WARNING: This product contains Pentachlorophenol, a chemical known to the state of California to cause cancer. WARNING: This product contains Naphthalene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 205-99-2: 0.096 æg/day NSRL (oral) CAS# 218-01-9: 0.35 æg/day NSRL (oral) CAS# 50-32-8: 0.06 æg/day NSRL CAS# 56-55-3: 0.033 æg/day NSRL (oral) CAS# 87-86-5: 40 æg/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 120-12-7: 2
CAS# 129-00-0: No information available.
CAS# 132-64-9: No information available.
CAS# 205-99-2: No information available.
CAS# 206-44-0: No information available.
CAS# 208-96-8: No information available.
CAS# 218-01-9: No information available.
CAS# 50-32-8: No information available.
CAS# 56-55-3: No information available.
CAS# 83-32-9: No information available.
CAS# 85-01-8: No information available.
CAS# 86-73-7: No information available.
CAS# 87-86-5: 3
CAS# 91-20-3: 2
CAS# 91-57-6: No information available.

Canada - DSL/NDSL

CAS# 120-12-7 is listed on Canada's DSL List.
CAS# 129-00-0 is listed on Canada's DSL List.
CAS# 132-64-9 is listed on Canada's DSL List.
CAS# 218-01-9 is listed on Canada's DSL List.
CAS# 50-32-8 is listed on Canada's DSL List.
CAS# 83-32-9 is listed on Canada's DSL List.
CAS# 85-01-8 is listed on Canada's DSL List.
CAS# 86-73-7 is listed on Canada's DSL List.
CAS# 87-86-5 is listed on Canada's DSL List.
CAS# 91-20-3 is listed on Canada's DSL List.
CAS# 91-57-6 is listed on Canada's DSL List.
CAS# 206-44-0 is listed on Canada's NDSL List.
CAS# 208-96-8 is listed on Canada's NDSL List.
CAS# 56-55-3 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

Canadian Ingredient Disclosure List

CAS# 120-12-7 is listed on the Canadian Ingredient Disclosure List.
CAS# 129-00-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 205-99-2 is listed on the Canadian Ingredient Disclosure List.
CAS# 206-44-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 208-96-8 is not listed on the Canadian Ingredient Disclosure List.
CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.
CAS# 56-55-3 is listed on the Canadian Ingredient Disclosure List.
CAS# 83-32-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 85-01-8 is listed on the Canadian Ingredient Disclosure List.
CAS# 86-73-7 is not listed on the Canadian Ingredient Disclosure List.
CAS# 87-86-5 is not listed on the Canadian Ingredient Disclosure List.
CAS# 91-20-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #3 Date: 3/18/2003

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 Fisher 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 Fisher has been advised of the possibility of such damages.

METAL

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: LL0070 LL0079 LL0080 LL0081 LL0082 LL0085 LL0086
Effective Date: March 29, 2005

SECTION I NAME

Product	Lead Metal
Chemical Synonyms	N/A
Formula	Pb
Unit Size	up to 2.5 Kg.
C.A.S. No.	7439-92-1

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC 800-424-9300
Day 585-226-6177

NFPA

Health	3
Fire	0
Reactivity	0

HMIS *

HAZARD RATING
MINIMAL 0 SLIGHT 1 MODERATE 2 SERIOUS 3 SEVERE 4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Lead metal, shot, granular, sheet, foil	99+%	See Section V.
CAUTION! MAY BE HARMFUL OR FATAL IF SWALLOWED		
OR INHALED AS FUMES OR DUST.		

SECTION III PHYSICAL DATA

Melting Point (°F)	Approx. 327.4°C (621°F)	Specific Gravity (H_2O = 1)	11.34 (20/4°C)
Boiling Point (°F)	1753°C (3187°F)	Percent Volatile by Volume (%)	0% at ambient temp.
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	Non-volatile (N/A).
Vapor Density (Air=1)	N/A		
Solubility in Water	Insoluble.		
Appearance & Odor	Bluish, silvery, gray soft metal, granular, shot, sheet, foil; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable (N/A).	Flammable Limits in Air % by Volume	Lower --------	Upper --------
Extinguisher Media	Dry chemical or carbon dioxide should be used on surrounding fire. Do not use water on fires where molten metal is present.	N/A		

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

When heated emits toxic fumes of lead which can react vigorously with oxidizing materials.

D.O.T. Non Regulated.

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA LL0070

Threshold Limited Value
Lead as inorganic compounds, as Pb: TWA 0.05 mg/m^3 (ACGIH 2001).

Effects of Overexposure
SKIN: Not absorbed through skin. EYES: No specific hazard known. Contact may cause transient irritation. INGESTION: May produce anorexia, vomiting, malaise, convulsions due to increased intracranial pressure. INHALATION: Of dust or fumes can cause lead poisoning. Target organs: Lungs, kidneys.

Emergency and First Aid Procedures
INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. EYES: Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. SKIN: Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability			Conditions to Avoid
	Unstable		High temperatures to produce fumes.
	Stable	X	

Incompatibility (Materials to Avoid) Strong oxidizing materials.

Hazardous Decomposition Products When heated, emits toxic fumes of lead.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled
Carefully sweep up without producing dust and recycle for use or place in a suitable container for disposal.

Waste Disposal Method
Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.
Dispose of in an approved chemical landfill or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None should be needed in normal laboratory use at room temperature. If dusty conditions prevail, work in ventilation hood or wear a NIOSH/MSHA-approved dust mask or respirator.

Ventilation				
	Local Exhaust	None needed.	Special	No.
	Mechanical (General)	None needed.	Other	No.

Protective Gloves	Recommended - leather.	Eye Protection	Chemical safety glasses.

Other Protective Equipment Smock, apron, eye wash station, lab coat, ventilation hood.

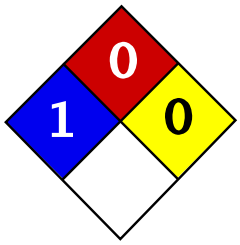
SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing
Keep container tightly closed when not in use.
Store in a cool, dry place away from fire hazards. Wash thoroughly after handling. Remove and wash contaminated clothing.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals. For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Lead can react violently with oxidizing materials. Water may become trapped within surface cracks which may cause an explosion when the metal is molten.

Revision No. 9	Date 03/29/05	Approved Michael Raszeja	Chemical Safety Coordinator MR



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

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
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

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

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 blood, lungs, brain, 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. 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: 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: Not applicable.

Special Remarks on Fire Hazards:
Moderate fire potential, in the form of dust or powder, when exposed to flame.
When manganese if heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence.
Concentrated nitric acid reacts with powdered manganese with incandescence and explosion.
Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to 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. 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:
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, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

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: 0.1 (mg/m3) from ACGIH (TLV) [United States]
TWA: 5 (mg/m3) [Canada]
TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States]
TWA: 5 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

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

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (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: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Superficially oxidized on exposure to air.
Reacts with aqueous solutions of sodium or potassium bicarbonate.
Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts.
Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively.
In the form of powder, it reduces most metallic oxides on heating.
On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic.
Also incompatible with hydroxides, cyanides, carbonates.

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): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Manganese can cross the placenta.
May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritaiton
Eyes: Dust may cause mechanical irritation.

Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressivness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation).
Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism.
Ingestion: May cause digestive tract irritation. There is a low gastrointesitnal absorption of manganese.
Chronic Potential Health Effects:
Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degeneratiave changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice)
Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

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: 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:
Illinois toxic substances disclosure to employee act: Manganese
Rhode Island RTK hazardous substances: Manganese
Pennsylvania RTK: Manganese
Minnesota: Manganese
Massachusetts RTK: Manganese
New Jersey: Manganese
New Jersey spill list: Manganese
Louisiana spill reporting: Manganese
California Director's List of Hazardous Substances: Manganese
TSCA 8(b) inventory: Manganese

SARA 313 toxic chemical notification and release reporting: Manganese

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): Not controlled under WHMIS (Canada).

DSCL (EEC): Not applicable.

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.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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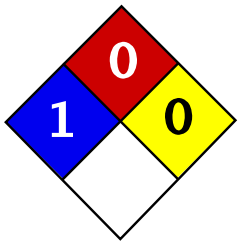
Last Updated: 10/09/2005 06:03 PM



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

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
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

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

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 blood, lungs, brain, 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. 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: 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: Not applicable.

Special Remarks on Fire Hazards:
Moderate fire potential, in the form of dust or powder, when exposed to flame.
When manganese if heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence.
Concentrated nitric acid reacts with powdered manganese with incandescence and explosion.
Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to 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. 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:
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, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

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: 0.1 (mg/m3) from ACGIH (TLV) [United States]
TWA: 5 (mg/m3) [Canada]
TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States]
TWA: 5 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

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

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (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: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Superficially oxidized on exposure to air.
Reacts with aqueous solutions of sodium or potassium bicarbonate.
Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts.
Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively.
In the form of powder, it reduces most metallic oxides on heating.
On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic.
Also incompatible with hydroxides, cyanides, carbonates.

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): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Manganese can cross the placenta.
May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: May cause skin irritaiton
Eyes: Dust may cause mechanical irritation.

Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressivness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation).
Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism.
Ingestion: May cause digestive tract irritation. There is a low gastrointesitnal absorption of manganese.
Chronic Potential Health Effects:
Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degeneratiave changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice)
Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

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: 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:
Illinois toxic substances disclosure to employee act: Manganese
Rhode Island RTK hazardous substances: Manganese
Pennsylvania RTK: Manganese
Minnesota: Manganese
Massachusetts RTK: Manganese
New Jersey: Manganese
New Jersey spill list: Manganese
Louisiana spill reporting: Manganese
California Director's List of Hazardous Substances: Manganese
TSCA 8(b) inventory: Manganese

SARA 313 toxic chemical notification and release reporting: Manganese

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): Not controlled under WHMIS (Canada).

DSCL (EEC): Not applicable.

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.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 10/09/2005 06:03 PM

METAL

10 M

Material Safety Data Sheet
Mercury

ACC# 14020

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury
Catalog Numbers: S40672B, S41542, S41599, S41599B, S41599E, S41599G, S41599J, S41599K, S41599M, S41600P, S41600S, S41600W, S41630A, S41630B, S41630C, S41631, S41631A, S41631B, S41631C, S41645, S45245, S46981, S50443, S71966, S71967, S71968, S78777, 13501, M139-1LB, M139-5LB, M140-14LB, M140-1LB, M140-5LB, M141-1LB, M141-6LB, NC9534278
Synonyms: Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-97-6	Mercury	100	231-106-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid.
Danger! Corrosive. Harmful if inhaled. May be absorbed through intact skin. Causes eye and skin irritation and possible burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause central nervous system effects. Inhalation of fumes may cause metal-fume fever. May cause liver and kidney damage. Possible sensitizer. This substance has caused adverse reproductive and fetal effects in animals.
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.
Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. 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.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) 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

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

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	0.1 mg/m3 Ceiling (vapor)

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)
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
Appearance: 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
Freezing/Melting Point:-38.87 deg C
Decomposition Temperature: Not available.
Solubility: 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: Oxygen, sulfur, acetylene, ammonia, chlorine dioxide, azides, chlorates, nitrates, sulfuric acid, halogens, rubidium, calcium, 3-bromopropyne, ethylene oxide, lithium, methylsilane + oxygen, peroxyformic acid, tetracarbonylnickel + oxygen, copper, copper alloys, boron diiodophosphide, metals, nitromethane, sodium carbide, aluminum, lead, iron, metal oxides.
Hazardous Decomposition Products: Mercury/mercury oxides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-97-6: OV4550000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-97-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at site of application).
Teratogenicity: Inhalation, rat: TCLo = 1 mg/m3/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m3/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m3/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m3.
Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the brain cortex can occur as a late sequela to past exposure.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury cmpd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be a rapid process.
Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.
Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	MERCURY	MERCURY
Hazard Class:	8	8
UN Number:	UN2809	UN2809
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-97-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs

CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7439-97-6: acute, chronic.

Section 313

This material contains Mercury (CAS# 7439-97-6, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7439-97-6 (listed as Mercury compounds) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains Mercury, a chemical known to the state of California to cause developmental reproductive toxicity.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 23 Toxic by inhalation.

R 33 Danger of cumulative effects.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

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 - DSL/NDSL

CAS# 7439-97-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, E.

Canadian Ingredient Disclosure List

CAS# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999
Revision #7 Date: 1/20/2005

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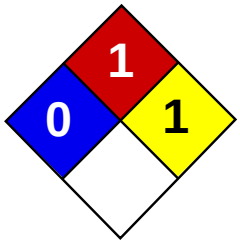

Material Safety Data Sheet
Zinc Metal MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc Metal

Catalog Codes: SLZ1054, SLZ1159, SLZ1267, SLZ1099, SLZ1204

CAS#: 7440-66-6

RTECS: ZG8600000

TSCA: TSCA 8(b) inventory: Zinc Metal

CI#: Not applicable.

Synonym: Zinc Metal Sheets; Zinc Metal Shot; Zinc Metal Strips

Chemical Name: Zinc Metal

Chemical Formula: Zn

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
Zinc Metal	7440-66-6	100

Toxicological Data on Ingredients: Zinc Metal 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: 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: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials, of acids, of alkalis, 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.

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:
Zinc + NaOH causes ignition. Oxidation of zinc by potassium proceeds with incandescence. Residues from zinc dust /acetic acid reduction operations may ignite after long delay if discarded into waste bins with paper. Incandescent reaction when Zinc and Arsenic or Tellurium, or Selenium are combined. When hydrazine mononitrate is heated in contact with zinc, a flamming decomposition occurs at temperatures a little above its melting point. Contact with acids and alkali hydroxides (sodium hydroxide, postasium hydroxide, calcium hydroxide, etc.) results in evolution of hydrogen with sufficient heat of reaction to ignite the hydrogen gas. Zinc foil ignites if traces of moisture are present. It is water reactive and produces flammable gases on contact with water. It may ignite on contact with water or moist air.

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:
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. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

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, alkalis, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction.

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. (Lustrous solid. Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 65.39 g/mole

Color: Bluish-grey

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

Boiling Point: 907°C (1664.6°F)

Melting Point: 419°C (786.2°F)

Critical Temperature: Not available.

Specific Gravity: Not available.

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, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, moisture

Incompatibility with various substances:
Reactive with oxidizing agents, acids, alkalis. Slightly reactive to reactive with moisture. The product may react violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with acids, halogenated hydrocarbons, NH_4NO_3, barium oxide, $Ba(NO_3)_2$, Cadmium, CS_2, chlorates, Cl_2, CrO_3, F_2, Hydroxylamine, $Pb(N_3)_2$, $MnCl_2$, HNO_3, performic acid, $KClO_3$, KNO_3, N_2O_2, Selenium, $NaClO_3$, Na_2O_2, Sulfur, Te, water, $(NH_4)_2S$, As_2O_3, CS_2, $CaCl_2$, chlorinated rubber, catalytic metals, halocarbons, o-nitroanisole, nitrobenzene, nonmetals, oxidants, paint primer base, pentacarbonoyliron, transition metal halides, seleninyl bromide, HCl, H_2SO_4, (Mg +$Ba(NO_3)_2$ +BaO_2), (ethyl acetoacetate +tribromoneopentyl alcohol. Contact with Alkali Hydroxides(Sodium Hydroxide, Potassium Hydroxide, Calcium Hydroxide, etc) results in evolution of hydrogen. Ammonium nitrate + zinc + water causes a violent reaction with evolution of steam and zinc oxide. May react with water.

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. Dermal exposure to zinc may produce leg pains, fatigue, anorexia and weight loss. Eyes: May cause eye irritation. Ingestion: May be harmul if swallowed. May cause digestive tract irritation with tightness in throat, nausea, vomiting, diarrhea, loss of appetite, malaise, abdominal pain. fever, and chills. May affect behavior/central nervous system and autonomic nervous system with ataxia, lethargy, staggering gait, mild derrangement in cerebellar function, lightheadness, dizzness, irritability, muscular stiffness, and pain. May also affect blood. Inhalation: Inhalation of zinc dust or fumes may cause respiratory tract and mucous membrane irritation with cough and chest pain. It can also cause "metal fume fever", a flu-like condition characterized appearance of chills, headached fever, maliase, fatigue, sweating, extreme thirst, aches in the legs and chest, and difficulty in breathing. A sweet taste may also be be present in metal fume fever, as well as a dry throat, aches, nausea, and vomiting, and pale grey cyanosis. The toxicological properties of this substance have not been fully investisgated.

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: Not available.

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:
New York release reporting list: Zinc Metal Rhode Island RTK hazardous substances: Zinc Metal Pennsylvania RTK: Zinc Metal Florida: Zinc Metal Michigan critical material: Zinc Metal Massachusetts RTK: Zinc Metal New Jersey: Zinc Metal California Director's List of Hazardous Substances: Zinc Metal TSCA 8(b) inventory: Zinc Metal TSCA 12(b) one time export: Zinc Metal SARA 313 toxic chemical notification and release reporting: Zinc Metal CERCLA: Hazardous substances.: Zinc Metal: 1000 lbs. (453.6 kg)

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

Other Classifications:

WHMIS (Canada): Not Available

DSCL (EEC):
R15- Contact with water liberates extremely flammable gases. R17- Spontaneously flammable in air. S7/8- Keep container tightly closed and dry.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 1

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. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

Attachment III

Heat and Cold Stress

Attachment III – Heat Stress / Cold Stress

1.0 HEAT STRESS

Excessive exposure to a hot environment can bring about a variety of heat-induced disorders. The four main types of heat stress related illnesses: heat rash, heat cramps, heat exhaustion, and heat stroke, are discussed below.

1.1 Heat Rash

Heat rash also know as prickly heat, is likely to occur in hot, humid environments where sweat is not readily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by an infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

1.2 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs or abdomen, but tired muscles (those used to perform the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth, such as the variety of sports drinks on the market.

CAUTION SHOULD BE EXERCISED BY PEOPLE WITH HEART PROBLEMS OR THOSE ON LOW SODIUM DIETS WHO WORK IN HOT ENVIRONMENTS. THESE PEOPLE SHOULD CONSULT A PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

1.3 Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from this condition still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

A summary of the key symptoms of heat exhaustion is as follows:

- Clammy skin
- Confusion
- Dizziness
- Fainting
- Fatigue
- Heat Rash
- Light-headedness
- Nausea
- Profuse sweating
- Slurred Speech
- Weak Pulse

In most cases, treatment involves having the victim rest in a cool place and drink plenty of fluids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

AS WITH HEAT CRAMPS, CERTAIN PERSONS SHOULD CONSULT WITH THEIR PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

1.4 Heat Stroke

This is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105^{o}F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

A summary of the key symptoms of heatstroke is as follows:

- Confusion
- Convulsions
- Incoherent Speech
- Staggering Gait
- Unconsciousness
- Sweating stops
- Hot skin, high temperature (yet extremities may feel chilled)

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes moving the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should include continuation of the cooling process and the monitoring of complications that often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

1.5 Preparing for the Heat

Humans, to a large extent, are capable of adjusting to heat. This acclimation to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more tolerable.

On the first day of exposure, body temperature, pulse rate, and general discomfort will be higher. With each succeeding day of exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body does become acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

A gradual exposure to heat gives the body time to become accustomed to higher temperatures, such as those encountered in chemical protective clothing.

1.6 Protecting Against Heat Stress

There are several methods that can be used to reduce heat stress:

- Limit duration of work periods
- Use protective clothing with cooling devices
- Enforce the use of the "Buddy System"
- Consume electrolyte solutions prior to suiting up
- Monitor workers for pulse recovery rates, body fluid loss, body weight loss, and excess fatigue
- Screen for heat stress susceptible candidates in your medical surveillance program
- Have all personnel know the signs and symptoms of heat stress

2.0 COLD STRESS

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold injury, ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at minus 18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

2.1 Frostbite

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost Nip or Initial Frostbite: characterized by suddenly blanching or whitening of skin.
- Superficial Frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite: tissues are cold, pale, and solid; extremely serious injury.

2.2 Hypothermia

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes rapid cooling of the body to less than 95°F)
- Unconsciousness, glassy stage, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

Thermal socks, long cotton or thermal underwear, hard hat liners and other cold weather gear can aid in the prevention of hypothermia. Blankets and warm drinks (other than caffeinated coffee) are also recommended.

Measures shall be taken to keep workers from getting wet, such as issuance of rain gear. Workers whose cloths become wet shall be given the opportunity to dry off and change clothes.

Attachment IV

Construction Safety Rules

Attachment IV - Construction Equipment Safety Rules

1.0 ELECTRICAL

1. Live electrical parts shall be guarded against accidental contact by cabinets, enclosure, location, or guarding. Cabinet covers will be replaced.

2. Working and clear space around electric equipment and distribution boxes will be kept clear and assessable.

3. Circuit breakers, switch boxes, etc. will be legibly marked to indicate their purpose.

4. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground-fault circuit interrupters for personnel protection. If the prime contractor has not provided this protection with GFCI receptacles at the temporary service drop, employees will ensure portable GFCI protection is provided. (Employers may wish to use assured equipment grounding conductor program in lieu of this GFCI protection.) This requirement is in addition to any other electrical equipment grounding requirement or double insulated protection.

5. All extension cords will be three-wire (grounded) type and designed for hard or extra hard usage (Type S, ST, SO, STO, or SJ, SJO, SJT, SJTO).

6. Ground prongs will not be removed.

7. Cords and strain relief devices/clamps will be in good condition.

8. All lamps for general illumination will have the bulbs protected against breakage.

9. Electrical cords will not suspend temporary lights unless cords and lights are designed for such suspension. Flexible cords used for temporary and portable lights will be designed for hard or extra hard usage.

10. Employees will not work in such close (able to contact) proximity to any part of an electric power circuit unless the circuit is de-energized, grounded, or guarded by insulation.

11. Equipment or circuits that are de-energized will be locked out and tagged out. The tags will plainly identify the equipment or circuits being worked on.

2.0 COMPRESSED GAS CYLINDERS

1. All gas cylinders will have their contents clearly marked on the outside of each cylinder.

2. Cylinders must be transported, stored, and secured in an upright position. They will never be left laying on the ground or floor, nor used as rollers or supports.

3. Cylinder valves must be protected with caps and closed when not in use.

4. All leaking or defective cylinders must be removed from service promptly, tagged as inoperable and placed in an open space removed from the work area.

5. Oxygen cylinders and fittings will be kept away from oil or grease.

6. When cylinders are hoisted, they will be secured in a cradle, sling-board, or pallet. Valve protection caps will not be used for lifting cylinders from one vertical level to another.

3.0 LADDERS

1. A competent person to identify any unsafe conditions will periodically inspect ladders.

2. Those ladders with structural defects will be removed from service, and repaired or replaced.

3. Straight ladders used on other than stable, level, and dry surfaces must be tied off, held, or secured for stability.

4. Portable ladder side rails will extend at least three feet above the upper landing to which the ladder is used to gain access.

5. The top or top step of a stepladder will not be used as a step.

4.0 AERIAL LIFTS

1. Aerial lifts include cherry pickers, extensible boom platforms, aerial ladders, articulating boom platforms, vertical towers, and any combinations of the above.

2. Only authorized and trained persons will operate aerial lifts.

3. Lift controls will be tested each day before use.

4. Safety harness will be worn when elevated in the aerial lift.

5. Lanyards will be attached to the boom or basket.

6. Employees will not belt off to adjacent poles, structures, or equipment while working from an aerial lift.

7. Employees will always stand firmly on the floor of the basket, and will not sit or climb on the edge of the basket.

8. Planks, ladders, or other devices will not be used for work position or additional working height.

9. Brakes will be set and outriggers will be used.

10. The aerial lift truck will not be moved with the boom elevated and employees in the `basket, unless the equipment is specifically designed for such.

5.0 CRANES

1. A competent person prior to each use/during use to make sure it is in safe operating condition will inspect all cranes. Also, a certification record of monthly inspections to include date, inspector signature, and crane identifier will be maintained.

2. A thorough annual inspection of hoisting machinery will be made by a competent person, or by a government or private agency, and records maintained.

3. Loads will never be swung over the heads of workers in the area.

4. Employees will never ride hooks, concrete buckets, or other material loads being suspended or moved by cranes.

5. Hand signals to crane operators will be those prescribed by the applicable ANSI standard to the type of crane in use.

6. Tag lines must be used to control loads and keep workers away.

7. Loads, booms, and rigging will be kept at least 10 feet from energized electrical lines rated 50 KV or lower unless the lines are de-energized. For lines rated greater that 50 KV follow OSHA Rules and Regulations, 1926.550(a)(15).

8. Cranes will always be operated on firm, level surfaces, or use mats/pads, particularly for near-capacity lifts.

9. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, will be barricaded in such a manner as to prevent employees from being struck or crushed by the crane.

10. If suspended personnel platforms are to be lifted with a crane, reference 1926.550(g) for general and specific requirements.

11. Rigging equipment (chains, slings, wire rope, hooks, other attachments, etc.) will be inspected prior to use on each shift to ensure it is safe. Defective rigging and equipment will be removed from service.

12. Job or shop hooks or other makeshift fasteners using bolts, wire, etc. will not be used.

13. Wire rope shall be taken out of service when one of the following conditions exist:

- In running ropes, 6 random distributed broken wires in one lay or 3 broken wires in one strand or one lay.
- Wear of one-third the original diameter of outside individual wires.
- Kinking, crushing, bird caging, heat damage, or any other damage resulting in distortion of the rope structure.
- In standing ropes, more than two broken wires in one lay in sections beyond end connections, or more than one broken wire at an end connection.

6.0 WELDING and BRAZING

1. Combustible material will be cleared from the area around cutting or welding operations.

2. Welding helmets and goggles will be worn for eye protection and to prevent flash burns.

3. Eye protection to guard against slag while chipping, grinding and dressing of welds will be worn.

4. Only electrode holders specifically designed for arc welding will be used.

5. All parts subject to electrical current will be fully insulated against the maximum voltage encountered to ground.

6. A ground return cable shall have a safe current carrying capacity equal to, or exceeding, the specified maximum output capacity of the arc-welding unit that it services.

7. Cables, leads, hoses, and connections will be placed so that there are no fire or tripping hazards.

7.0 TOOLS

1. Take special precautions when using power tools.

2. Defective tools will be removed form service.

3. Electric power tools will be the grounded-type or double insulated.

4. Power tools will be turned off and motion stopped before setting tool down.

5. Tools will be disconnected from power source before changing drills, blades or bits, or attempting repair or adjustment. Never leave a running tool unattended.

6. Power saws, table saws, and radial arm saws will have operational blade guards installed and used.

7. Unsafe/defective hand tools will not be used. These include sprung jaws on wrenches, mushroomed head of chisels/punches, and cracked/broken handles of any tool.

8. Portable abrasive grinders will have guards installed covering the upper and back portions of the abrasive wheel. Wheel speed ratings will never be less than the grinder RPM speed.

9. Compressed air will not be used for cleaning purposes except when pressure is reduced to less than 30 psi by regulating or use of a safety nozzle, and then only with effective chip guarding and proper personal protective equipment.

10. Abrasive blasting nozzles will have a valve that must be held open manually.

11. Only trained employees will operate powder-actuated tools.

12. Any employee furnished tools of any nature must meet all OSHA and ANSI requirements.

8.0 SAFETY RAILINGS AND OTHER FALL PROTECTION

1. All open sided floors and platforms six feet or more above adjacent floor/ground level will be guarded by a standard railing (top and mid rail, toeboard if required).

2. A stairway or ladder will be provided at any point of access where there is a break in elevation of 19 inches or more.

3. All stairways of four or more risers or greater than 30 inches high will be guarded by a handrail or stair rails

4. When a floor hole or opening (greater than two inches in its least dimension) is created during a work activity, through which a worker can fall, step into, or material can fall through, a cover or a safety guardrail must be installed immediately.

5. Safety nets will be provided when workplaces are more than 25 feet above the ground, water, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts, is impractical.

6. Safety harnesses, lanyards, lines, and lifelines may be used in lieu of other fall protection systems to provide the required fall protection.

7. Adjustment of lanyards must provide for not more than a six-foot fall, and all tie off points must be at least waist high.

8.1 Scaffolds

1. Scaffolds will be erected, moved, dismantled, or altered only under the supervision of a competent person qualified in scaffold erection, moving, dismantling, or alteration.

2. Standard guardrails (consisting of top-rail and mid-rail) will be installed on all open sides and ends of scaffold platforms and/or work levels more than ten feet above the ground, floor, or lower level.

3. Scaffolds four to ten feet in height with a minimum horizontal dimension in any direction less than 45 inches will have standard railings installed on all open sides/ends.

4. Platforms at all working levels will be fully planked. Planking will be laid tight with no more than one inch space between them, overlap at least 12 inches, and extend over end supports 6 - 12 inches.

5. The front edge of all platforms will be no more than 14 inches from the face of the work, except plastering/lathing may be 18 inches.

6. Mobile scaffolds will be erected no more than a maximum height of four times their minimum base dimension.

7. Scaffolds will not be overloaded beyond their design loadings.

8. Scaffold components should not be used as tie-off/anchor points for fall protection devices.

9. Portable ladders, hook-on ladders, attachable ladders, integral prefabricated scaffold frames, walkways, or direct access from another scaffold or structure will be used for access when platforms are more than two feet above or below a point of access.

10. Cross braces will not be used as a mean of access to scaffolds.

11. Scaffolds will not be erected, used, dismantled, altered, or moved such that they or any conductive material handled on them might come closer to exposed and energized power lines than the following:

- Three feet from insulated lines of less than 300 volts;
- Ten feet plus for any other insulated or un-insulated lines.

8.2 Excavations and Trenches

1. Any excavation or trench five feet or more in depth will be provided cave-in protection through shoring, sloping, benching, or the use of hydraulic shoring, trench shields, or trench boxes.

2. Trenches less than five feet in depth and showing potential of cave-in will also be provided cave-in protection. Specific requirements of each system are dependent upon the soil classification as determined by a competent person.

3. A competent person will inspect each excavation/trench daily prior to start of work, after every rainstorm or other hazard-increasing occurrence, and as needed throughout the shift.

4. Means of egress will be provided in trenches four feet or more in depth so as to require no more than 25 feet of lateral travel for each employee in the trench.

5. Spoil piles and other equipment will be kept at least two feet from the edge of the trench or excavation.

9.0 MOTOR VEHICLES AND MECHANIZED EQUIPMENT

1. All vehicles and equipment will be checked at the beginning of each shift, and during use, to make sure it is in safe operating condition.

2. All equipment left unattended at night adjacent to highways in normal use shall have lights or reflectors, or barricades with lights or reflectors, to identify the location of the equipment.

3. When equipment is stopped or parked, parking brakes shall be set. Equipment on inclines shall have wheels chocked as well as having parking brakes set.

4. Operators shall not use earth-moving or compaction equipment having an obstructed rear view unless vehicle has an audible reverse signal alarm, or is backed only when observer says it is safe to do so.

5. All vehicles shall have in operable condition:

- Horn (bi-directional equipment)
- Seats, firmly secured, for the number of persons carried. Passengers must ride in seats.
- Seat belts properly installed.
- Service, parking and emergency brake system.
- All vehicles with cabs will be equipped with windshields with safety glass.
- All material handling equipment will equipped with rollover protective structures.

10.0 MISCELLANEOUS

1. All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the impalement hazard.

2. Enclosed chutes will be used when material, trash, and debris are dropped more than 20 feet outside the exterior walls of a building. A substantial gate will be provided near the discharge end of the chute, and guardrails at the chute openings into which workers drop material.

3. Only trained employees will service large truck wheels. A cage or other restraining device plus an airline assembly consisting of a clip-on chuck, gauge, and length of hose will be used to inflate any large truck tires.

4. Only trained employees will operate forklifts and other industrial trucks.

Attachment V

OSHA 301 - Injury and Illness Incident Form

OSHA's Form 301
Injury and Illness Incident Report

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.

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

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary,* these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone (_____)_____--_____ **Date** ____/ ____/ ____

Information about the employee

1) **Full name** _____

2) **Street** _____

City _____ **State** _____ **ZIP** _____

3) **Date of birth** _____ / _____ / _____

4) **Date hired** _____ / _____ / _____

5) ❒ **Male**
❒ **Female**

Information about the physician or other health care professional

6) **Name of physician or other health care professional** _____

_____

7) **If treatment was given away from the worksite, where was it given?**

Facility _____

Street _____

City _____ **State** _____ **ZIP** _____

8) **Was employee treated in an emergency room?**
❒ **Yes**
❒ **No**

9) **Was employee hospitalized overnight as an in-patient?**
❒ **Yes**
❒ **No**

Information about the case

10) **Case number from the *Log*** _____ *(Transfer the case number from the Log after you record the case.)*

11) **Date of injury or illness** _____ / _____ / _____

12) **Time employee began work** _____ **AM / PM**

13) **Time of event** _____ **AM / PM** ☐ **Check if time cannot be determined**

14) ***What was the employee doing just before the incident occurred?*** **Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific.** ***Examples:*** **"climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."**

15) ***What happened?*** **Tell us how the injury occurred.** ***Examples:*** **"When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."**

16) ***What was the injury or illness?*** **Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or sore."** ***Examples:*** **"strained back"; "chemical burn, hand"; "carpal tunnel syndrome."**

17) ***What object or substance directly harmed the employee?*** ***Examples:*** **"concrete floor"; "chlorine"; "radial arm saw."** ***If this question does not apply to the incident, leave it blank.***

18) ***If the employee died, when did death occur?*** **Date of death** _____ / _____ / _____

Appendix F

Citizen Participation Plan

APPENDIX F

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and West 30th Highline Holdings, L.L.C. 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, West 30th Highline Holdings, L.L.C. 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, Jimit Shah at 212-788-8348, 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. West 30th Highline Holdings, L.L.C. will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

New York Public Library

135 East 46th Street (between Lexington & Third Aves.)

New York, NY 10017

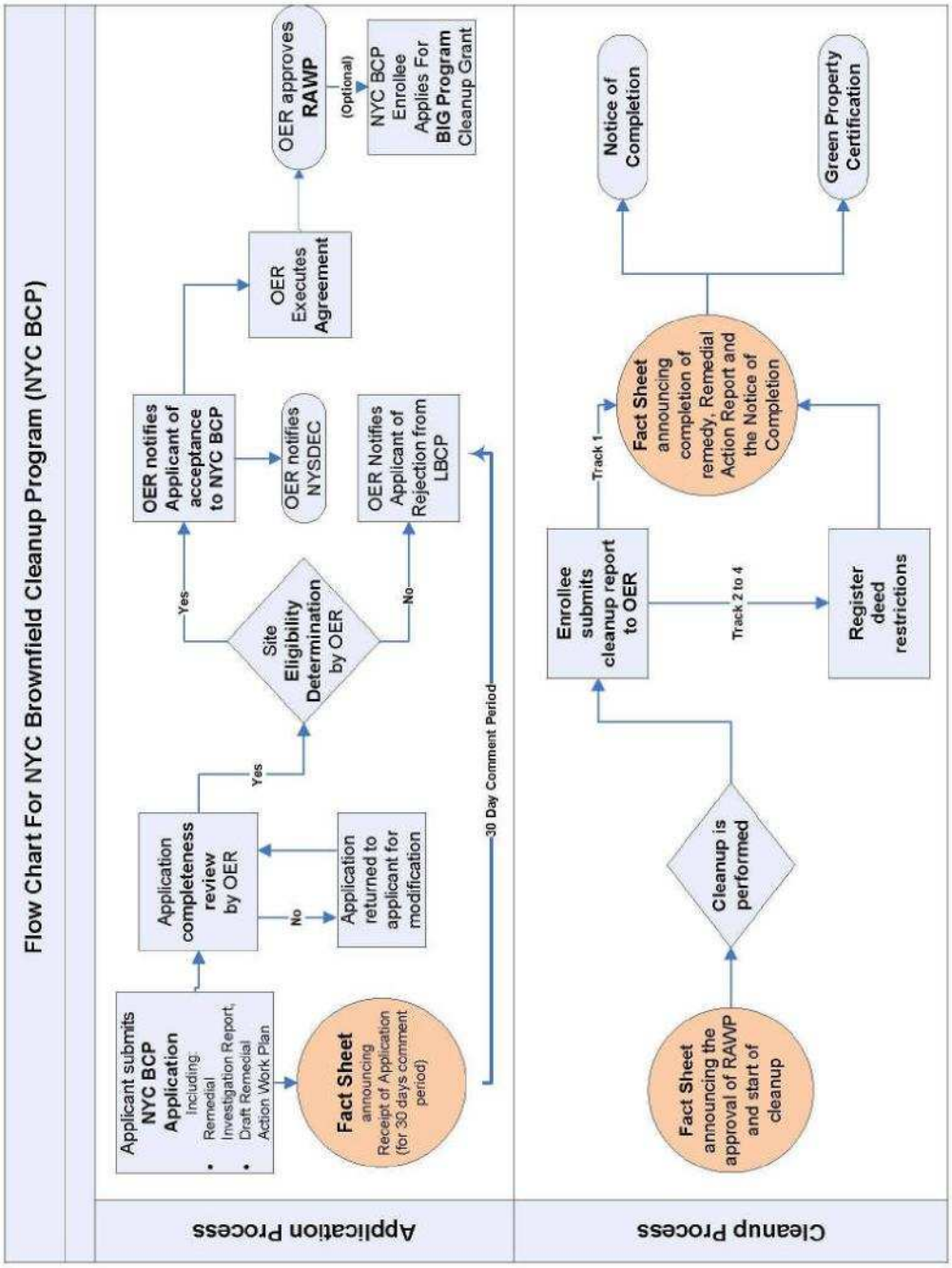
(212) 621-0670

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunda
11:00 AM – 7:00 PM	10:00 AM – 6:00 PM	11:00 AM – 6:00 PM	11:00 AM – 6:00 PM	11:00 AM – 6:00 PM	10:00 AM – 5:00 PM	CLOSED

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

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 West 30th Highline Holdings, L.L.C., reviewed and approved by OER prior to distribution and mailed by West 30th Highline Holdings, L.L.C.. 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 G

Sustainability Statement

APPENDIX G

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 Remedial Action Report (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 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 Voluntary Cleanup Program. West 30th Highline Holdings, L.L.C. is participating in OER's Paperless Voluntary 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. West 30th Highline Holdings, L.L.C.is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as

videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

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

An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.