

**HOMEWOOD SUITES – 312 W. 37TH STREET  
MANHATTAN, NEW YORK**

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**Remedial Action Work Plan**

**NYC BCP Number: 12CBCP028M  
E-Designation Site Number: 12EH-N057M**

**Prepared for:**

West 37<sup>th</sup> Street Partners LLC  
c/o Albanese Development  
1050 Franklin Avenue  
Garden City, New York 11530

**Prepared by:**

Arnold F. Fleming, P.E.  
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**DECEMBER 2011**



*Environmental Management & Consulting*

December 29, 2011

New York City Office of Environmental Remediation  
City Brownfield Cleanup Program  
c/o Shaminder Chawla  
100 Gold Street, 2<sup>nd</sup> Floor  
New York, NY 10038

**Re: 12CBCP028M  
312 West 37<sup>th</sup> Street – Homewood Suites  
Remedial Action Work Plan (RAWP) Stipulation List**

Dear Mr. Chawla:

Fleming-Lee Shue, Inc. hereby submits a Remedial Action Work Plan (RAWP) Stipulation List for the subject site to the New York City Office of Environmental Remediation (NYCOER) on behalf of West 37<sup>th</sup> Street Partners LLC. This letter serves as an addendum to the RAWP to stipulate additional content, requirements and procedures that will be followed during the site remediation. The contents of this list are added to the RAWP and will supersede the content in the RAWP where there is a conflict in purpose or intent. The additional requirements/procedures include the following:

**Stipulation List**

1. The criterion attached in **Addendum 1** will be utilized if petroleum containing tank or vessel is identified during the remedial action or subsequent redevelopment excavation activities. All petroleum spills will be reported to the NYSDEC hotline as required by applicable laws and regulations. This contingency plan is designed for heating oil tanks and other small or moderately sized storage vessels. If larger tanks, such as gasoline storage tanks are identified, OER will be notified before this criterion is utilized.
2. Collection and analysis of End Point Samples will be conducted to evaluate the performance of the remedy with respect to attainment of Track 1 and/or Track 4 SCOs. End point samples will be taken for parameters of concern. A map indicating minimum post-remedial End Point Sampling Locations is attached as **Addendum 2**. If hotspots are encountered, procedures discussed in RAWP section 4.2 End-Point Sampling will be followed.

3. Revised CHASP is included as **Addendum 3**.
4. Revised Sub-Slab Depressurization System (SSDS) Plans are included as **Addendum 4**. The SSDS will be installed underneath the slab and will consist of the following:
  - A 12" gas-permeable layer of crushed stone beneath the building slab and vapor barrier;
  - Gas vapor collection piping within the gas permeable layer consisting of 6"-diameter schedule 80 slotted PVC pipe and solid PVC pipe connected to a vertical riser;
  - A 6" cast iron riser pipe running from the pit under the slab, up through the building, and discharging at the roof through a 6" cast iron pipe; and
  - A 6" galvanized steel turbine ventilator at the top of the cast iron pipe.
5. This NYC BCP project involving the removal and transportation of hazardous waste may be subject to the New York State Department of Environmental Conservation's Special Assessment Tax (ECL 27-0923) and Hazardous Waste Regulatory Fees (ECL 72-00402). See DEC's website for more information: <http://www.dec.ny.gov/chemical/9099.html>.
6. A CD containing the final RAWP including this approved Stipulation List will be placed in the library that constitutes the primary public repository for project documents.
7. Signage for the project will include a sturdy placard mounted in a publically accessible right of way to building and other permits signage will consist of the NYC BCP Information Sheet (attached **Addendum 5**) announcing the remedial action. The Information sheet will be laminated and permanently affixed to the placard.

Sincerely,  
Fleming Lee Shue, Inc.

A handwritten signature in black ink that reads "Arnold F. Fleming". The signature is written in a cursive, flowing style.

Arnold F. Fleming, P.E.  
President

cc: H. Moore

## **Addendum 1**

### **Generic Procedures for Management of Underground Storage Tanks identified under the NYC BCP**

Prior to Tank removal, the following procedures should be followed:

- Remove all fluid to its lowest draw-off point.
- Drain and flush piping into the tank.
- Vacuum out the “tank bottom” consisting of water product and sludge.
- Dig down to the top of the tank and expose the upper half.
- Remove the fill tube and disconnect the fill, gauge, product, vent lines and pumps. Cap and plug open ends of lines.
- Temporarily plug all tank openings, complete the excavation, remove the tank and place it in a secure location.
- Render the tank safe and check the tank atmosphere to ensure that petroleum vapors have been satisfactorily purged from the tank.
- Clean tank or remove to storage yard for cleaning.
- If the tank is to be moved, it must be transported by licensed waste transporter. Plug and cap all holes prior to transport leaving a 1/8 inch vent hole located at the top of the tank during transport.
- After cleaning, the tank must be made acceptable for disposal at a scrap yard, cleaning the tanks interior with a high pressure rinse and cutting the tank in several pieces.

During the tank and pipe line removal, the following field observations should be made and recorded:

- A description and photographic documentation of the tank and pipe line condition (pitting, holes, staining, leak points, evidence of repairs, etc.).
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation, with a calibrated photoionization detector (PID).

#### Impacted Soil Excavation Methods

The excavation of the impacted soil will be performed following the removal of the existing tanks. Soil excavation will be performed in accordance with the procedures described under Section 5.5 of Draft DER-10 as follows:

- A description and photographic documentation of the excavation.
- Examination of the excavation floor and sidewalls for physical evidence of contamination (odor, staining, sheen, etc.).
- Periodic field screening (through bucket return) of the floor and sidewalls of the excavation, with calibrated photoionization detector (PID).

Final excavation depth, length, and width will be determined in the field, and will depend on the horizontal and vertical extent of contaminated soils as identified through physical examination (PID response, odor, staining, etc.). Collection of verification samples will be performed to evaluate the success of the removal action as specified in this document.

The following procedure will be used for the excavation of impacted soil (as necessary and appropriate):

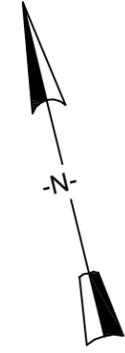
- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan.
- Prior to excavation, ensure that the area is clear of utility lines or other obstructions. Lay plastic sheeting on the ground next to the area to be excavated.
- Using a rubber-tired backhoe or track mounted excavator, remove overburden soils and stockpile, or dispose of, separate from the impacted soil.
- If additional UST's are discovered, the NYSDEC will be notified and the best course of action to remove the structure should be determined in the field. This may involve the continued trenching around the perimeter to minimize its disturbance.
- If physically contaminated soil is present (e.g., staining, odors, sheen, PID response, etc.) an attempt will be made to remove it, to the extent not limited by the site boundaries or the bedrock surface. If possible, physically impacted soil will be removed using the backhoe or excavator, segregated from clean soils and overburden, and staged on separated dedicated plastic sheeting or live loaded into trucks from the disposal facility. Removal of the impacted soils will continue until visibly clean material is encountered and monitoring instruments indicate that no contaminants are present.
- Excavated soils which are temporarily stockpiled on-site will be covered with tarp material while disposal options are determined. Tarp will be checked on a daily basis and replaced, repaired or adjusted as needed to provide full coverage. The sheeting will be shaped and secured in such a manner as to drain runoff and direct it toward the interior of the property.

Once the site representative and regulatory personnel are satisfied with the removal effort, verification of confirmatory samples will be collected from the excavation in accordance with DER-10.

**Addendum 2**  
End Point Sampling Plan

FILE: P:\Project Files\10173 - Albanese Development Corp\001 - West 37th Street\Figures\Addendum 2.dwg DATE: 12/21/2011

# WEST 37 ST



*Environmental Management & Consulting*  
158 West 29 Street, 9th Fl.  
New York, NY 10001

**312 WEST 37th STREET  
NEW YORK, NY**

**ADDENDUM 2**

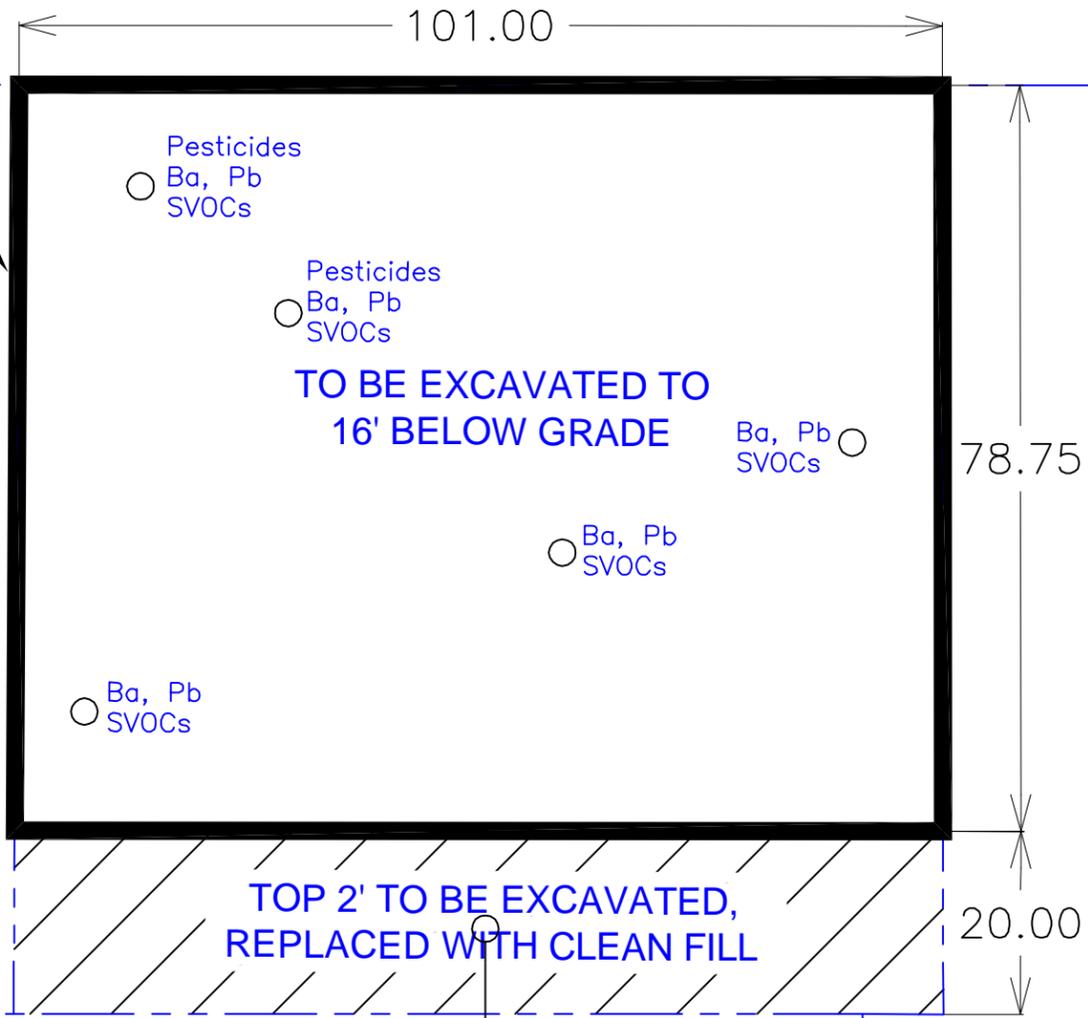
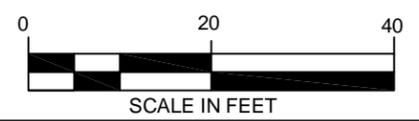
**PROPOSED POST  
REMEDIAL  
ENDPOINT  
SAMPLING  
LOCATIONS**

Date  
**December 20, 2011**

Project Number  
**10173-001**

### LEGEND

-  PROPOSED REAR YARD
-  ENDPOINT SAMPLING LOCATION (WITH REQUIRED ANALYSIS)



OUTLINE OF PLANNED BUILDING FOOTPRINT

COMMERCIAL/OFFICE BUILDINGS

COMMERCIAL/OFFICE BUILDINGS

COMMERCIAL/OFFICE BUILDINGS

**Addendum 3**  
Revised Construction Health & Safety Plan (CHASP)

**312 West 37<sup>th</sup> Street Site**  
New York, New York  
Block 292, Lots 15 and 16

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# **CONSTRUCTION HEALTH AND SAFETY PLAN**

**Prepared For:**  
Albanese Development  
1050 Franklin Avenue  
Garden City, NY  
**FLS Project Number: 10173**

**Submitted to:**  
New York City Office of Environmental Remediation  
E-Designation Program  
c/o Dan Cole, Bureau Chief  
100 Gold Street, 2nd Floor  
New York, NY 10038

The logo for Fleming Lee Shue consists of the company name in a blue, serif font, centered within a double-lined rectangular border. The text is arranged in two lines: "Fleming" on the top line and "Lee Shue" on the bottom line.

*Fleming  
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**NOVEMBER 2011**

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**Construction Health and Safety Plan  
312 West 37<sup>th</sup> Street Site  
New York, New York**

**1.0 INTRODUCTION**

Fleming-Lee Shue, Inc. (FLS) prepared this Construction Health and Safety Plan (CHASP) on behalf of Albanese Development for use and implementation by FLS employees providing environmental oversight and their representatives during construction of the proposed structure at the 312 West 37<sup>th</sup> Street Site (the Site) in New York, New York (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.

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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 proposed future use of the Site will consist of a 21-story hotel building with a basement, which will cover 4/5 (8,000 sf) of the lot. A 2,000-sf courtyard will remain in the rear portion of the lot. The current zoning designation is C6-4M, a central high-density commercial district. The proposed use is consistent with existing zoning for the property. The first floor will contain the hotel lobby, and the basement will contain a gym and meeting rooms for guests, and a break room and offices for the hotel staff. The foundation excavation will extend to 16 feet below grade across the building footprint, with one central spot extending to 19 feet below grade associated with an elevator pit. Excavation is not anticipated to extend below the water table at 20 feet below grade.

## **1.2 Site Description and Previous Investigation Results**

### ***1.2.1 Site Description***

The Site is located at 312 37<sup>th</sup> Street in New York, New York. The tax map number designation is Block 760, Lot 51. The Site is currently a parking lot. Tenement buildings occupied the site in the early 20<sup>th</sup> century. No building has existed on the site since at least the 1950s. A small gasoline station operated onsite in the 1940s to the early 1950s. Two 550-gallon USTs were identified during a geophysical survey performed at the site in early 2011.

### ***1.2.2 Previous Site Investigation Results***

A Phase I Environmental Site Assessment was conducted by FLS in April 2011. FLS determined that historic usage of the site included a gasoline filling station containing

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two gasoline USTs. The tanks, fill lines and fill ports have been abandoned and are still present onsite, but their condition is unknown. A geophysical survey identified the presumed location of the USTs. The presence of the tanks was considered to represent a recognized environmental condition.

1. Elevation of the property is approximately 38 feet above mean sea level.
2. Depth to groundwater is approximately 20 feet at the Site.
3. Groundwater flow is generally from east to west beneath the Site.
4. Depth to bedrock is approximately 35 feet at the Site.
5. Soil stratigraphy encountered at the site included a surficial fill layer consisting of topsoil, sand, brick fragments, and concrete fragments ranging in thickness from 5 to 11 feet across the site. This fill layer is underlain by a clay confining layer ranging in thickness from 2 to 4 feet, beneath which is fine-medium sand with some coarse sand and gravel that extends to 20 feet below grade.
6. Soil/fill samples collected during the RI showed no volatile organic compounds (VOCs) exceeding NYSDEC Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (UUSCOs). Several VOCs in some samples, including PCE and TCE, were identified but at extremely low levels (typically below 4 ug/kg). Five semi-volatile organic compounds (SVOCs) in three shallow soil samples and in one deep sample exceed UUSCOs. Of these, only one SVOC exceeded Track 2 Restricted CommercialSCOs (RCSCOs) in three samples. The SVOCs identified are polycyclic aromatic hydrocarbon compounds (PAH) and are observed at relatively low concentrations. Several metals including lead, mercury, barium, zinc and copper exceed UUSCOs in shallow soil and one deep soil sample. Of these, only barium (3 samples) and lead (3 samples) exceeded Track 2 RCSCOs. Overall, the occurrence of PAHs and metals is consistent with findings during the collection of soil samples and suggests that historical fill is responsible for the observed low to moderate levels of contamination. One PCB exceeds UUSCOs in two shallow samples, and two pesticides exceed UUSCOs in one shallow and one deep sample. No PCBs or pesticides exceed Track 2 RCSCOs in any sample onsite. No contaminant source areas were identified during this remedial investigation.
7. Groundwater samples collected during the RI showed no SVOCs or pesticides exceeding New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). One pesticide exceeded GQS in three samples. One VOC (cis 1,2-dichloroethene) marginally exceeding GQS in one groundwater sample. PCE and TCE were identified in groundwater samples at low concentrations below GQS. Several metals exceeded GWS in dissolved samples, including magnesium (one sample), manganese (4 samples), sodium (4 samples), and selenium (2 samples). Metals findings indicate that there is likely minor to moderate saline intrusion in local groundwater but no metals contamination source onsite. While some VOCs were identified at low levels in groundwater, none of these compounds

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were identified in onsite soils above corresponding groundwater protection standards in 6NYCRR Part 375-6.8.

8. Soil vapor samples collected during the RI showed numerous VOCs detected at generally low to moderate concentrations, including three compounds listed in the NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006) Decision Matrices. These include TCE and PCE which were identified in all soil vapor samples and range from 7-12 ug/m<sup>3</sup> and 46-176 ug/m<sup>3</sup>, respectively.

## **2.0 POTENTIAL CHEMICAL AND PHYSICAL HAZARDS**

### **2.1 *Potential Chemical Hazards***

This CHASP focuses on the following chemicals of concern:

- VOCs
  - Cis-1,2-Dichloroethene
  - Perchloroethene (PCE)
  - Tetrachloroethene (TCE)
- SVOCs
  - PAHs
- Metals
  - Lead
  - Barium
  - Copper
  - Mercury
  - Zinc
- Pesticides
  - 4,4'-DDT

Attachment II lists the exposure limits, physical and chemical properties, recommended protection levels and symptoms of exposure to the chemicals known to be present at the site. 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 scaffolds, confined spaces and other construction equipment are addressed in Sections 3.11 and 4.2 of this CHASP. A discussion of heat stress and cold stress and related illnesses is provided in Attachment III.

### **2.3 *Biological Hazards***

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

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- Bites from animals, rats (and other rodents) that can lead to a serious infection,
- Exposure to bacteria transmitted by rodents (particularly rats) via their urine or mucous secretions, resulting in fever, and
- Bites or stings from insects resulting in skin inflammation, disease, or allergic response.

### **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, with a contingency to upgrade to Level C protection if total organic compound concentrations in the breathing zone consistently reach or exceed 5 parts per million (ppm) as measured with a photoionization detector (PID). If PID readings in the breathing zone consistently reach or exceed 25 ppm, work will be stopped and the Site HSO and Project Manager contacted. 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;

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- 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.

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New York, New York**

**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):

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- 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. 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;

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- 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.

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- 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.

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- 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 regarding 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.

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**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. A PID (to monitor total volatile organic concentrations) will be used to measure worker breathing zone ambient on-site concentrations during on-site activities. The equipment will be calibrated daily and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book.

The following response actions will be taken based on PID readings in the breathing zone. All work will be performed in level D PPE unless breathing zone volatile organic concentrations exceed 5 ppm. Once sustained levels of 5 ppm are measured, work will be stopped.

PARAMETER	INSTRUMENT	PID READING	ACTION LEVELS/RESPONSE
Volatile organics	Photoionization detector (PID)	> 5 ppm	Temporarily halt work activities and monitor until readings decrease to below 5ppm.
		>5ppm - <25ppm	Halt work activities, upgrade to Level C; continue monitoring
		>25ppm	Shut down work activities

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/m<sup>3</sup>

Range: 0.001 to 10 mg/m<sup>3</sup>

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/m<sup>3</sup> over the integrated period not to exceed 15 minutes.

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## **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 wash of hands and face.

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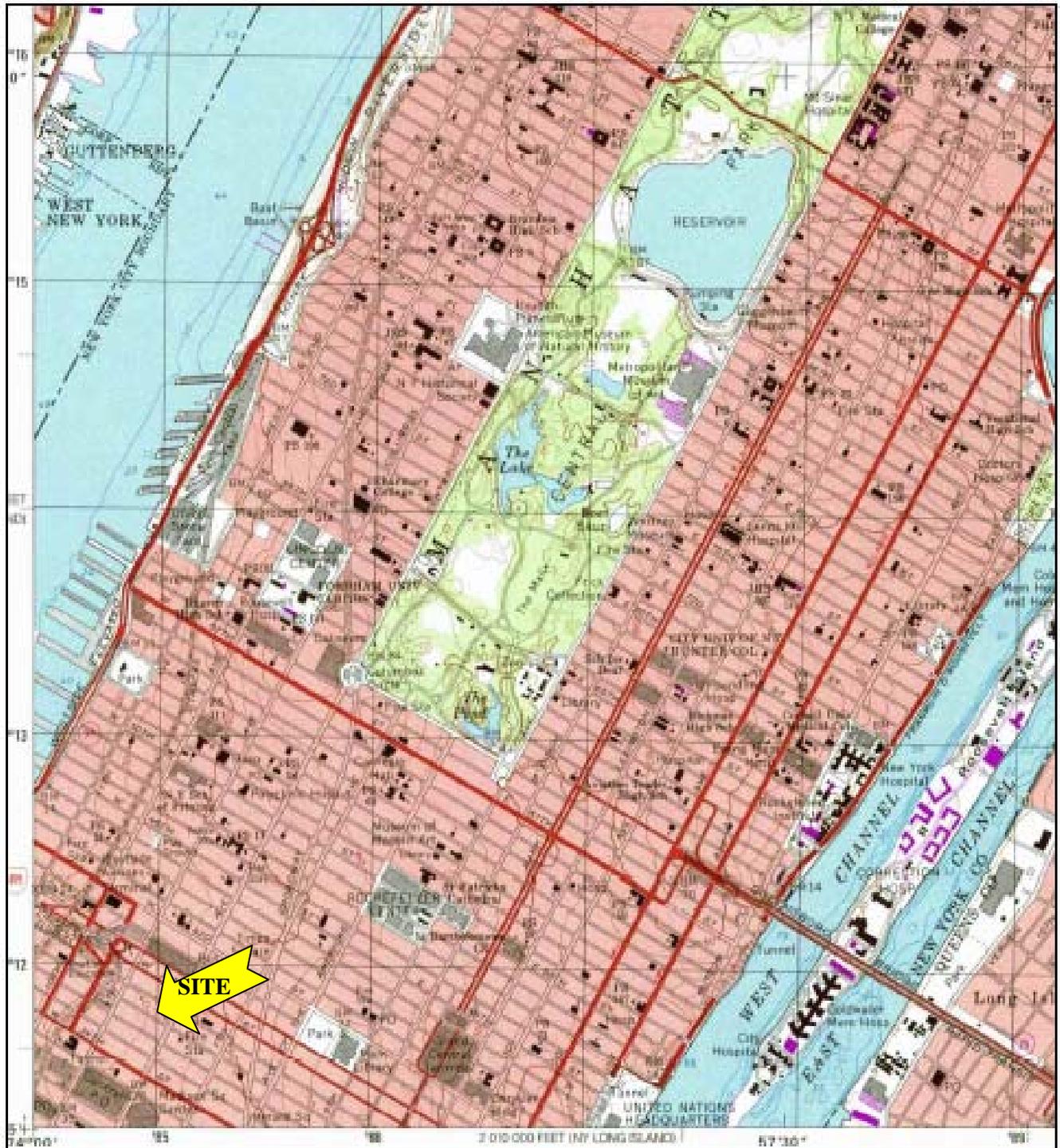
**7.0 EMERGENCY AND CONTINGENCY PLAN**

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).

**FIGURE 1**  
**Site Location Map**



**FIGURE 1: Site Location Map**

**SITE:** 312 West 37<sup>th</sup> Street  
 Block 760, Lot 51  
 New York, New York

**FLS Project No.** 10173-001



**FIGURE 2**  
**Route to the Hospital**



**Trip to:**  
 St Vincents Midtown Hospital  
 415 W 51st St  
 New York, NY 10019  
 (212) 459-8000  
**1.28 miles**  
**4 minutes**

Notes

**To investors who want to retire comfortably.**

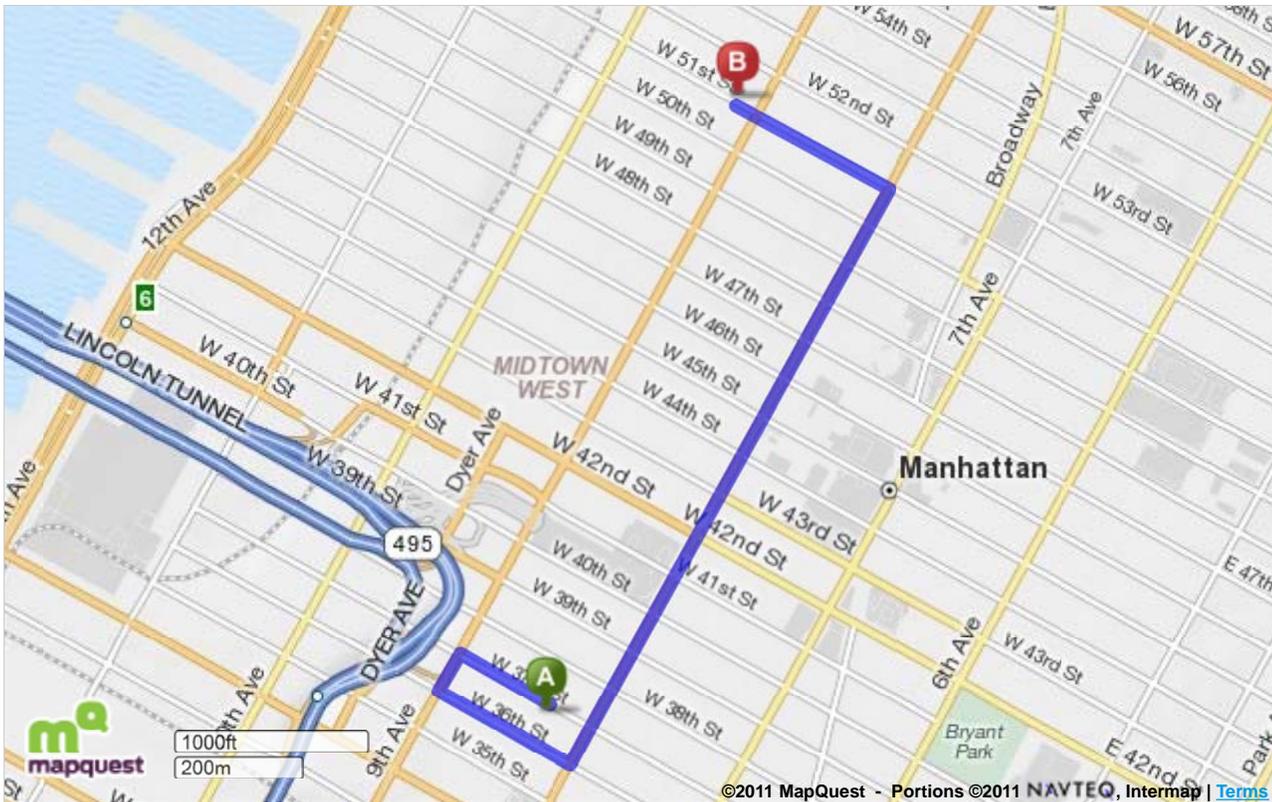
If you have a \$500,000 portfolio, download the guide written by *Forbes* columnist and money manager Ken Fisher's firm. It's called "**The 15-Minute Retirement Plan.**" Even if you have something else in place right now, it *still* makes sense to request your guide!

[Click Here to Download Your Guide!](#)

FISHER INVESTMENTS

	<b>312 W 37th St</b> New York, NY 10018-4208	<b>Miles Per Section</b>	<b>Miles Driven</b>
	1. Start out going <b>northwest</b> on <b>W 37th St</b> toward <b>9th Ave.</b>	<b>Go 0.1 Mi</b>	0.1 mi
	2. Take the 1st <b>left</b> onto <b>9th Ave.</b> <i>T S Ma Restaurant is on the corner</i> <i>If you reach 10th Ave you've gone about 0.1 miles too far</i>	<b>Go 0.05 Mi</b>	0.2 mi
	3. Turn <b>left</b> onto <b>W 36th St.</b> <i>Thai Select is on the corner</i> <i>If you reach W 35th St you've gone a little too far</i>	<b>Go 0.2 Mi</b>	0.3 mi
	4. Take the 1st <b>left</b> onto <b>8th Ave.</b> <i>If you reach 7th Ave you've gone about 0.1 miles too far</i>	<b>Go 0.7 Mi</b>	1.1 mi
	5. Turn <b>left</b> onto <b>W 51st St.</b> <i>W 51st St is just past W 50th St</i> <i>House of Brews is on the left</i> <i>If you reach W 52nd St you've gone a little too far</i>	<b>Go 0.2 Mi</b>	1.3 mi
	6. <b>415 W 51ST ST</b> is on the <b>right.</b> <i>Your destination is just past 9th Ave</i> <i>If you reach 10th Ave you've gone about 0.1 miles too far</i>		1.3 mi
	<b>St Vincents Midtown Hospital</b> 415 W 51st St, New York, NY 10019 (212) 459-8000	<b>1.3 mi</b>	<b>1.3 mi</b>

Total Travel Estimate: **1.28 miles - about 4 minutes**



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\$32 for a Wine-Tasting Course at Abigail's Cafe (\$65... on Fort Greene-Clinton Hill Patch

**Get the Deal!**

**TABLE 1**  
**Project Team Organization**

**TABLE 1**  
**Project Team Organization**

**PERSONNEL**

Mr. Arnold Fleming, P.E.  
Mr. Matthew Frankenberry  
Mr. Jesse Mausner, P.G.  
Mr. Bill Maniquez  
Mr. David Grunat

**RESPONSIBILITIES**

President, FLS  
Client Representative/Site  
Manager  
Senior Geologist/Project  
Manager  
Professional III/HSO  
(alternate)  
Professional III/HSO  
(alternate)

**TABLE 2**  
**Emergency Contacts and Phone Numbers**

**TABLE 2**  
**Emergency Contacts and Phone Numbers**

<b>Company</b>	<b>Individual Name</b>	<b>Title</b>	<b>Contact Number</b>
FLS	Arnold Fleming	Project Director	212-675-3225 (office)
FLS	Jesse Mausner	Project Manager/HSO	212-675-3225 (office)
FLS	Bill Maniquez	Field Supervisor	212-675-3225 (office) 646-584-2319 (cell)
FLS	Dave Grunat	HSO (an alternate)	212-675-3225 (office) 646-841-3100 (cell)
Albanese Org.	Matt Frankenberry	Site Contact	516-746-6000 (office)
<b>Police/Fire Department</b>			<b>911</b>

**ATTACHMENT I**  
**Acknowledgment Form**



**ATTACHMENT II**  
**Profiles of Chemicals of Concern**  
**Material Safety Data Sheets**

## Health Hazards for Contaminants of Concern

Contaminant	Recognized and Suspected Health Hazards
PAHs	<b>Suspected</b> carcinogen; cardiovascular or blood toxicant; gastrointestinal or liver toxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
TCE	<b>Probable</b> carcinogen; respiratory toxicant; may be toxic to kidneys, liver, peripheral & central nervous system
PCE	<b>Suspected</b> carcinogen; respiratory toxicant; may be toxic to kidneys, liver, peripheral & central nervous system; respiratory and skin irritant
Cis-1,2-Dichloroethene	Skin and eye irritant, gastrointestinal irritant, neurotoxicant
4,4'-DDT	<b>Suspected</b> carcinogen; neurotoxicant; gastrointestinal toxicant, suspected reproductive toxicant
Calcium	Cardiovascular or blood toxicant; endocrine toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant
Copper	<b>Suspected</b> cardiovascular or blood toxicant; developmental toxicant; gastrointestinal or liver toxicant; kidney toxicant; reproductive toxicant; respiratory toxicant
Lead	<b>Recognized</b> carcinogen; developmental toxicant; reproductive toxicant
	<b>Suspected</b> cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Mercury	<b>Recognized</b> developmental toxicant
	<b>Suspected</b> cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Nickel	<b>Suspected</b> cardiovascular or blood toxicant; developmental toxicant; gastrointestinal or liver toxicant; kidney toxicant; reproductive toxicant; respiratory toxicant
Zinc	<b>Suspected</b> cardiovascular or blood toxicant; developmental toxicant; immunotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant

# 4,4'-DDT

sc-238975



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code  
Key:

EXTREME

HIGH

MODERATE

LOW

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### PRODUCT NAME

4,4'-DDT

### STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

### NFPA



### SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and  
Canada: 877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436  
2255 (1-800-CHEMCALL) or call +613 9573 3112

### PRODUCT USE

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

### SYNONYMS

C<sub>14</sub>H<sub>9</sub>Cl<sub>5</sub>, "1, 1' -(2, 2, 2-trichloroethylidene) bis [4-chlorobenzene]", "1, 1' -(2, 2, 2-trichloroethylidene) bis [4-chlorobenzene]", "1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)ethane", "1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)ethane", "ethane, 1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)", "ethane, 1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)", "benzene, 1, 1' -(, 2, 2-trichloroethylidene)bis(4-chloro)-", "benzene, 1, 1' -(, 2, 2-trichloroethylidene)bis(4-chloro)-", "alpha, alpha-bis(p-chlorophenyl)-beta, beta, beta-trichloroethane", "1, 1-bis-(p-chlorophenyl)-2, 2, 2-trichloroethane", "1, 1-bis-(p-chlorophenyl)-2, 2, 2-trichloroethane", "2, 2-bis(p-chlorophenyl)-1, 1, 1-trichloroethane", "2, 2-bis(p-chlorophenyl)-1, 1, 1-trichloroethane", "p, p' -DDT", "p, p' -DDT", "diphenyl trichloroethane", "dichlorodiphenyltrichloroethane", "p, p-dichlorodiphenyltrichloroethane", "p, p-dichlorodiphenyltrichloroethane", "4, 4' -dichlorodiphenyltrichloroethane", "4, 4' -dichlorodiphenyltrichloroethane", Agritan, Anofex, Arkotine, Azotox, "Bosan supra", Bovidermal, Chlorophenothane, Chlorophenotoxum, Citox, Clofenotane, Dedelo, Deoval, Ditoxan, Dibovan, Dicophane, Didigam, Didimac, Dodat, Dykol, Estonate, Genitox, Gesafid, Gesapon, Gesarex, Gesarol, Guesapon, Guesarol, Gyron, Havero-extra, Hildit, Ivoran, Ixodex, Kopsal, Mutoxin, Neocid, OMS-16, Parachlorodicum, Peb1, Pentachlorin, Zeidane, Zerdane, insecticide

## Section 2 - HAZARDS IDENTIFICATION

### CANADIAN WHMIS SYMBOLS



### EMERGENCY OVERVIEW

#### RISK

Limited evidence of a carcinogenic effect.

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

## POTENTIAL HEALTH EFFECTS

### ACUTE HEALTH EFFECTS

#### SWALLOWED

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

#### EYE

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

#### SKIN

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

#### INHALED

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

### CHRONIC HEALTH EFFECTS

- There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.

There is some evidence to provide a presumption that human exposure to the material may result in impaired fertility on the basis of: some evidence in animal studies of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects but which is not a secondary non-specific consequence of other toxic effects.

The following chronic health effects can occur some time after exposure to DDT and can last for months or years. There is some evidence that it causes cancer in humans and it has been shown to cause liver cancer in animals.

DDT may damage the liver and kidneys, damage the developing fetus and decrease fertility in males and females, and cause central nervous system degeneration.

High doses of o,p'-DDT fed to immature female rats exert clear oestrogenic effects. Males fed 1 ppm o,p'-DDT from birth had significantly heavier bodies, testes and seminal vesicles at day 112. In a another study adult male rats treated with o,p'-DDT showed decreased corticosterone formed from progesterone in the adrenals and lowered unchanged progesterone. In brain metabolism, treatment with o,p'-DDT increased dihydrotestosterone from testosterone while androstenediol decreased. The authors concluded that the effects of o,p'-DDT administration are a decrease in plasma testosterone and in androgen biosynthesis, and an increase in plasma oestradiol.

Exposure to organochlorine pesticides for long periods can cause multiple nervous system infections and disorders involving the brain and autonomic nerves with headache, dizziness, "pins and needles", tremor in the limbs, disturbances in nerves supplying blood vessels, pain in the bowel and stiffening of the bile duct, rapid heartbeat, hollow heart sounds and a tight pain in the chest. There can be blood problems with loss of platelets and white blood cells, change in blood cell distribution, anemia, loss of appetite and weight. There may be disturbed behavior. Some organochlorines may have female sex hormone-like effects, causing withering of the testicles, reduced fertility and disturbed sexual activity.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

### HAZARD RATINGS

Flammability: 1  Min Max

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

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



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

## Section 4 - FIRST AID MEASURES

### SWALLOWED

- - Give a slurry of activated charcoal in water to drink. NEVER GIVE AN UNCONSCIOUS PATIENT WATER TO DRINK.
  - At least 3 tablespoons in a glass of water should be given.
  - Although induction of vomiting may be recommended (IN CONSCIOUS PERSONS ONLY), such a first aid measure is dissuaded because to the risk of aspiration of stomach contents. (i) It is better to take the patient to a doctor who can decide on the necessity and method of emptying the stomach. (ii) Special circumstances may however exist; these include non- availability of charcoal and the ready availability of the doctor.
- NOTE: If vomiting is induced, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear protective gloves when inducing vomiting.
- REFER FOR MEDICAL ATTENTION WITHOUT DELAY.
  - In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
  - If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
  - If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
- (ICSC20305/20307).

### EYE

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

### SKIN

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

### INHALED

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

### NOTES TO PHYSICIAN

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

## Section 5 - FIRE FIGHTING MEASURES

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

## EXTINGUISHING MEDIA

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

## FIRE FIGHTING

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

## GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

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

Combustion products include: carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

## FIRE INCOMPATIBILITY

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

## PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

Respirator:

Particulate

## Section 6 - ACCIDENTAL RELEASE MEASURES

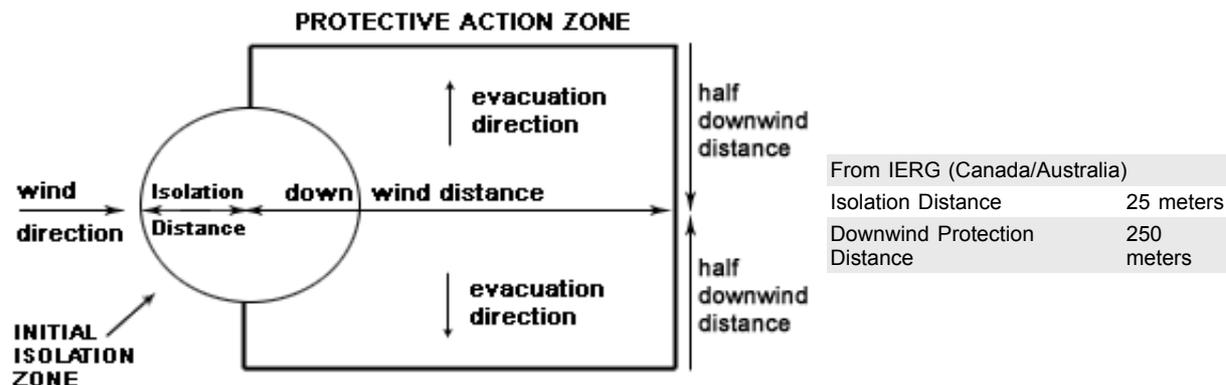
### MINOR SPILLS

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

### MAJOR SPILLS

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

## PROTECTIVE ACTIONS FOR SPILL



## FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 151 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

## ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

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

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

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

### RECOMMENDED STORAGE METHODS

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

For low viscosity materials

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

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

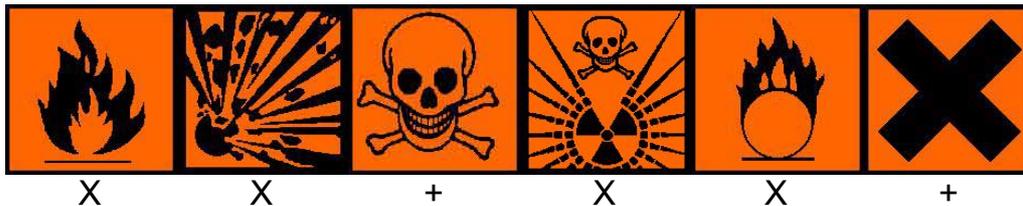
- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

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

### STORAGE REQUIREMENTS

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

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together

O: May be stored together with specific preventions

+: May be stored together

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

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

Canada - Northwest Territories

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

#### EMERGENCY EXPOSURE LIMITS

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

#### MATERIAL DATA

DDT:

■ for DDT:

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

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

#### PERSONAL PROTECTION



Consult your EHS staff for recommendations

#### EYE

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

## HANDS/FEET

- Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

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

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

## OTHER

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

## RESPIRATOR

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

\* - Negative pressure demand \*\* - Continuous flow

Explanation of Respirator Codes:

Class 1 low to medium absorption capacity filters.

Class 2 medium absorption capacity filters.

Class 3 high absorption capacity filters.

PAPR Powered Air Purifying Respirator (positive pressure) cartridge.

Type A for use against certain organic gases and vapors.

Type AX for use against low boiling point organic compounds (less than 65°C).

Type B for use against certain inorganic gases and other acid gases and vapors.

Type E for use against sulfur dioxide and other acid gases and vapors.

Type K for use against ammonia and organic ammonia derivatives

Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.

Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.

Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

## ENGINEERING CONTROLS

- 
- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:
  - (a): particle dust respirators, if necessary, combined with an absorption cartridge;
  - (b): filter respirators with absorption cartridge or canister of the right type;
  - (c): fresh-air hoods or masks
- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.

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

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

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)

grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)
--	------------------------------

Within each range the appropriate value depends on:

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

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

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### PHYSICAL PROPERTIES

Solid.

Does not mix with water.

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

### APPEARANCE

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

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

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

### STORAGE INCOMPATIBILITY

- - Avoid strong bases.
- Avoid reaction with oxidizing agents.

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

## Section 11 - TOXICOLOGICAL INFORMATION

DDT

### TOXICITY AND IRRITATION

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

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

Oral (human infant) LDLo: 150 mg/kg

Oral (man) TDLo: 6 mg/kg

Oral (human) TDLo: 16 mg/kg

Oral (human) LDLo: 500 mg/kg

Oral (human) TDLo: 5 mg/kg

Dermal (rat) LD50: 1931 mg/kg

Dermal (rabbit) LD50: 300 mg/kg

#### ■ For DDT:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

seen at doses of 83 mg/kg/day in females (but not males) , and in males (but not females) at doses of 40 mg/kg/day. In other studies, however, no carcinogenic activity was observed in rats at doses less than 25 mg/kg/day; no carcinogenic activity was seen in mice with at doses of 3-23 mg/kg/day over an unspecified period, and in other hamster studies there have been no indications of carcinogenic effects.

The available epidemiological evidence regarding DDT's carcinogenicity in humans, when taken as a whole, does not suggest that DDT and its metabolites are carcinogenic in humans at likely dose levels. In several epidemiological studies, no significant associations were seen between DDT exposure and disease, but in one other study, a weak association was observed. In this latter study, which found a significant association between long-term, high DDT exposures and pancreatic cancers in chemical workers, there were questions raised as to the reliability of the medical records of a large proportion of the cancer cases.

Organ Toxicity: Acute human exposure data and animal studies reveal that DDT can affect the nervous system, liver, kidney. Increased tumor production in the liver and lung has been observed in test animals. An association with pancreatic cancer was suggested in humans in one study.

Fate in Humans & Animals: DDT is very slowly transformed in animal systems. Initial degradates in mammalian systems are 1,1-dichloro-2,2-bis(p-dichlorodiphenyl)ethylene (DDE) and 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane (DDD), which are very readily stored in fatty tissues. These compounds in turn are ultimately transformed into bis(dichlorodiphenyl) acetic acid (DDA) via other metabolites at a very slow rate. DDA, or conjugates of DDA, are readily excreted via the urine.

Levels of DDT or metabolites may occur in fatty tissues (e.g. fat cells, the brain, etc.) at levels of up to several hundred times that seen in the blood. DDT or metabolites may also be eliminated via mother's milk by lactating women.

WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.

ADI: 0.002 mg/kg/day

NOEL: 0.25 mg/kg/day

## CARCINOGEN

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

## SKIN

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

## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

DDT:

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

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

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

■ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

■ For DDT

log Kow : 6.19

Half-life (hr) air: 170

Half-life (hr) H<sub>2</sub>O surface water: 5500

Half-life (hr) soil: 17000

BCF : 12000-40000

Environmental fate:

Breakdown in Soil and Groundwater: DDT is very highly persistent in the environment, with a reported half life of between 2-15 years and is immobile in most soils. Routes of loss and degradation include runoff, volatilization, photolysis and biodegradation (aerobic and anaerobic). These processes generally occur only very slowly. Breakdown products in the soil environment are DDE and DDD, which are also highly persistent and have similar chemical and physical properties.

Due to its extremely low solubility in water, DDT will be retained to a greater degree by soils and soil fractions with higher proportions of soil organic matter. It may accumulate in the top soil layer in situations where heavy applications are (or were) made annually; e.g., for apples. Generally DDT is tightly sorbed by soil organic matter, but it (along with its metabolites) has been detected in many locations in soil and groundwater where it may be available to organisms. This is probably due to its high persistence; although it is immobile or only very slightly mobile, over very long periods of time it may be able to eventually leach into groundwater, especially in soils with little soil organic matter.

Residues at the surface of the soil are much more likely to be broken down or otherwise dissipated than those below several inches. Studies in Arizona have shown that volatilization losses may be significant and rapid in soils with very low organic matter content (desert soils) and high irradiance of sunlight, with volatilization losses reported as high as 50% in 5 months. In other soils (Hood River and Medford) this rate may be as low as 17- 18% over 5 years. Volatilisation loss will vary with the amount of DDT applied, proportion of soil organic matter, proximity to soil-air interface and the amount of sunlight.

Breakdown of Chemical in Surface Water: DDT may reach surface waters primarily by runoff, atmospheric transport, drift, or by direct application (e.g. to control mosquito-borne malaria). The reported half-life for DDT in the water environment is 56 days in lake water and approximately 28 days in river water. The main pathways for loss are volatilization, photodegradation, adsorption to water-borne particulates and sedimentation. Aquatic organisms, as noted above, also readily take up and store DDT and its metabolites. Field and laboratory studies in the United Kingdom demonstrated that very little breakdown of DDT occurred in estuary sediments over the course of 46 days.

Breakdown of Chemical in Vegetation: DDT does not appear to be taken up or stored by plants to a great extent. It was not translocated into alfalfa or soybean plants, and only trace amounts of DDT or its metabolites were observed in carrots, radishes and turnips all grown in DDT-treated soils. Some accumulation was reported in grain, maize and rice-plants, but little translocation occurred and residues were located primarily in the roots.

Ecotoxicity:

Effects on Birds:

Bird dietary LD<sub>50</sub>: mallard duck 2240 mg/kg, Japanese quail 841 mg/kg, pheasant 1334 mg/kg

Reported dietary LD<sub>50</sub>s in such species as bobwhite quail, California quail, red-winged blackbird, cardinal, house sparrow, blue jay, sandhill crane and clapper rail also indicate slight toxicity both in acute 5-day trials and over longer periods of up to 100 days. In birds, exposure to DDT occurs mainly through the food web through predation on aquatic and/or terrestrial species having body burdens of DDT, such as fish, earthworms and other birds.

There has been much concern over chronic exposure of bird species to DDT and effects on reproduction, especially eggshell thinning and embryo deaths. The mechanisms of eggshell thinning are not fully understood. It is thought that this may occur from the major metabolite, DDE, and that predator species of birds are the most sensitive to these effects. Laboratory studies on bird reproduction have demonstrated the potential of DDT and DDE to cause subtle effects on courtship behavior, delays in pairing and egg laying and decreases in egg weight in ring doves and Bengalese finches. The implications of these for long-term survival and reproduction of wild bird species is unclear.

There is evidence that synergism may be possible between DDT's metabolites and organophosphate (cholinesterase-inhibiting) pesticides to produce greater toxicity to the nervous system and higher mortality. Aroclor (polychlorinated biphenyls, or PCBs) may result in additive effects on eggshell thinning.

Effects on Aquatic Species

Fish LC<sub>50</sub> (96 h): coho salmon 4 ug/l, rainbow trout 8.7 ug/l, northern pike 2.7 ug/l, black bullhead 4.8 ug/l, bluegill sunfish 8.6 ug/l, largemouth bass 1.5 ug/l, walleye 2.9 ug/l, fathead minnow 21.5 ug/l, channel catfish 12.2 ug/l, largemouth bass 1.5 ug/l, guppy 56 ug/l

DDT is very highly toxic to many aquatic invertebrate species. Reported 96-hour LC<sub>50</sub>s in various aquatic invertebrates (e.g., stoneflies, midges, crayfish, sow bugs) range from 0.18 ug/L to 7.0 ug/L, and 48-hour LC<sub>50</sub>s are 4.7 ug/L for daphnids and 15 ug/L for sea shrimp. Other reported 96-hour LC<sub>50</sub>s for various aquatic invertebrate species are from 1.8 ug/L to 54 ug/L. Early developmental stages are more susceptible than adults to DDT's effects. The reversibility of some effects, as well as the

development of some resistance, may be possible in some aquatic invertebrates . DDT is very highly toxic to fish species as well. . Observed toxicity in coho and chinook salmon was greater in smaller fish than in larger . It is reported that DDT levels of 1 ng/L were sufficient to affect the hatching of coho salmon eggs DDT may be moderately toxic to some amphibian species and larval stages are probably more susceptible than adults In addition to acute toxic effects, DDT may bioaccumulate significantly in fish and other aquatic species, leading to long-term exposure. This occurs mainly through uptake from sediment and water into aquatic flora and fauna, and also fish . Fish uptake of DDT from the water will be size-dependent with smaller fish taking up relatively more than larger fish . A half- time for elimination of DDT from rainbow trout was estimated to be 160 days . The reported bioconcentration factor for DDT is 1,000 to 1,000,000 in various aquatic species, and bioaccumulation may occur in some species at very low environmental concentrations . Bioaccumulation may also result in exposure to species which prey on fish or other aquatic organisms (e.g., birds of prey).

Effects on Other Animals (Nontarget species)

Earthworms are not susceptible to acute effects of DDT and its metabolites at levels higher than those likely to be found in the environment, but they may serve as an exposure source to species that feed on them. DDT is non-toxic to bees; the reported topical LD50 for DDT in honeybees is 27 ug/bee . Laboratory studies indicate that bats may be affected by DDT released from stored body fat during long migratory periods.

■ Outbreaks of poisoning from food contaminated with organochlorines are characterized by headache, nausea, vomiting, restlessness, irritability, vertigo, muscle twitching, confusion, stupor, coma and convulsions.

The organochlorine pesticides are highly soluble in lipids and most organic solvents but have low water solubilities and low vapor pressure.

Adsorption in various soils depends strongly on the presence of soil organic matter. Once adsorbed they do not readily desorb. Such compounds do not as a consequence leach or diffuse in soils and transport to the hydrosphere from contaminated soils will be largely as a result of the erosion of soil particles or sediments, rather than by desorption and dissolution.

When organochlorines are poorly adsorbed, as in sandy soils, vaporization losses are significant. Volatilization from water or soil may also occur.

The actual evaporation rate depends on factors such as temperature, soil properties, soil water content and other physicochemical properties such as water solubility and degree of adsorption. The importance of soil moisture in volatilization led to the use of the term "co-distillation".

The effect observed in soil however is more accurately described as displacement of the sorbed pesticides by water molecules. As a result compounds which otherwise possess low water solubility are quite volatile from water.

Degradation of the organochlorines is slow compared to other classes of insecticide and in soil and water is due mainly to the action of micro- organisms. Pathways include dechlorination and dehydrochlorination. Oxidation is only moderately important. Epoxidations and rearrangements are common amongst the cyclodiene pesticides. These rearrangement reactions produce complicated "cage-like" structures that are toxic.

Bioaccumulation of the some organochlorines (notably DDT and dieldrin) are higher in aquatic ecosystems than in terrestrial ecosystems. Physicochemical properties such as high lipid solubility, low water solubility and chemical stability are the most significant factors behind such bioaccumulation.

The effects of bioaccumulation are manifest at the top of the food chain where, for example, predatory fish and birds, suffer from acute and chronic toxicity and reproductive failures. Effects may range from obvious toxicity to subtle behavioral changes. Evidence exists that the population effects are reversible with time.

■ DO NOT discharge into sewer or waterways.

■ The material is classified as an ecotoxin\* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l

\* Classification of Substances as Ecotoxic (Dangerous to the Environment)

Appendix 8, Table 1

Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993 Commission of the European Communities.

### Ecotoxicity

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

## Section 13 - DISPOSAL CONSIDERATIONS

### US EPA Waste Number & Descriptions

#### B. Component Waste Numbers

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

#### Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

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

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

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

## Section 14 - TRANSPORTATION INFORMATION



DOT:

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

Hazardous materials descriptions and proper shipping names:

Organochlorine pesticides, solid, toxic

#### Air Transport IATA:

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

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

#### Maritime Transport IMDG:

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

Limited Quantities: 5 kg

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

## Section 15 - REGULATORY INFORMATION

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

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

## Section 16 - OTHER INFORMATION

### LIMITED EVIDENCE

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

### REPRODUCTIVE HEALTH GUIDELINES

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

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
DDT	0.01 mg/m <sup>3</sup>	1000	R	3	-

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

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■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:  
[www.chemwatch.net/references](http://www.chemwatch.net/references).

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

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Issue Date: Apr-27-2009

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# Material Safety Data Sheet

cis-1,2-Dichloroethylene, 97%

ACC# 97773

## Section 1 - Chemical Product and Company Identification

**MSDS Name:** cis-1,2-Dichloroethylene, 97%

**Catalog Numbers:** AC113380000, AC113380025, AC113380100

**Synonyms:** cis-Acetylene dichloride.

**Company Identification:**

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

**For information in North America, call:** 800-ACROS-01

**For emergencies in the US, call CHEMTREC:** 800-424-9300

## Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
156-59-2	cis-1,2-Dichloroethylene	97	205-859-7

## Section 3 - Hazards Identification

### EMERGENCY OVERVIEW

Appearance: Clear liquid. Flash Point: 6 deg C.

**Warning! Flammable liquid and vapor.** Harmful if inhaled. Unstabilized substance may polymerize. Causes eye and skin irritation. May be harmful if swallowed. May cause respiratory tract irritation.

**Target Organs:** Central nervous system, respiratory system, eyes, skin.

#### Potential Health Effects

**Eye:** Causes moderate eye irritation.

**Skin:** Causes moderate skin irritation. May cause dermatitis.

**Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May be harmful if swallowed. May cause central nervous system depression.

**Inhalation:** May cause respiratory tract irritation. May cause narcotic effects in high concentration. Eye irritation, vertigo, and nausea were reported in humans exposed at 2200 ppm.

**Chronic:** Not available. Some German investigators reported fatty degeneration of the liver upon repeated narcotic doses in rats and

## Section 4 - First Aid Measures

**Eyes:** In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.

**Skin:** In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

**Ingestion:** 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:** If inhaled, remove to fresh air. 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. Vapors may form an explosive mixture with air. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Fire or excessive heat may result in violent rupture of the container due to bulk polymerization. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. Hazardous polymerization may occur under fire conditions.

**Extinguishing Media:** Use water fog, dry chemical, carbon dioxide, or regular foam.

**Flash Point:** 6 deg C ( 42.80 deg F)

**Autoignition Temperature:** 440 deg C ( 824.00 deg F)

**Explosion Limits, Lower:**9.70 vol %

**Upper:** 12.80 vol %

**NFPA Rating:** (estimated) Health: 2; Flammability: 3; Instability: 2

## 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. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Pure vapor will be uninhibited and may polymerize in vents or other confined spaces.

**Storage:** Keep away from sources of ignition. Store in a tightly closed container. Flammables-area. Store protected from light and air.

## Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

### Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
cis-1,2-Dichloroethylene	200 ppm TWA	none listed	none listed

**OSHA Vacated PELs:** cis-1,2-Dichloroethylene: No OSHA Vacated PELs are listed for this chemical.

### Personal Protective Equipment

**Eyes:** Wear chemical splash goggles.

**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:** Liquid

**Appearance:** Clear

**Odor:** Pleasant odor

**pH:** Not available.

**Vapor Pressure:** 201 mm Hg @ 25 deg C

**Vapor Density:** 3.34 (air=1)

**Evaporation Rate:** Not available.

**Viscosity:** Not available.

**Boiling Point:** 60 deg C @ 760 mm Hg

**Freezing/Melting Point:** -80 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Insoluble.

**Specific Gravity/Density:** 1.2800

**Molecular Formula:** C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>

**Molecular Weight:** 96.94

## Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures. This material is a monomer and may polymerize under certain conditions if the stabilizer is lost.

**Conditions to Avoid:** Light, ignition sources, exposure to air, excess heat.

**Incompatibilities with Other Materials:** Strong oxidizing agents, strong bases, copper.

**Hazardous Decomposition Products:** Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

**Hazardous Polymerization:** May occur.

## Section 11 - Toxicological Information

**RTECS#:**

**CAS#** 156-59-2: KV9420000

**LD50/LC50:**

**CAS#** 156-59-2:

Inhalation, rat: LC50 = 13700 ppm;

**Carcinogenicity:**

**CAS#** 156-59-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

**Epidemiology:** No data available.

**Teratogenicity:** No data available.

**Reproductive Effects:** No data available.

**Mutagenicity:** No data available.

**Neurotoxicity:** No data 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:** None listed.

## Section 14 - Transport Information

	US DOT	Canada TDG
<b>Shipping Name:</b>	DOT regulated - small quantity provisions apply (see 49CFR173.4)	1,2-DICHLOROETHYLENE
<b>Hazard Class:</b>		3
<b>UN Number:</b>		UN1150
<b>Packing Group:</b>		II

## Section 15 - Regulatory Information

### US FEDERAL

#### TSCA

CAS# 156-59-2 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

None of the chemicals in this material have an RQ.

#### SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

**Section 313** No chemicals are reportable under Section 313.

#### Clean Air Act:

This material does not contain any hazardous air pollutants.

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.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

**OSHA:**

None of the chemicals in this product are considered highly hazardous by OSHA.

**STATE**

CAS# 156-59-2 can be found on the following state right to know lists: Pennsylvania, Massachusetts.

**California Prop 65**

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:**

XN F

**Risk Phrases:**

R 11 Highly flammable.

R 20 Harmful by inhalation.

R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Safety Phrases:**

S 16 Keep away from sources of ignition - No smoking.

S 29 Do not empty into drains.

S 7 Keep container tightly closed.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

**WGK (Water Danger/Protection)**

CAS# 156-59-2: No information available.

**Canada - DSL/NDSL**

CAS# 156-59-2 is listed on Canada's NDSL List.

**Canada - WHMIS**

WHMIS: 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.

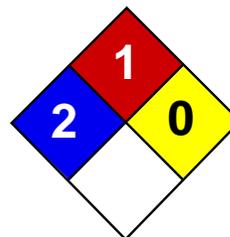
**Canadian Ingredient Disclosure List**

**Section 16 - Additional Information**

**MSDS Creation Date:** 2/09/1998

**Revision #5 Date:** 3/16/2007

*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.*



Health	2
Fire	1
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet Trichloroethylene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Trichloroethylene

**Catalog Codes:** SLT3310, SLT2590

**CAS#:** 79-01-6

**RTECS:** KX4560000

**TSCA:** TSCA 8(b) inventory: Trichloroethylene

**CI#:** Not available.

**Synonym:**

**Chemical Formula:** C<sub>2</sub>HCl<sub>3</sub>

**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](http://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
Trichloroethylene	79-01-6	100

**Toxicological Data on Ingredients:** Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.

**MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

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

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

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

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

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

**Auto-Ignition Temperature:** 420°C (788°F)

**Flash Points:** Not available.

**Flammable Limits:** LOWER: 8% UPPER: 10.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>), halogenated compounds.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. 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. Avoid contact with skin and eyes

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor 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: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m<sup>3</sup>) from ACGIH Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 131.39 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 86.7°C (188.1°F)

**Melting Point:** -87.1°C (-124.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.4649 (Water = 1)

**Vapor Pressure:** 58 mm of Hg (@ 20°C)

**Vapor Density:** 4.53 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 20 ppm

**Water/Oil Dist. Coeff.:** The product is equally soluble in oil and water; log(oil/water) = 0

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol, diethyl ether, acetone.

**Solubility:**

Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:**

Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Passes through the placental barrier in human. Detected in maternal milk in human.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Trichloroethylene : UN1710 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

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

### Other Classifications:

#### WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

#### DSCL (EEC):

R36/38- Irritating to eyes and skin. R45- May cause cancer.

#### HMIS (U.S.A.):

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** h

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

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

#### Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

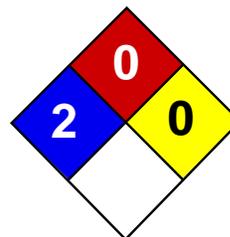
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:54 PM

**Last Updated:** 11/01/2010 12:00 PM

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Health	2
Fire	0
Reactivity	0
Personal Protection	G

## Material Safety Data Sheet Tetrachloroethylene MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Tetrachloroethylene

**Catalog Codes:** SLT3220

**CAS#:** 127-18-4

**RTECS:** KX3850000

**TSCA:** TSCA 8(b) inventory: Tetrachloroethylene

**CI#:** Not available.

**Synonym:** Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolve; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

**Chemical Name:** Ethylene, tetrachloro-

**Chemical Formula:** C<sub>2</sub>-Cl<sub>4</sub>

**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](http://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
Tetrachloroethylene	127-18-4	100

**Toxicological Data on Ingredients:** Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50 ): Acute: 5200 ppm 4 hours [Mouse].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, 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:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

### **Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

### **Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

### **Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

### **Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. 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:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

### **Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. 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 gas/fumes/ vapor/spray. Avoid contact with skin. 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, metals, acids, alkalis.

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

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

**Personal Protection:**

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor 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: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Ethereal.

**Taste:** Not available.

**Molecular Weight:** 165.83 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 121.3°C (250.3°F)

**Melting Point:** -22.3°C (-8.1°F)

**Critical Temperature:** 347.1°C (656.8°F)

**Specific Gravity:** 1.6227 (Water = 1)

**Vapor Pressure:** 1.7 kPa (@ 20°C)

**Vapor Density:** 5.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 5 - 50 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.4

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

## 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, metals, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium, barium. Protect from light.

**Special Remarks on Corrosivity:** Slowly corrodes aluminum, iron, and zinc.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic). May cause cancer.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symptoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorientation, seizures, emotional instability, stupor, coma). It may cause pulmonary edema. Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver (hepatitis, fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/central nervous system/peripheral nervous system (impaired memory, numbness of extremities, peripheral neuropathy and other

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fathead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

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

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Tetrachloroethylene UNNA: 1897 PG: III

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

#### WHMIS (Canada):

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

#### DSCL (EEC):

R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** g

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

**Health:** 2

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

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

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:29 PM

**Last Updated:** 11/01/2010 12:00 PM

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This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

**SUMMARY:** Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

## What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

## What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

## How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smoke-houses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

- ❑ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

### How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

### How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

### Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

### Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air ( $0.2 \text{ mg/m}^3$ ). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is  $5 \text{ mg/m}^3$  averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed  $0.1 \text{ mg/m}^3$  for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

### Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

### References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

**Where can I get more information?** For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



# Material Safety Data Sheet

Benzo[a]pyrene, 98%

ACC# 37175

## Section 1 - Chemical Product and Company Identification

**MSDS Name:** Benzo[a]pyrene, 98%

**Catalog Numbers:** AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000

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

**Company Identification:**

Acros Organics N.V.  
One Reagent Lane  
Fair Lawn, NJ 07410

**For information in North America, call:** 800-ACROS-01

**For emergencies in the US, call CHEMTREC:** 800-424-9300

## Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

## Section 3 - Hazards Identification

### EMERGENCY OVERVIEW

Appearance: yellow to brown powder.

**Danger!** May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.

**Target Organs:** Reproductive system, skin.

#### Potential Health Effects

**Eye:** May cause eye irritation.

**Skin:** May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.

**Ingestion:** May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.

**Inhalation:** May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.

**Chronic:** May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

## 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:** Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

**Ingestion:** Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

**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. 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 appropriate foam.

**Flash Point:** Not available.

**Autoignition Temperature:** Not available.

**Explosion Limits, Lower:** Not available.

**Upper:** Not available.

**NFPA Rating:** (estimated) Health: 2; Flammability: 0; Instability: 0

## Section 6 - Accidental Release Measures

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

**Spills/Leaks:** Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

**Storage:** Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

## 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 adequate ventilation to keep airborne concentrations low.

### Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[a]pyrene	0.2 mg/m <sup>3</sup> TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m <sup>3</sup> TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches). 80 mg/m <sup>3</sup> IDLH (listed under Coal tar	0.2 mg/m <sup>3</sup> TWA (as benzene soluble fraction) (listed under Coal tar pitches).

pitches).

**OSHA Vacated PELs:** Benzo[a]pyrene: 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 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:** Powder

**Appearance:** yellow to brown

**Odor:** faint aromatic odor

**pH:** Not available.

**Vapor Pressure:** Not available.

**Vapor Density:** Not available.

**Evaporation Rate:**Not available.

**Viscosity:** Not available.

**Boiling Point:** 495 deg C @ 760 mm Hg

**Freezing/Melting Point:**175 - 179 deg C

**Decomposition Temperature:**Not available.

**Solubility:** 1.60x10<sup>-3</sup> mg/l @25°C

**Specific Gravity/Density:**Not available.

**Molecular Formula:**C20H12

**Molecular Weight:**252.31

## Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.

**Conditions to Avoid:** Dust generation.

**Incompatibilities with Other Materials:** Strong oxidizing agents.

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide.

**Hazardous Polymerization:** Has not been reported.

## Section 11 - Toxicological Information

**RTECS#:**

**CAS#** 50-32-8: DJ3675000

**LD50/LC50:**

Not available.

**Carcinogenicity:**

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).

**Epidemiology:** No information found

**Teratogenicity:** No information found

**Reproductive Effects:** Adverse reproductive effects have occurred in experimental animals.

**Mutagenicity:** Mutagenic effects have occurred in humans. Mutagenic effects have occurred in experimental animals.

**Neurotoxicity:** No information found

**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# 50-32-8: waste number U022.

## Section 14 - Transport Information

	US DOT	Canada TDG
<b>Shipping Name:</b>	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
<b>Hazard Class:</b>		9
<b>UN Number:</b>		UN3077
<b>Packing Group:</b>		III

## Section 15 - Regulatory Information

### US FEDERAL

#### TSCA

CAS# 50-32-8 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# 50-32-8: 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 # 50-32-8: immediate, delayed.

**Section 313**

This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

**Clean Air Act:**

This material does not contain any hazardous air pollutants.

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# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

**OSHA:**

None of the chemicals in this product are considered highly hazardous by OSHA.

**STATE**

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

**California Prop 65**

**The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:**

WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 50-32-8: 0.06 æg/day NSRL

**European/International Regulations**

**European Labeling in Accordance with EC Directives**

**Hazard Symbols:**

T N

**Risk Phrases:**

R 43 May cause sensitization by skin contact.

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 60 May impair fertility.

R 61 May cause harm to the unborn child.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Safety Phrases:**

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.

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# 50-32-8: No information available.

**Canada - DSL/NDSL**

CAS# 50-32-8 is listed on Canada's DSL List.

**Canada - WHMIS**

This product has a WHMIS classification of D2A.

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.

**Canadian Ingredient Disclosure List**

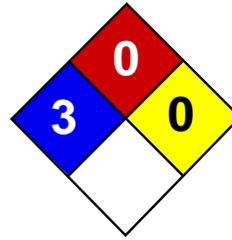
CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

<b>Section 16 - Additional Information</b>
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**MSDS Creation Date:** 9/02/1997

**Revision #7 Date:** 6/30/2006

*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.*



Health	3
Fire	0
Reactivity	0
Personal Protection	

# Material Safety Data Sheet

## Mercury MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Mercury

**Catalog Codes:** SLM3505, SLM1363

**CAS#:** 7439-97-6

**RTECS:** OV4550000

**TSCA:** TSCA 8(b) inventory: Mercury

**CI#:** Not applicable.

**Synonym:** Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragryum

**Chemical Name:** Mercury

**Chemical Formula:** Hg

**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](http://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
Mercury	7439-97-6	100

**Toxicological Data on Ingredients:** Mercury LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

Hazardous in case of skin contact (permeator). **CARCINOGENIC EFFECTS:** Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

## Section 4: First Aid Measures

### **Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

### **Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

### **Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

### **Inhalation:**

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

### **Serious Inhalation:**

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

### **Ingestion:**

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

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

### **Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

### **Special Remarks on Fire Hazards:**

When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

### **Special Remarks on Explosion Hazards:**

A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor 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: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m<sup>3</sup>) from OSHA (PEL) [United States]  
Inhalation TWA: 0.025 (mg/m<sup>3</sup>) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid. (Heavy liquid)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 200.59 g/mole

**Color:** Silver-white

**pH (1% soln/water):** Not available.

**Boiling Point:** 356.73°C (674.1°F)

**Melting Point:** -38.87°C (-38°F)

**Critical Temperature:** 1462°C (2663.6°F)

**Specific Gravity:** 13.55 (Water = 1)

**Vapor Pressure:** Not available.

**Vapor Density:** 6.93 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Very slightly soluble in cold 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, metals.

**Corrosivity:** Non-corrosive in presence of glass.

### Special Remarks on Reactivity:

Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonylnickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsilane, calcium,

### Special Remarks on Corrosivity:

The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalgam) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

### Toxicity to Animals:

LD50: Not available. LC50: Not available.

### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

### Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

**Special Remarks on other Toxic Effects on Humans:**

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

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

### Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Mercury UNNA: 2809 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

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

**DSCL (EEC):**

R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. 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.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:**

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

**Health:** 3

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

## Section 16: Other Information

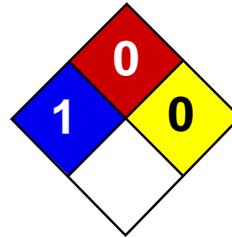
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:22 PM

**Last Updated:** 11/01/2010 12:00 PM

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Health	1
Fire	0
Reactivity	0
Personal Protection	E

# Material Safety Data Sheet

## Lead MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Lead

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

**CAS#:** 7439-92-1

**RTECS:** OF7525000

**TSCA:** TSCA 8(b) inventory: Lead

**CI#:** Not available.

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

**Chemical Name:** Lead

**Chemical Formula:** Pb

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

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

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

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

### Section 2: Composition and Information on Ingredients

**Composition:**

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

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

### Section 3: Hazards Identification

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

**Potential Chronic Health Effects:**

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

### Section 4: First Aid Measures

**Eye Contact:**

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

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

**Serious Skin Contact:** Not available.

**Inhalation:**

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

**Serious Inhalation:** Not available.

**Ingestion:**

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

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

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

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

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

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

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

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:**

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

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

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

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

### Personal Protection in Case of a Large Spill:

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

### Exposure Limits:

TWA: 0.05 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] TWA: 0.03 (mg/m<sup>3</sup>) from NIOSH [United States] TWA: 0.05 (mg/m<sup>3</sup>) [Canada] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 207.21 g/mole

**Color:** Bluish-white. Silvery. Gray

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

**Boiling Point:** 1740°C (3164°F)

**Melting Point:** 327.43°C (621.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 11.3 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, excess heat

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

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

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungs by mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually absorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, delirium, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead colic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

**Section 13: Disposal Considerations****Waste Disposal:**

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

**Section 14: Transport Information**

**DOT Classification:** Not a DOT controlled material (United States).

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

**Section 15: Other Regulatory Information****Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

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

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

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

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:21 PM

**Last Updated:** 11/01/2010 12:00 PM

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# Barium



## MATERIAL SAFETY DATA SHEET

### I. PRODUCT IDENTIFICATION

**Manufacturer/Supplier:**

ESPI Metals

1050 Benson Way, Ashland, OR 97520

Toll Free (800) 638-2581 \* Fax (541) 488-8313

E-Mail: [sales@espimetals.com](mailto:sales@espimetals.com)**Product Name:** Barium**Formula:** Ba**CAS Number:** 7440-39-3

### II. HAZARDOUS INGREDIENTS

**Hazardous Component:** Barium**Percent (%):** 0-100**OSHA/PEL:** 0.5 mg/m<sup>3</sup>**ACGIH/TLV:** 0.5 mg/m<sup>3</sup>**HMIS Ratings:****Health:** 2**Flammability:** 3**Reactivity:** 3

### III. PHYSICAL DATA

**Boiling Point:** 1640 °C**Melting Point:** 725 °C

- Specific Gravity:** 3.51 @ 20 °C
- Solubility in H<sub>2</sub>O:** Reacts violently
- Appearance and Odor:** Silver gray metal, no odor.

#### **IV. FIRE AND EXPLOSION HAZARDS DATA**

**Flash Point:** N/A

**Flammability:** Highly flammable

**Autoignition Temperature:** N/E

**Explosive Limits: Lower:** N/E **Upper:** N/E

**Extinguishing Media:** FLAMMABLE SOLID!! Use dry chemical/dolomite (powdered limestone) or sodium chloride. DO NOT USE WATER, CARBON DIOXIDE, OR HALOGENATED EXTINGUISHERS!

**Special Firefighting Procedures:** Wear full face, self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Flammable solid.

**Unusual Fire and Explosion Hazards:** Material readily reacts with water generating flammable and/or explosive hydrogen gas. Emits toxic fumes under fire conditions. **Caution!** Fire may reignite after having been extinguished. Blend with large excess of dolomite.

#### **V. HEALTH HAZARD INFORMATION**

##### **Effects of Exposure:**

To the best of our knowledge the chemical, physical, and toxicological properties of barium have not been thoroughly investigated and recorded.

Barium compounds may cause severe gastroenteritis, including abdominal pain, vomiting and diarrhea, tremors, faintness, paralysis of the arms and legs, and slow or irregular heartbeat. Severe cases may produce collapse and death due to respiratory failure. Soluble barium compounds are more likely to cause these effects than insoluble compounds. Inhalation of fumes may cause sore throat, coughing, labored breathing, and irritation of the respiratory tract as well as the above symptoms.

##### **Acute Effects:**

**Inhalation:** May cause severe irritation to the nose, throat, and upper respiratory tract.

**Ingestion:** May cause severe irritation of the mouth, throat, and esophagus.

**Skin:** Contact with skin can cause mild to moderate irritation. May cause chemical burns as it reacts with moisture on living tissue. Can lead to the development of a hypersensitivity in susceptible individuals.

**Eye:** May cause chemical burns as it reacts with moisture on living tissue.

##### **Chronic Effects:**

**Inhalation:** May cause sensitization.

**Ingestion:** May cause chronic barium poisoning.

**Skin:** May cause dermatitis.

**Eye:** May cause corneal opacity and blindness.

**Target Organs:** Respiratory System, Eye, Skin, Immune System (Allergic Reactions), Central Nervous System, and Heart.

**Medical Conditions Generally Aggravated by Exposure:** Pre-existing respiratory disorders.

**Carcinogenicity:** NTP: No      IARC: No      OSHA: No

#### **EMERGENCY AND FIRST AID PROCEDURES:**

**INHALATION:** Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult, seek immediate medical attention.

**INGESTION:** Seek immediate medical attention.

**SKIN:** Remove metal particles. Remove contaminated clothing. Carefully brush material off skin and wash area with soap and water. Seek medical attention if irritation develops.

**EYE:** Remove metal particles. Contamination of the eyes should be treated by immediate and prolonged irrigation with copious amounts of water. Lift upper and lower eye lids frequently. Get prompt medical attention.

**NOTE TO PHYSICIAN:** Treatment should be directed at preventing absorption, administering to the symptoms as they occur, and providing supportive therapy. Attention: Up to two days latent period.

#### **VI. REACTIVITY DATA**

**Stability:** Stable if used and stored according to specifications.

**Conditions to Avoid:** Water or moisture and air. Avoid friction, heat, sparks, and flame.

**Incompatibility (Materials to Avoid):** Water or moisture, oxidizing agents, oxygen, acids, alcohols, halocarbons, carbon dioxide, ammonia.

**Hazardous Decomposition Products:** Toxic fumes of hydrogen and barium oxide.

**Hazardous Polymerization:** Will not occur

#### **VII. SPILL OR LEAK PROCEDURES**

**Steps to Be Taken in Case Material Is Released or Spilled:** Wear appropriate respiratory and protective equipment specified in section VIII. Isolate spill area and provide ventilation. Protect from ignition sources. Keep unprotected persons away. Sweep or scoop spilled product and place in a closed container for further handling and disposal. Do not flush to sewer, stream, or other bodies of water. Cover very small quantities in the open with powdered limestone and let decompose.

**Waste Disposal Method:** Material in the elemental state should be recovered for reuse or recycling. Observe all federal, state & local regulations.

#### **VIII. SPECIAL PROTECTION INFORMATION**

**Respiratory Protection:** NIOSH approved cartridge respirator.

**Ventilation:** Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below exposure limits. Handle in a controlled environment in an inert gas.

**Protective Gloves:** Leather-palmed, heat resistant gloves.

**Eye Protection:** Chemical splash goggles and a full face shield. An eye wash facility should be readily available.

**Other Protective Clothing or Equipment:** The use of fire resistant outer clothing is advisable.

## **IX. SPECIAL PRECAUTIONS**

**Precautions to Be Taken in Handling and Storage:** Barium metal should be stored in tightly-closed containers under argon or mineral oil. When handling, wear non-sparking shoes and flame resistant clothing. Avoid friction, heat, sparks, and flame. Use only non-sparking tools and utensils. Ground all equipment, vessels, tables, and other metallic objects that may come into contact with the product. Do not store together with acids, halogens and oxidizing agents. Store away from water/moisture.

**Other Precautions:** Can autoignite in air. Extremely sensitive to shock, heat, friction and static electricity. Rubber gloves, rubber protective clothing and apron, goggles and gas filter mask should be worn when working in a barium storage area.

**Empty Container Precautions:** This container is hazardous when empty. Do not use heat, sparks, open flame, torches, or cigarettes on or near empty container. Empty containers can retain product residues. Do not reuse empty container for food, clothing, or other products for human or animal consumption or where skin contact may occur.

**Work Practices:** Implement engineering and work practice controls to reduce and maintain concentration of exposure at low levels. Do not use tobacco or food in work area. Wash thoroughly after handling, especially before eating, drinking, smoking, or using restroom facilities. Contaminated clothing and shoes should be thoroughly cleaned before reuse. Do not blow dust off clothing or skin with compressed air. Maintain eyewash capable of sustained flushing, safety drench shower and facilities for washing.

**TSCA Listed:** Yes

### **DOT Regulations:**

**Hazard Class:** 4.3

**Identification Number:** UN1400

**Packing Group:** II

**Proper Shipping Name:** Barium

**Label:** Dangerous when wet

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI shall not be held liable for any damage resulting from handling or from contact with the above product.

Issued by: S. Dierks

Revised/Verified: July 2011

# **ATTACHMENT III**

## **Heat Stress/Cold Stress and Related Illnesses**

## 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 known 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°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 Equipment 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 than 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 from 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**  
**Injuries and Illnesses Incident Report Form**  
**(OSHA 301)**

# 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."

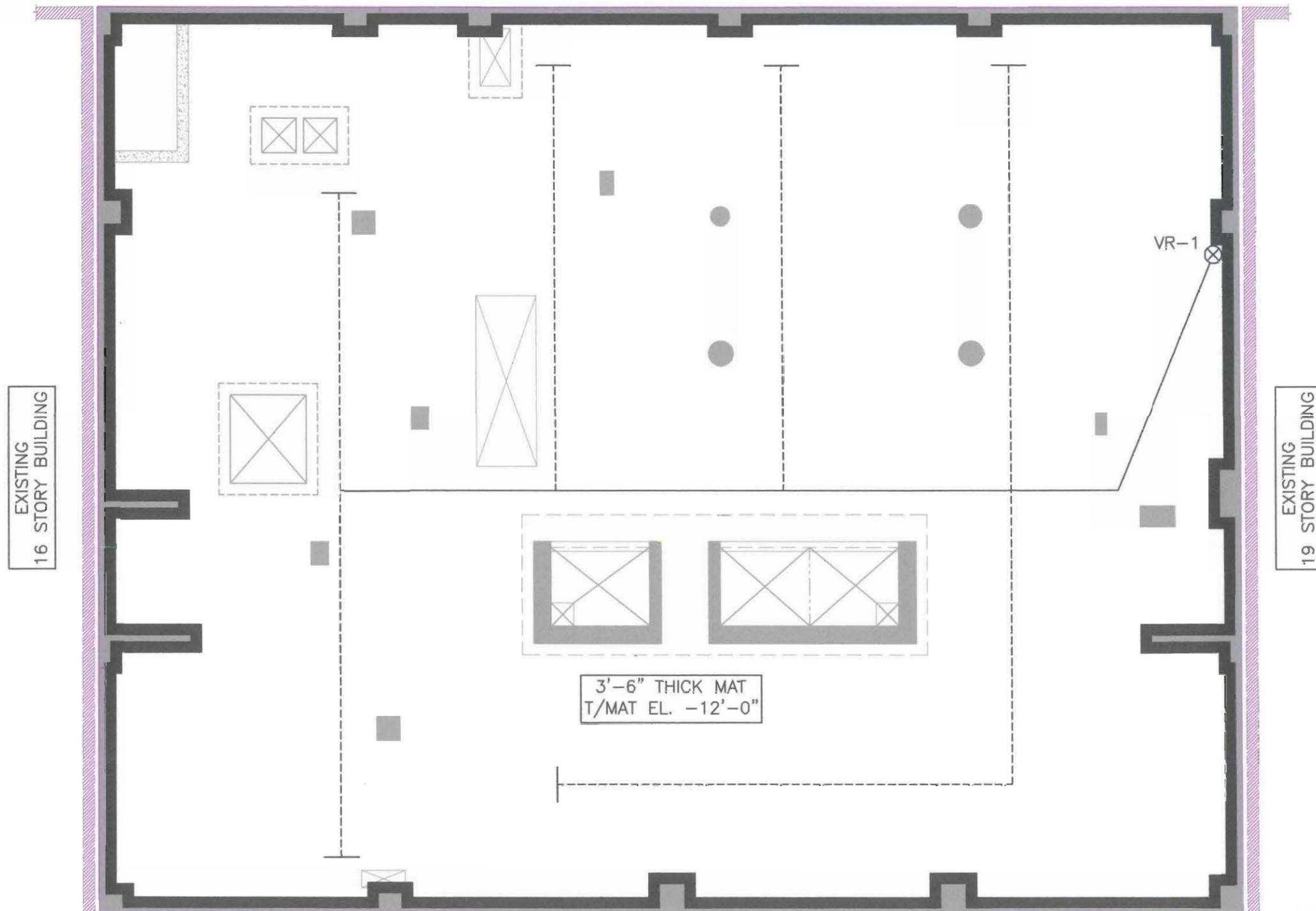
15) **What happened?** Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

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 \_\_\_\_/\_\_\_\_/\_\_\_\_

**Addendum 4**  
SSDS Plans



**NOTES:**

1. DRAWING NOT TO BE USED FOR STRUCTURAL, ARCHITECTURAL, OR OTHER REFERENCE EXCEPT FOR SUB-SLAB DEPRESSURIZATION SYSTEM.
2. THE EXTENTS OF THE BUILDING CONSTRUCTION BENEATH THE FLOOR SLABS SHALL BE LINED WITH GAS VAPOR BARRIER. AS PART OF THE BUILDING CONSTRUCTION, THE GAS VAPOR BARRIER SHALL ALSO BE APPLIED VERTICALLY TO BELOW GRADE WALLS AND WALLS OF PITS AND SUMPS.
3. UNDERSLAB GAS VAPOR COLLECTION PIPING SHALL BE CONSTRUCTED OF SCHEDULE 80 WITH 6 ROWS OF 0.03 INCH WIDE SLOTS ALONG THE CIRCUMFERENCE OF THE PIPE KEEPING SLOT SPACING OF 0.25 INCH THROUGHOUT THE LENGTH OF EACH PIPE. THE INSIDE AND OUTSIDE SLOT LENGTHS SHALL BE 1.5 AND 2.75 INCHES RESPECTIVELY. THE SOLID PIPING SHALL BE CONSTRUCTED OF SCHEDULE 80 PVC WITH 1 ROW OF 0.5 INCH DIAMETER PERFORATION AT THE BOTTOM OF THE PIPE KEEPING PERFORATION SPACING OF 2 FEET THROUGHOUT THE LENGTH OF EACH SOLID PIPE TO DRAIN THE CONDENSATE WATER. SLOTTED AND SOLID PIPE ENDS TO BE CAPPED.
4. SLOTTED AND SOLID GAS VAPOR COLLECTION PIPING SHALL BE 6" DIAMETER UNLESS OTHERWISE SPECIFIED ON THE DRAWING.
5. GAS VAPOR COLLECTION PIPING BELOW STRUCTURAL SLAB SHALL BE SCHEDULE 80 PVC PIPE AT DIAMETERS SHOWN. VERTICAL RISER THROUGH THE BUILDING SHALL BE CAST IRON. THE TRANSITION FROM SCHEDULE 80 PVC SHALL BE MADE BELOW THE SLAB JUST BEFORE THE RISER PENETRATION AS SHOWN IN DETAIL ON FIGURE 3.
6. REFER TO SPECIFICATION SECTION "SUB-SLAB DEPRESSURIZATION SYSTEM" FOR ADDITIONAL REQUIREMENTS.



*Environmental Management & Consulting*

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

West 37th Street  
New York, NY

**FIGURE 1**

**SSDS LAYOUT  
CELLAR FLOOR  
PLAN**

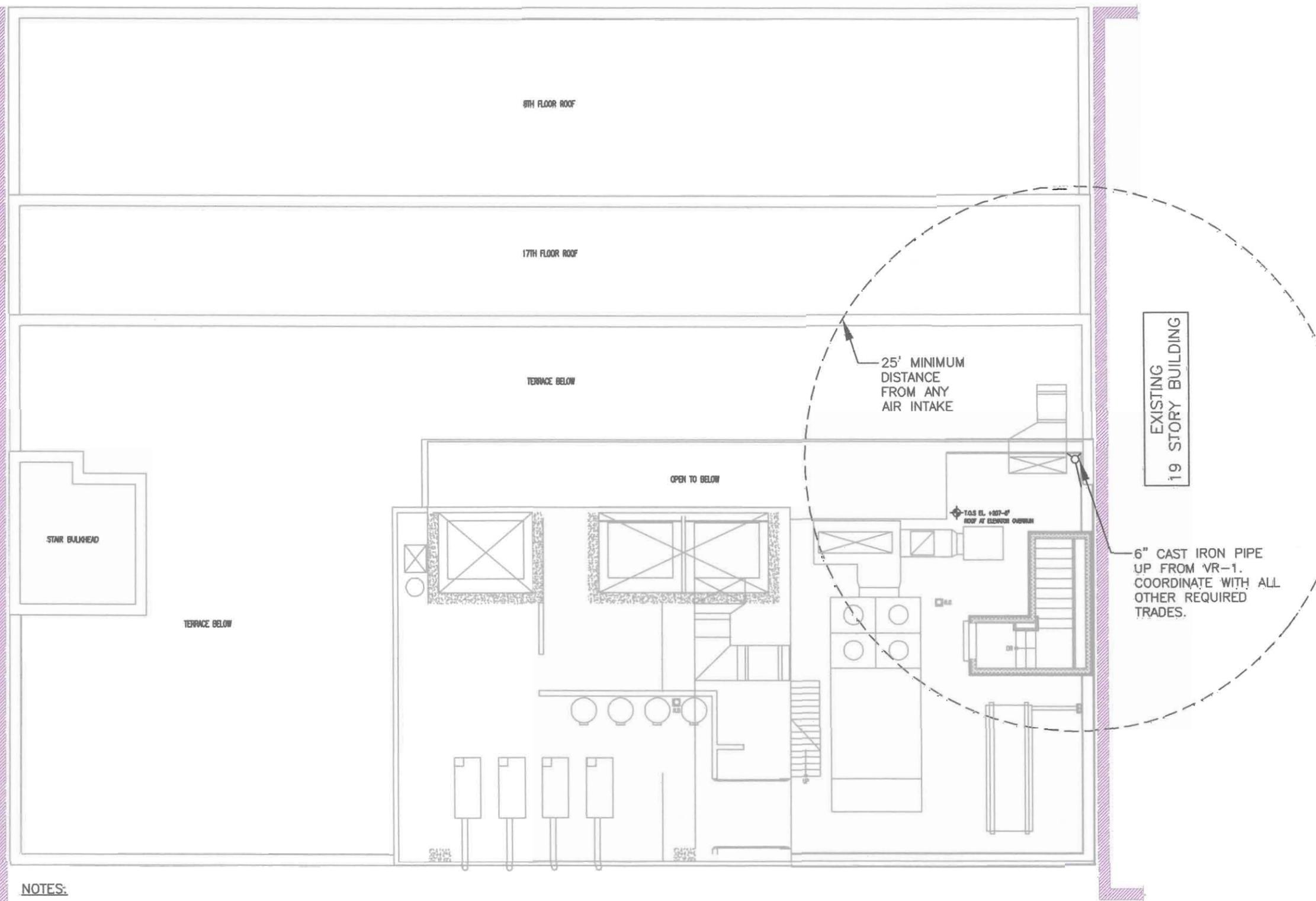
Date  
**December 28, 2011**

Project Number  
**10173-001-3**

**LEGEND**

- 6" DIAMETER SLOTTED PVC PIPE
- 6" DIAMETER SOLID PVC PIPE
- |-|-|- PIPE CAP
- VR-1 ⊗ VERTICAL RISER EXTEND THROUGH ROOF
- EXTENT OF GAS VAPOR BARRIER UNDERNEATH THE SLAB & ALONG THE WALLS AND MINIMUM 12-INCH THICK CONTINUOUS GAS PERMEABLE AGGREGATE LAYER (¾" CLEAN, WASHED STONE)

EXISTING  
16 STORY BUILDING



**NOTES:**

1. CAST IRON SHALL BE 6" DIAMETER AS INDICATED ON THE DRAWINGS.
2. CONTRACTOR TO VERIFY THAT VENT STACK EXHAUST LOCATION IS A DISTANCE OF 25 FEET OR MORE FROM ANY FRESH AIR INTAKES OR OPERABLE WINDOWS (INCLUDING THOSE ON ADJOINING PROPERTIES). FINAL LOCATION AND HEIGHT OF VENT STACKS SHALL BE IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.
3. VENT STACK SHALL BE SECURELY ANCHORED WITH ADEQUATE STRUCTURAL SUPPORTS.
4. IF A CONFLICT ARISES BETWEEN THE SSDS PIPING AND STRUCTURAL, ARCHITECTURAL, OR MEP ELEMENTS OF THE BUILDING, THE SSDS PIPING CAN BE REALIGNED (HORIZONTALLY OR VERTICALLY) AS NECESSARY TO AVOID THE CONFLICT. SUBMIT SHOP DRAWING FOR APPROVAL PRIOR TO INSTALLATION.
5. CONTRACTOR TO COORDINATE INSTALLATION OF SSDS ROOF PENETRATION PRIOR TO WATERPROOFING OF THE ROOF.
6. SEE ARCHITECTURAL PLANS AND SPECS FOR WATERPROOFING INSTALLATION DETAILS.



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West 37th Street  
New York, NY

**FIGURE 2**

**SSDS LAYOUT  
ROOF PLAN  
(21ST FLOOR)**

Date  
**December 28, 2011**

Project Number  
**10173-001-3**

**LEGEND**





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New York, NY 10001

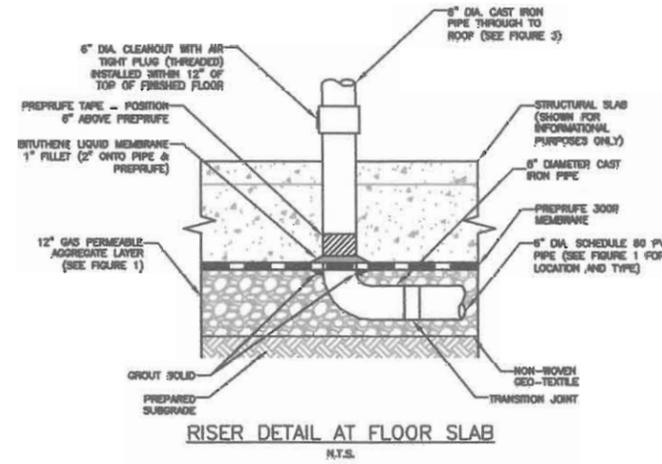
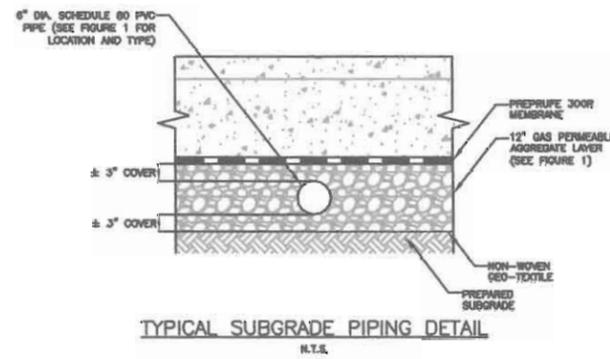
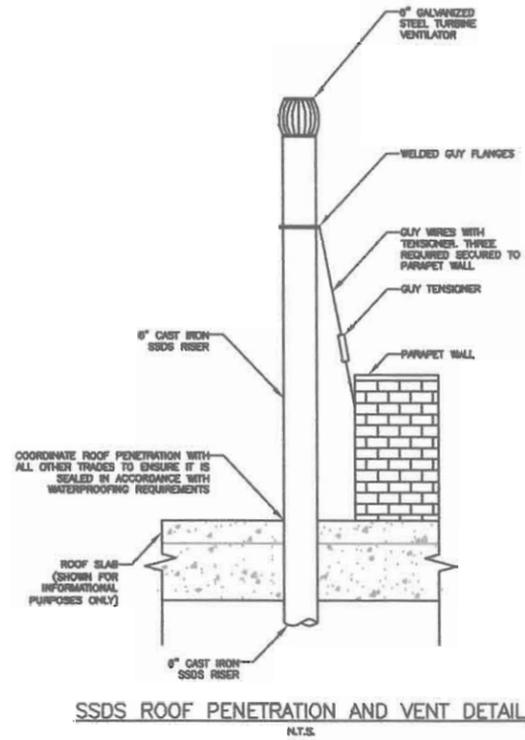
West 37th Street  
New York, NY

**FIGURE 3**

**SSDS  
DETAILS**

Date  
**December 28, 2011**

Project Number  
**10173-001-3**



**NOTES:**

1. CAST IRON PIPE SHALL BE 6" DIAMETER AS INDICATED ON THE DRAWINGS.
2. CONTRACTOR TO VERIFY THAT VENT STACK EXHAUST LOCATION IS A DISTANCE OF 25 FEET OR MORE FROM ANY FRESH AIR INTAKES OR OPERABLE WINDOWS (INCLUDING THOSE ON ADJOINING PROPERTIES). FINAL LOCATION AND HEIGHT OF VENT STACKS SHALL BE IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.
3. VENT STACK SHALL BE SECURELY ANCHORED WITH ADEQUATE STRUCTURAL SUPPORTS, SEE DETAIL ON THIS SHEET.
4. IF A CONFLICT ARISES BETWEEN THE SSDS PIPING AND STRUCTURAL, ARCHITECTURAL, OR MEP ELEMENTS OF THE BUILDING, THE SSDS PIPING CAN BE REALIGNED (HORIZONTALLY OR VERTICALLY) AS NECESSARY TO AVOID THE CONFLICT. SUBMIT SHOP DRAWING FOR APPROVAL PRIOR TO INSTALLATION.
5. CONTRACTOR TO COORDINATE INSTALLATION OF SSDS ROOF PENETRATION PRIOR TO WATERPROOFING OF THE ROOF.
6. SEE ARCHITECTURAL PLANS AND SPECS FOR WATERPROOFING INSTALLATION DETAILS.
7. REFER TO SPECIFICATION SECTION "SUB-SLAB DEPRESSURIZATION SYSTEM" FOR ADDITIONAL REQUIREMENTS.

**Addendum 5**  
Signage



# NYC Brownfield Cleanup Program

This property is enrolled in the New York City Brownfield Cleanup Program for environmental remediation. This is a voluntary program administered by the NYC Office of Environmental Remediation.

For more information, log on to:

[www.nyc.gov/oer](http://www.nyc.gov/oer)



If you have questions or would like more information, please contact:

Shaminder Chawla at (212) 788-8841  
or email us at [brownfields@cityhall.nyc.gov](mailto:brownfields@cityhall.nyc.gov)

312 West 37<sup>th</sup> Street Site  
Site #: 12CBCP028M

# REMEDIAL ACTION WORK PLAN

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# **EXECUTIVE SUMMARY**

West 37<sup>th</sup> Street Partners LLC has enrolled in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate a 10,000-square foot site located at 312 West 37<sup>th</sup> Street in Manhattan, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

## **Site Location and Current Usage**

The Site is located at 312 West 37<sup>th</sup> Street in midtown Manhattan, New York and is identified as Tax Block 760 Lot 51 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,000-square feet and is bounded by West 37<sup>th</sup> Street to the north, and multi-story commercial office buildings with ground-level retail to the east, west, and south, and is between 8<sup>th</sup> and 9<sup>th</sup> Avenues. A map of the site boundary is shown in Figure 2. The Site is a former parking lot that is currently vacant.

## **Summary of Proposed Redevelopment Plan**

The proposed future use of the Site will consist of a 21-story hotel building with a basement, which will cover 4/5 (8,000 sf) of the lot. A 2,000-sf courtyard will remain in the rear portion of the lot. Layout of the proposed site development is presented in Figure 2. The current zoning designation is C6-4M, a central high-density commercial district. The proposed use is consistent with existing zoning for the property. The first floor will contain the hotel lobby, and the basement will contain a gym and meeting rooms for guests, and a break room and offices for the hotel staff. The foundation excavation will extend to 16 feet below grade across the building footprint, with one central spot extending to 19 feet below grade associated with an elevator pit. Excavation is not anticipated to extend below the water table at 20 feet below grade. Layout of the proposed site development is presented in Figure 2.

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

### **Summary of the Remedy**

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establishment of Track 1 and Track 4 Soil Cleanup Objectives (SCOs) for site areas A (building footprint) and B (courtyard), respectively. Excavation and removal of soil/fill exceeding SCOs.
4. Collection and analysis of hotspot end-point samples to determine the performance of the remedy with respect to attainment of SCOs in hotspot areas.
5. Removal of underground storage tanks and closure of petroleum spills in compliance with applicable local, State and Federal laws and regulations.
6. Construction and maintenance of an engineered composite cover consisting of a building slab covering 80% of the site (site area A, building footprint), and open space cover consisting of a 2 feet thick layer of clean fill covering the remaining 20% (site area B, courtyard) to prevent human exposure to residual soil/fill remaining under the Site;
7. Installation of a vapor barrier system beneath the building slab.
8. Installation and operation of a passive sub-slab depressurization system.

9. Demarcation of residual soil/fill.
10. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
11. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
12. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
13. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
14. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
15. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
16. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.
17. Submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual contamination and off site soil vapor contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
18. 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 (for areas where Track 1 is not achieved); and (4) higher level of land usage without OER-approval (for areas where Track 1 is not achieved).

# COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation created the New York City Brownfield Cleanup Program (NYC BCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

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

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

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

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

**Health and Safety Plan.** This cleanup plan includes a 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. The Site safety coordinator is Jesse Mausner and can be reached at 212-675-3225 ext. 310.

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

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

**Odor, Dust and Noise Control.** This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). If you observe problems in these areas, please contact the onsite Project Manager Jesse Mausner at 212-675-3225 ext. 310 or NYC Office of Environmental Remediation Project Manager Hannah Moore at 212-788-8841. The project is also required to comply with NYC noise control standards. If you observe any noise control issues, please contact Hannah Moore.

**Quality Assurance.** This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be

summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

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

**Hours of Operation.** The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation are 7:30 am to 3:30 pm Monday through Friday.

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

**Complaint Management.** The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Jesse Mausner at 212-675-3225 ext. 310, the NYC Office of Environmental Remediation Project Manager Hannah Moore at 212-788-8841, or call 311 and mention the Site is in the NYC Brownfield Cleanup Program.

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

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

**Soil Chemical Testing and Screening.** All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held

instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

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

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

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

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

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

**Truck Routing.** Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

**Final Report.** The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at New York Public Library (455 5<sup>th</sup> 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.

## LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PE	Professional Engineer

PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

# CERTIFICATION

I, Arnold Fleming, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 312 West 37<sup>th</sup> Street Site 12CBCP028M.

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

*Arnold F. Fleming*  
Signature

12/14/11  
Date



# **REMEDIAL ACTION WORK PLAN**

## **1.0 SITE BACKGROUND**

West 37<sup>th</sup> Street Partners LLC has applied for enrollment in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate a property located at 312 West 37<sup>th</sup> Street in midtown Manhattan, New York (the Site). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

### **1.1 SITE LOCATION AND CURRENT USAGE**

The Site is located at 312 West 37<sup>th</sup> Street in midtown Manhattan, New York and is identified as Tax Block 760 Lot 51 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,000-square feet and is bounded by West 37<sup>th</sup> Street to the north, and multi-story commercial office buildings with ground-level retail to the east, west, and south, and is between 8<sup>th</sup> and 9<sup>th</sup> Avenues. A map of the site boundary is shown in Figure 2. The Site is a former parking lot that is currently vacant.

### **1.2 PROPOSED REDEVELOPMENT PLAN**

The proposed future use of the Site will consist of a 21-story hotel building with a basement, which will cover 4/5 (8,000 sf) of the lot. A 2,000-sf courtyard will remain in the rear portion of the lot. Layout of the proposed site development is presented in Figure 2. The current zoning designation is C6-4M, a central high-density commercial district. The proposed use is consistent with existing zoning for the property. The first floor will contain the hotel lobby, and the

basement will contain a gym and meeting rooms for guests, and a break room and offices for the hotel staff. The foundation excavation will extend to 16 feet below grade across the building footprint, with one central spot extending to 19 feet below grade associated with an elevator pit. Excavation is not anticipated to extend below the water table at 20 feet below grade. Layout of the proposed site development is presented in Figure 2.

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

### **1.3 DESCRIPTION OF SURROUNDING PROPERTY**

Adjacent properties are occupied by multi-story commercial office buildings with some ground-level retail to the north, east, west, and south. The neighboring building to the east contains a drop-off facility for a dry cleaner, but no dry cleaning operations are done on-site.

Figure 2 shows the surrounding land usage.

### **1.4 REMEDIAL INVESTIGATION**

A remedial investigation was performed and the results are documented in a companion document called “*Remedial Investigation Report, 312 West 37<sup>th</sup> Street*”, dated October 2011 (RIR).

#### **Summary of Past Uses of Site and Areas of Concern**

The Site was improved with several tenement style buildings from at least 1890 until approximately 1930, with a Chinese laundry operation depicted circa 1911. A two-story building in the rear of the property was originally depicted as commercial, but by 1930 was depicted as an apartment building. By the early 1940s, the Site became an auto parking lot with a filling station in the northwest corner of the lot. The filling station contained two gasoline underground storage tanks (USTs) and a small 1-story structure, and reportedly ceased operations in the late 1950s. The subject property has remained a commercial auto parking lot through the present.

The AOCs identified for this site include:

1. Two suspect 550-gallon USTs in the northwest corner of the Site, with associated fill lines extending to the sidewalk, where two fill ports were visible.
2. Historic Fill.

### **Summary of the Work Performed under the Remedial Investigation**

West 37<sup>th</sup> Street Partners LLC performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed eight soil borings across the entire project Site, and collected 16 soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed four temporary groundwater monitoring points throughout the Site and collected four groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installed five soil vapor probes around Site perimeter and collected five soil vapor samples for chemical analysis, plus one ambient air sample.

### **Summary of Environmental Findings**

1. Elevation of the property is approximately 38 feet above mean sea level.
2. Depth to groundwater is approximately 20 feet at the Site.
3. Groundwater flow is generally from east to west beneath the Site.
4. Depth to bedrock is approximately 35 feet at the Site.
5. Soil stratigraphy encountered at the site included a surficial fill layer consisting of topsoil, sand, brick fragments, and concrete fragments ranging in thickness from 5 to 11 feet across the site. This fill layer is underlain by a clay confining layer ranging in thickness from 2 to 4 feet, beneath which is fine-medium sand with some coarse sand and gravel that extends to 20 feet below grade.
6. Soil/fill samples collected during the RI showed no volatile organic compounds (VOCs) exceeding NYSDEC Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (UUSCOs). Several VOCs in some samples, including PCE and TCE, were identified but at extremely low levels (typically below 4 ug/kg). Five semi-volatile organic compounds

(SVOCs) in three shallow soil samples and in one deep sample exceed UUSCOs. Of these, only one SVOC exceeded Track 2 Restricted Commercial SCOs (RCSCOs) in three samples. The SVOCs identified are polycyclic aromatic hydrocarbon compounds (PAH) and are observed at relatively low concentrations. Several metals including lead, mercury, barium, zinc and copper exceed UUSCOs in shallow soil and one deep soil sample. Of these, only barium (3 samples) and lead (3 samples) exceeded Track 2 RCSCOs. Overall, the occurrence of PAHs and metals is consistent with findings during the collection of soil samples and suggests that historical fill is responsible for the observed low to moderate levels of contamination. One PCB exceeds UUSCOs in two shallow samples, and two pesticides exceed UUSCOs in one shallow and one deep sample. No PCBs or pesticides exceed Track 2 RCSCOs in any sample onsite. No contaminant source areas were identified during this remedial investigation.

7. Groundwater samples collected during the RI showed no SVOCs or PCBs exceeding New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). One pesticide exceeded GQS in three samples. One VOC (cis 1,2-dichloroethene) marginally exceeding GQS in one groundwater sample. PCE and TCE were identified in groundwater samples at low concentrations below GQS. Several metals exceeded GWS in dissolved samples, including magnesium (one sample), manganese (4 samples), sodium (4 samples), and selenium (2 samples). Metals findings indicate that there is likely minor to moderate saline intrusion in local groundwater but no metals contamination source onsite. While some VOCs were identified at low levels in groundwater, none of these compounds were identified in onsite soils above corresponding groundwater protection standards in 6NYCRR Part 375-6.8.
8. Soil vapor samples collected during the RI showed numerous VOCs detected at generally low to moderate concentrations, including three compounds listed in the NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006) Decision Matrices. These include TCE and PCE which were identified in all soil vapor samples and range from 7-12 ug/m<sup>3</sup> and 46-176 ug/m<sup>3</sup>, respectively.

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

## **2.0 REMEDIAL ACTION OBJECTIVES**

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

### **Groundwater**

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

### **Soil**

- Prevent direct contact with contaminated soil.

### **Soil Vapor**

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

### **3.0 REMEDIAL ALTERNATIVES ANALYSIS**

The following two remedial action alternatives, one achieving Track 1 SCOs (Alternative 1) and one achieving Track 4 SCOs (Alternative 2), are considered in this analysis:

- Alternative 1 involves
  - Establishment of Track 1 Unrestricted Use SCOs. Track 1 SCOs are effectively achieved with removal of soil and fill material to approximately 16 feet bgs throughout the site; and
  - As part of construction, placement of a soil vapor barrier beneath the building slab and along foundation side walls and a passive sub-slab depressurization system beneath the foundation to prevent migration of vapors into building from offsite.
- Alternative 2 involves
  - Establishment of Track 4 SCOs. Track 4 SCOs are effectively achieved with removal of soil and fill material to approximately 16 feet bgs over 80% of the site and to approximately 2 feet bgs over 20% of the site;
  - Placement of a soil vapor barrier beneath the building slab and along foundation side walls and a passive sub-slab depressurization system beneath the foundation due to the presence of off-site impacts to soil vapor and groundwater;
  - Placement of a final cover over the entire site to eliminate exposure to remaining soil/fill;
  - Establishment of use restrictions including prohibitions on the use of groundwater from the site and prohibitions on other sensitive site uses, such as farming or vegetable gardening, to eliminate future exposure pathways;
  - Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these engineering and institutional controls, including the performance of periodic inspections and certification that the controls are performing as they were intended; and

- Placement of a deed restriction to memorialize the remedial action and the Engineering and Institutional Controls to ensure that future owners of the site continue to maintain these controls as required.

### **3.1 THRESHOLD CRITERIA**

#### **Protection of Public Health and the Environment**

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

Alternative 1 would result in removal of all soil/fill with contaminant concentrations above Track 1 SCOs. 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

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater;
- Minimizing potential exposure to contaminated soils/ vapors during construction by implementing an approved soil and materials management plan and community air monitoring plan (CAMP); and

The potential for migration of soil vapor into occupied structures and associated inhalation exposures will be eliminated by installing a vapor barrier and passive SSDS during construction.

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, a vapor barrier and SSDS. 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

- 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 groundwater (from off-site sources) by placement of composite cover system and via institutional controls; and
- Eliminating the potential for migration of soil vapor into occupied structures and associated inhalation exposures by installing a vapor barrier and passive SSDS, in conjunction with the composite cover system.

### **3.2. BALANCING CRITERIA**

#### **Compliance with Standards, Criteria and Guidance (SCGs)**

Alternative 1 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.

Alternative 2 would address the chemical-specific SCGs for soil, groundwater, and soil vapor by establishment of Track 4 SCOs 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 in compliance 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.

Both Alternative 1 and 2 would result in short-term impacts associated with excavation, handling, load out of materials, and truck traffic. However, focused attention to means and methods during the remedial action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

### **Long-term effectiveness and permanence**

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

Alternative 1 and Alternative 2 would achieve long-term effectiveness and permanence by permanently removing all or most impacted soils, respectively.

Alternative 2 would provide long-term effectiveness by attaining Track 4 SCOs, placing a concrete slab under the building, establishing use restrictions, establishing a Site Management Plan to ensure long-term management of Institutional and Engineering Controls, and placing a deed restriction to memorialize these controls for the long term. Groundwater use restrictions will eliminate potential exposure to groundwater and establishment of an SMP and a deed restriction will ensure that this protection remains effective for the long-term (in perpetuity). The SMP will ensure long-term effectiveness of all Engineering and Institutional Controls 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 in perpetuity.

### **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. Removal of soil to a depth of approximately 16 feet would occur.

Alternative 2 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil in site area A to a depth of approximately 16 feet bgs and to approximately 2 feet bgs in site area B by removing all soil in excess of restricted commercial use SCOs in those areas. Remaining soil/fill would meet Track 4 site specific SCOs.

### **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.

Both Alternatives are both feasible and implementable. They use standard materials, services, and well-established technology. The reliability of these remedies is also high. There are no specific difficulties associated with any of the activities proposed, which utilize standard industry methods.

### **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 the Track 1 alternative are higher than the Track 2 alternative in that a higher volume of soil/fill will be excavated for off-site disposal to achieve a Track 1 status over the entire site. In both cases, appropriate public health and environmental protections are achieved.

Both alternatives satisfy the threshold balancing criterion and other criteria listed here, and each is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduces both mobility and toxicity.

### **Community Acceptance**

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

Based on the overall goals of the remedial program and initial observations by the project team, both of the alternatives are acceptable to the community. This RAWP will be subject to and undergo public review under the NYC BCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment 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 (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

Because of the complete soil removal proposed for the Track 1 alternative, it provides protection of public health and the environment for both the proposed use of the Site and any future use. The Track 1 alternative provides a remedial action that is beneficial to the surrounding community and is consistent with the goals of the City for remediating and redeveloping brownfield sites.

The Track 4 alternative also provides sufficient environmental and public health protection for the intended use.

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

### **Sustainability of the Remedial Action**

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

While alternative 2 would result in lower energy use based on reducing the volume of material transported off-site, both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action.

## **4.0 REMEDIAL ACTION**

### **4.1 SUMMARY OF PREFERRED REMEDIAL ACTION**

The preferred remedial action is the Track 1 Alternative over site area A (building footprint) and the Track 4 Alternative across site area B (rear yard). The preferred remedial action achieves protection of public health and the environment for the intended use of the property. The preferred remedial action will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action 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 for particulates and volatile organic carbon compounds.
3. Establishment of Track 1 and Track 4 Soil Cleanup Objectives (SCOs) for site areas A and B, respectively. Excavation and removal of soil/fill exceeding SCOs.
4. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
5. Removal of underground storage tanks and closure of petroleum spills in compliance with applicable local, State and Federal laws and regulations.
6. Construction and maintenance of an engineered composite cover consisting of a building slab covering 80% of the site (site area A), and open space cover consisting of a 2 feet thick layer of clean fill covering the remaining 20% (site area B) to prevent human exposure to residual soil/fill remaining under the Site;
7. Installation of a vapor barrier system beneath the building slab.

8. As part of construction of the building, installation and operation of a passive sub-slab depressurization system.
9. Demarcation of residual soil/fill in site area B.
10. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
11. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite.
12. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
13. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
14. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
15. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
16. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.
17. Submission of an approved Site Management Plan (SMP) for site area B 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.

18. Recording of a Declaration of Covenants and Restrictions for areas where Track 1 is not achieved 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.

#### 4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track 1 and 4 Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are Track 1 Unrestricted Use SCOs for site area A and Track 4 SCOs for site area B. Both SCOs for this property are shown 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 3. The location of planned excavations is shown in Figure 2.

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

#### Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 7,300 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.

<b><u>Disposal Facility</u></b>	<b><u>Waste Type</u></b>	<b><u>Estimated Quantities</u></b>
Clean Earth, Cartaret, NJ	Historic fill/non-hazardous soil	Unknown

Pure Earth, Vineland, NJ	Petroleum contaminated soil, non-hazardous soil	Unknown
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### End-Point Sampling

Hotspots may be identified during this remedial action. Hotspot removal actions under this plan will be performed in conjunction with remedial end-point sampling. End-point sampling frequency will consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:
  - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
  - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

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

remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all 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 exceedence 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 will be 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 will followed. Soil samples were analyzed by an ELAP-certified laboratory approved by the NYSDOH. For every 20 soil samples, one duplicate soil sample will also be collected and analyzed for all parameters.

### **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 1. The estimated quantity of soil to be imported into the Site for backfill and cover soil is 225 tons. No onsite soil/fill expected to be reused/ relocated on Site during construction.

### **4.3 ENGINEERING CONTROLS**

Engineering Controls will be employed in the remedial action to address residual contamination remaining at the site. The Site has one primary Engineering Control Systems on site area B in addition to the vapor barrier and passive sub-slab depressurization system that will be built as part of construction on site area A. These are described below:

#### **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:

- 2-feet of clean cover soil in the rear courtyard area, which is approximately 2,000 square feet in area. This is planned to be the only area of exposed soil on the Site following construction;
- As part of construction a concrete building slab consisting of a 3.5 foot-thick Mat Slab as the building foundation.

Figure 2 shows the typical design for each remedial cover type used on this Site. Figure 3 shows the location of each cover type built at the Site.

The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

#### **Vapor Barrier**

As part of construction and in order to prevent migration of organic vapors through the building slab into the interior spaces of the building, a vapor barrier will be installed beneath the building foundation and on the outside of the foundation walls. The vapor barrier will consist of:

- A Grace Preprufe® 300R Vapor/Waterproofing membrane consisting of a 46-mil high-density polyethylene (HDPE) sheet with a synthetic adhesive and weather

resistant protective coating beneath the foundation

- A Grace Preprufe® 160R Vapor/**Waterproofing** membrane consisting of a 32-mil HDPE sheet with a synthetic adhesive and weather resistant protective coating for the foundation walls.

Figure 3 shows a diagram that includes the vapor barrier underneath the building foundation at the Site. Specifications from the manufacturer are provided in Appendix 5.

The vapor barrier system is a permanent engineering control for the Site.

### **Sub-slab depressurization**

Migration of soil vapor will be mitigated with the construction of a passive sub-slab depressurization system (SSDS). The SSDS will be installed underneath the slab and will consist of the following:

- An 8” gas-permeable layer of crushed stone beneath the building slab and vapor barrier
- A 4’ by 4’ by 4” SSDS pit in the center of the building footprint
- A 6” cast iron pipe running from the pit under the slab, up through the building, and discharging at the roof through a 6” cast iron pipe

Figure 3 shows a diagram that includes the SSDS underneath the building foundation at the Site. Figures 4 and 5 show the SSDS layout underneath the cellar and on the roof, and Figure 6 shows the SSDS details. A specification for SSDS installation is provided in Appendix 5.

The SSDS is a permanent engineering control for the Site.

## **4.4 INSTITUTIONAL CONTROLS**

Institutional Controls (IC) have been incorporated in this remedial action to manage residual soil/fill and other media on Site Area B and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs will be established in a Declaration of Covenant and Restrictions (DCR) assigned to the property by the

title holder and will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

Institutional Controls for this remedial action are:

- Recording of an OER-approved Declaration of Covenant and Restrictions (DCR) with the City Register or county clerk, as appropriate. The DCR will include a description of all ECs and ICs, will summarize the requirements of the Site Management Plan, and will note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted annually and will comply with RCNY §43-1407(1)(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 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 Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by the DCR and this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the DCR and the Site Management Plan are implemented.

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

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

#### **4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT**

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the BCP 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.

##### **Known and Potential Sources**

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

Soil:

- Metals, including lead and barium, exceeding Track 2 Restricted Commercial SCOs;
- SVOCs exceeding Track 2 Restricted Commercial SCOs;

Groundwater:

- The VOC cis 1,2-dichloroethene found above its GQS;
- The pesticide 4,4-DDT found above its GQS; and

Soil Vapor:

- VOCs detected at low to moderate concentrations, including TCE and PCE.

### **Nature, Extent, Fate and Transport of Contaminants**

Soil: Metals and SVOCs are present throughout the site. Metals of concern were not found in dissolved groundwater samples above GQS, indicating that the property is not contributing to groundwater standard violation.

Groundwater: The RI identified cis 1,2-dichloroethene above its GQS, but cis 1,2-dichloroethene was not detected in any soil samples. The pesticide 4, 4-DDT was identified in 3 of 4 groundwater samples above TOGS 1.1.1 GA standards.

Soil Vapor: TCE and PCE were found in all soil vapor sampling locations, but neither TCE or PCE were found in soil or groundwater above their respective UUSCOs, groundwater protection standards for soil or GQSs. It is suspected that these compounds are derived from an offsite source.

### **Potential Routes of Exposure**

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

comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

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

### **Existence of Human Health Exposure**

*Current Conditions:* As the site is currently capped with asphalt, there are no potential exposure pathways from soil/ fill. 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 by 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, stormwater pollution prevention, and dust controls, employment of a community air monitoring plan, and implementation of a Construction Health and Safety Plan.

*Proposed Future Conditions:* Under future remediated conditions, the site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and engineering controls will prevent potential for inhalation via soil vapor intrusion. 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. 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
5. Schools (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 and remediation phase. During the remedial action, on-site exposure pathways will be eliminated by preventing access to the site, through implementation of soil/materials management, stormwater pollution prevention, and dust controls, employment of a community air monitoring plan, 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 Jesse Mausner, P.G. (project manager). The Professional Engineer (PE) 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 approximate hours for operation of remedial construction will be from 7:30 am to 3:30 pm. These hours conform to the New York City Department of Buildings construction code requirements.

### **5.4 CONSTRUCTION HEALTH AND SAFETY PLAN**

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

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

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

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

## **5.5 COMMUNITY AIR MONITORING PLAN**

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

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

## **VOC Monitoring, Response Levels, and Actions**

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

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

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

## **Particulate Monitoring, Response Levels, and Actions**

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate

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

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

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

## **5.6 AGENCY APPROVALS**

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

## **5.7 SITE PREPARATION**

### **Pre-Construction Meeting**

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

## **Mobilization**

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

## **Utility Marker Layouts, Easement Layouts**

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance 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.

## **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 equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management features will be decided on and managed by the construction manager for the Site.

### **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 BCP 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 BCP 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 will be planned by the construction manager for the Site and reported to OER.

## **5.9 DEMOBILIZATION**

Demobilization will include:

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

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

## **5.10 REPORTING AND RECORD KEEPING**

### **Daily Reports**

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

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

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

## **Record Keeping and Photo-Documentation**

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

### **5.11 COMPLAINT MANAGEMENT**

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

### **5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN**

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

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

### **5.13 DATA USABILITY SUMMARY REPORT**

The primary objective of a Data Usability Summary Report (DUSR) is to determine whether or not data meets the site specific criteria for data quality and data use. The DUSR provides an evaluation of analytical data without third party data validation. The DUSR for post-remedial

samples collected during implementation of this RAWP will be included in the Remedial Action Report (RAR).

## **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 and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Recorded Declaration of Covenants and Restrictions.
- Reports and supporting material will be submitted in digital form.

## **Remedial Action Report Certification**

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

*I, \_\_\_\_\_, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the Site name Site Site number.*

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

## 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 3-4 month remediation period is anticipated.

<b>Schedule Milestone</b>	<b>Weeks from Remedial Action Start</b>	<b>Duration (weeks)</b>
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	2	0
Mobilization	2	2
Remedial Excavation	4	18
Demobilization	100	2
Record Declaration of Covenants and Restrictions	102	2
Submit Remedial Action Report	104	

## Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)

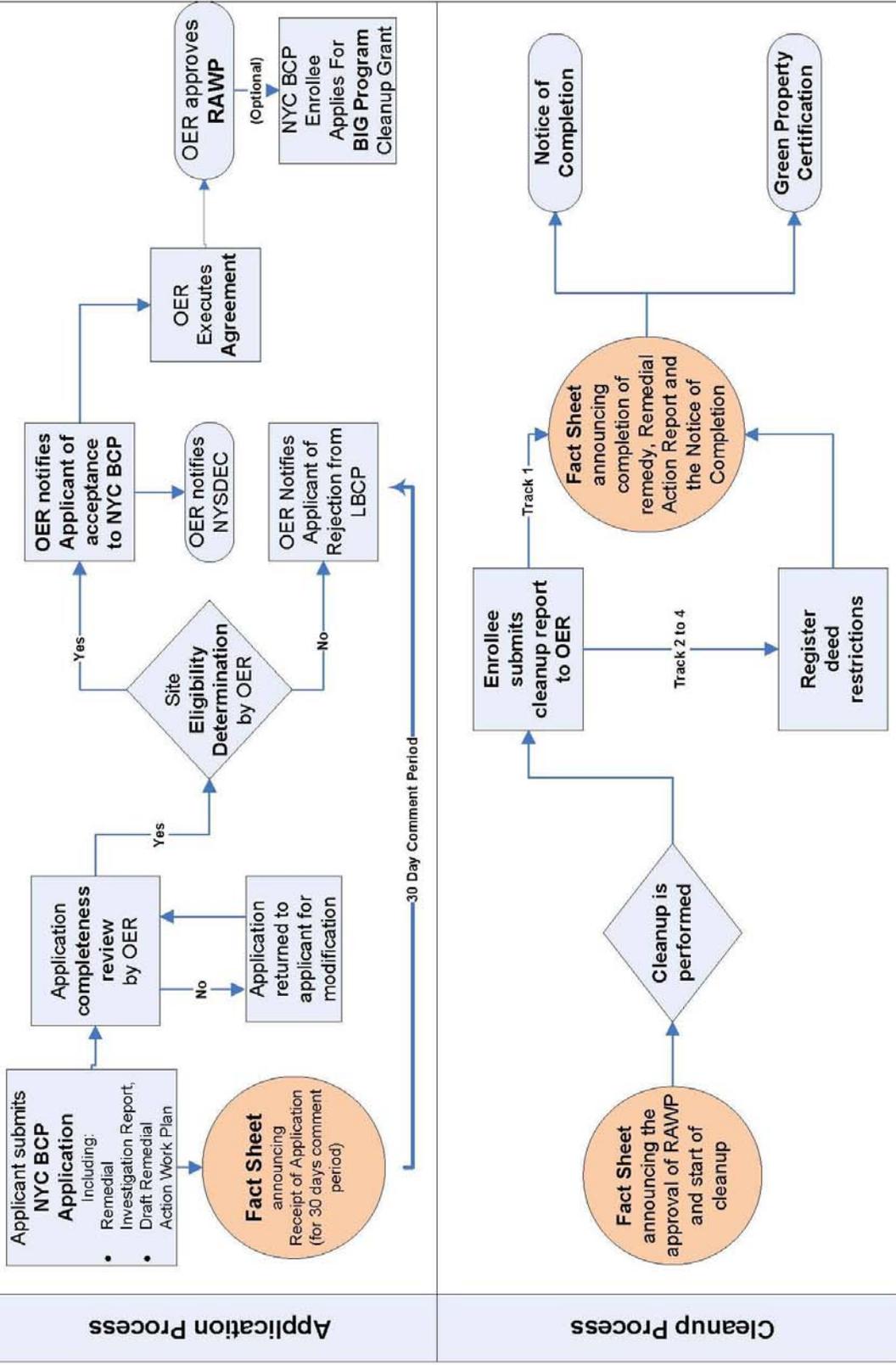


Table 1  
 NYSDEC Part 375-6  
 Soil Cleanup Objectives  
 312 West 37th Street, New York, NY

Units	BCP	
	Commercial	Unrestricted
	Use SCOs (Track 4)	Use SCOs (Track 1)
mg/kg	mg/kg	mg/kg
<b>VOCs</b>		
Acetone		0.05
1,2-Dichlorobenzene	500	1.1
1,3-Dichlorobenzene	280	2.4
1,4-Dichlorobenzene	130	1.8
Benzene	44	0.06
Bromodichloromethane		
Bromoform		
Bromomethane		
2-Butanone (MEK)	500	0.12
Carbon disulfide		
Carbon tetrachloride	22	0.76
Chlorobenzene	500	1.1
Chloroethane		
Chloroform	350	0.37
Chloromethane		
Dibromochloromethane		
1,1-Dichloroethane	240	0.27
1,2-Dichloroethane	30	0.02
1,1-Dichloroethene	500	0.25
cis-1,2-Dichloroethene	500	0.25
trans-1,2-Dichloroethene	500	0.19
1,2-Dichloropropane		
cis-1,3-Dichloropropene		
trans-1,3-Dichloropropene		
Ethylbenzene	390	1
Hexachlorobenzene	6	0.33
2-Hexanone		
4-Methyl-2-pentanone(MIBK)		
Methyl tert-butyl ether (MTBE)	500	0.93
Methylene chloride	500	0.05
n-Propylbenzene	500	3.9
sec-Butylbenzene	500	11
tert-Butylbenzene	500	5.9
Styrene		
1,1,2,2-Tetrachloroethane		
Tetrachloroethene	150	1.3
Toluene	500	0.7
1,1,1-Trichloroethane	500	0.68
1,1,2-Trichloroethane		
1,2,4-Trimethylbenzene	190	3.6
1,3,5-Trimethylbenzene	190	8.4
Trichloroethene	200	0.47
Vinyl chloride	13	0.02
Xylene (total)	500	0.26

\* Site-specific SCO

Units	BCP	
	Commercial	Unrestricted
	Use SCOs (Track 4)	Use SCOs (Track 1)
mg/kg	mg/kg	mg/kg
<b>SVOCs</b>		
2-Chlorophenol		
4-Chloro-3-methyl phenol		
2,4-Dichlorophenol		
2,4-Dimethylphenol		
2,4-Dinitrophenol		
4,6-Dinitro-o-cresol		
2-Methylphenol		
3&4-Methylphenol		
2-Nitrophenol		
4-Nitrophenol		
Pentachlorophenol	6.7	0.8
Phenol	500	0.33
2,4,5-Trichlorophenol		
2,4,6-Trichlorophenol		
Acenaphthene	500	20
Acenaphthylene	500	100
Anthracene	500	100
Benzo(a)anthracene	5.6	1
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	5.6	1
Benzo(g,h,i)perylene	500	100
Benzo(k)fluoranthene	56	0.8
4-Bromophenyl phenyl ether		
Butyl benzyl phthalate		
2-Chloronaphthalene		
4-Chloroaniline		
Carbazole		
Chrysene	56	1
bis(2-Chloroethoxy)methane		
bis(2-Chloroethyl)ether		
bis(2-Chloroisopropyl)ether		
4-Chlorophenyl phenyl ether		
1,2-Dichlorobenzene		
1,3-Dichlorobenzene		
1,4-Dichlorobenzene		
2,4-Dinitrotoluene		
2,6-Dinitrotoluene		
3,3'-Dichlorobenzidine		
Dibenzo(a,h)anthracene	0.56	0.33
Dibenzofuran		
Di-n-butyl phthalate		
Di-n-octyl phthalate		
Diethyl phthalate		
Dimethyl phthalate		
bis(2-Ethylhexyl)phthalate		
Fluoranthene	500	100
Fluorene	500	30
Hexachlorobenzene		
Hexachlorobutadiene		
Hexachlorocyclopentadiene		
Hexachloroethane		
Indeno(1,2,3-cd)pyrene	5.6	0.5
Isophorone		
2-Methylnaphthalene		
2-Nitroaniline		
3-Nitroaniline		
4-Nitroaniline		
Naphthalene		12
Nitrobenzene		
N-Nitroso-di-n-propylamine		
N-Nitrosodiphenylamine		
m-Cresol	500	0.33
o-Cresol	500	0.33
p-Cresol	500	0.33
Phenanthrene	500	100
Pyrene	500	100
1,2,4-Trichlorobenzene		
<b>Total SVOCs</b>	<b>250*</b>	<b>250*</b>

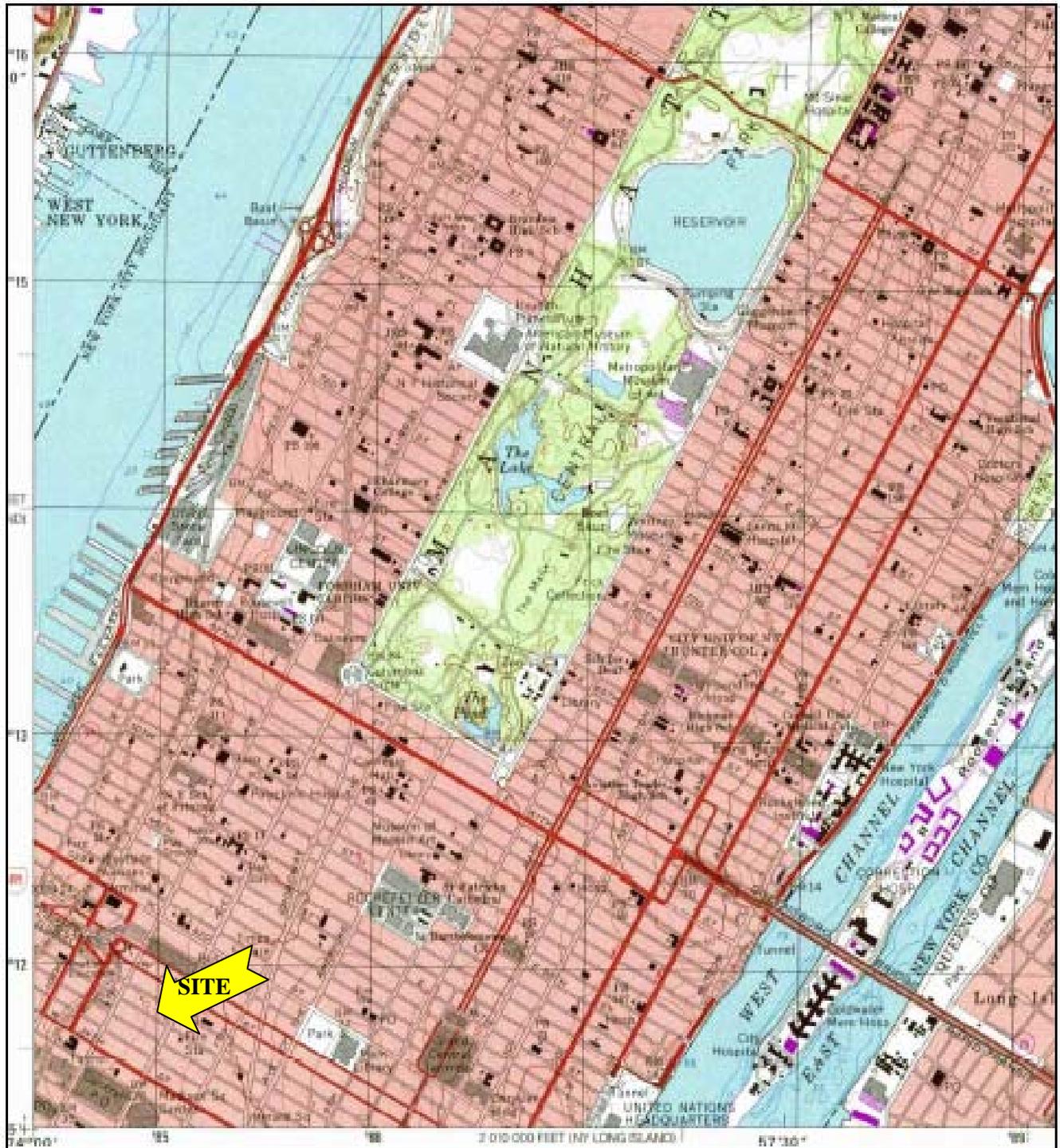
Table 1  
 NYSDEC Part 375-6  
 Soil Cleanup Objectives  
 312 West 37th Street, New York, NY

	BCP	
	Commercial	Unrestricted
	Use SCOs (Track 4)	Use SCOs (Track 1)
Units	mg/kg	mg/kg
<b>Pesticides</b>		
2,4,5-TP Acid (Silvex)	500	3.8
Aldrin		
alpha-BHC	3.4	0.097
beta-BHC	3	0.036
delta-BHC	500	0.04
gamma-BHC (Lindane)	9.2	0.1
alpha-Chlordane	24	0.094
gamma-Chlordane		
Dieldrin	1.4	0.0005
4,4'-DDD	92	0.0033
4,4'-DDE	62	0.0033
4,4'-DDT	47	0.0033
Endrin	89	0.014
Endosulfan sulfate	200	2.4
Endrin aldehyde		
Endosulfan-I	200	2.4
Endosulfan-II	200	2.4
Heptachlor	15	0.042
Heptachlor epoxide		
Methoxychlor		
Endrin ketone		
Toxaphene		

	BCP	
	Commercial	Unrestricted
	Use SCOs (Track 4)	Use SCOs (Track 1)
Units	mg/kg	mg/kg
<b>Metals</b>		
Aluminum		
Antimony		
Arsenic	16	13
Barium	750*	350
Beryllium	590	7.2
Cadmium	9.3	2.5
Calcium		
Chromium, hexavalent	400	1
Chromium, trivalent	1500	30
Cobalt		
Copper		
Iron		
Lead	1000	63
Magnesium		
Manganese	10000	1600
Mercury	2.8	0.18 (total Hg)
Nickel	310	30
Potassium		
Selenium	1500	3.9
Silver	1500	2
Sodium		
Thallium		
Vanadium		
Zinc	10000	109

\* Site-specific SCO

	BCP	
	Commercial	Unrestricted
	Use SCOs (Track 4)	Use SCOs (Track 1)
Units	mg/kg	mg/kg
<b>PCBs</b>		
Aroclor 1016	1	0.1
Aroclor 1221	1	0.1
Aroclor 1232	1	0.1
Aroclor 1242	1	0.1
Aroclor 1248	1	0.1
Aroclor 1254	1	0.1
Aroclor 1260	1	0.1



**FIGURE 1: Site Location Map**

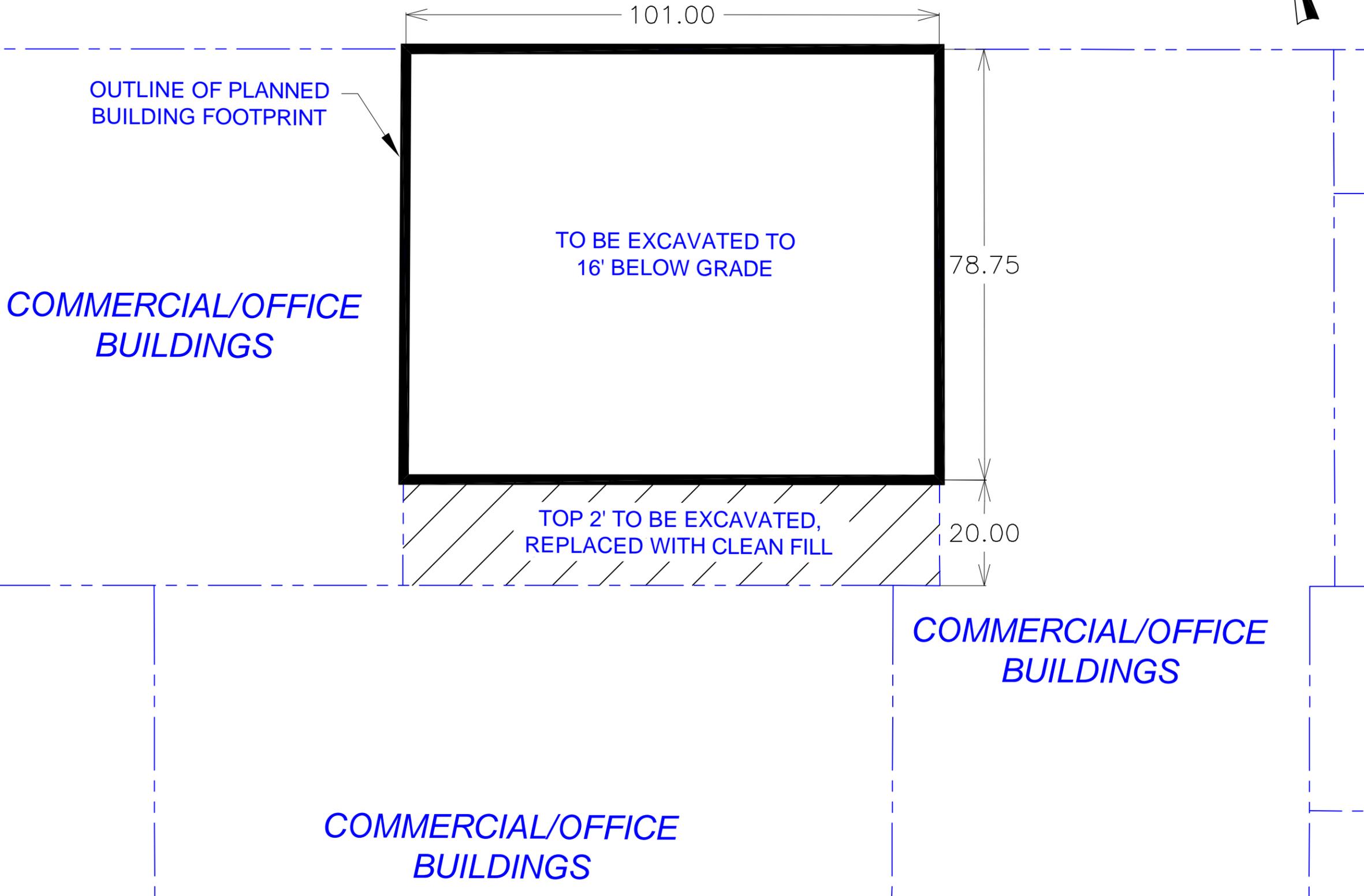
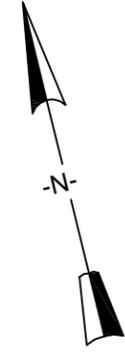
**SITE:** 312 West 37<sup>th</sup> Street  
 Block 760, Lot 51  
 New York, New York

**FLS Project No.** 10173-001



FILE: P:\Project Files\10173 - Albanese Development Corp\001 - West 37th Street\Figures\FIG 2 Site Excavation Plan.dwg DATE: 11/16/2011

# WEST 37 ST



*Environmental Management & Consulting*  
158 West 29 Street, 9th Fl.  
New York, NY 10001

312 WEST 37th STREET  
NEW YORK, NY

**FIGURE 2**

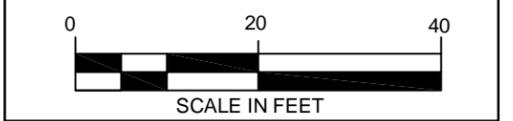
**SITE  
EXCAVATION  
PLAN**

Date  
**November 16, 2011**

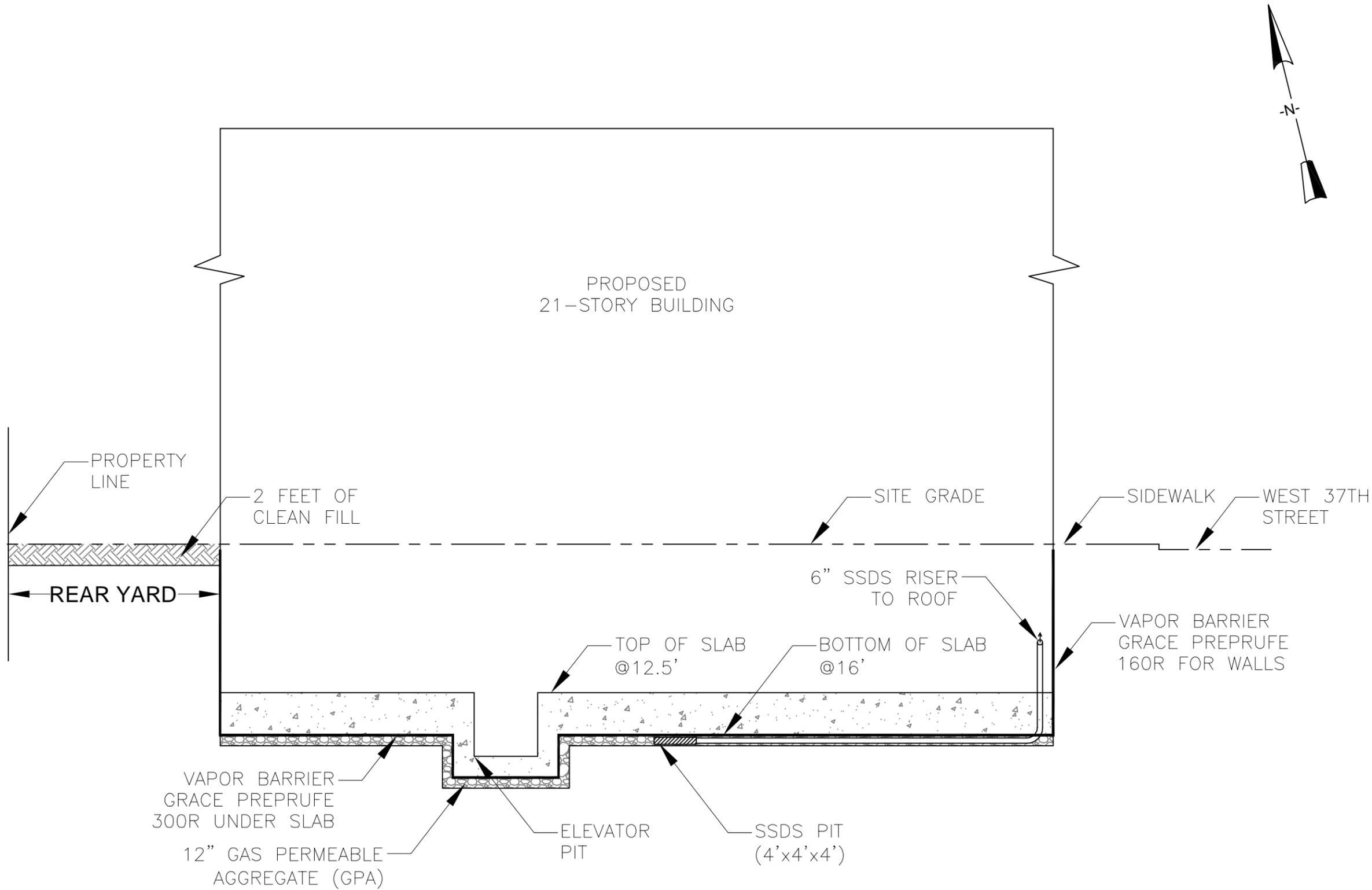
Project Number  
**10173-001**

### LEGEND

 PROPOSED REAR YARD



FILE: P:\Project Files\10173 - Albonese Development Corp\001 - West 37th Street\Figures\Fig 3 Excavation Cross Section.dwg DATE: 11/22/2011



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

312 WEST 37th STREET  
NEW YORK, NY

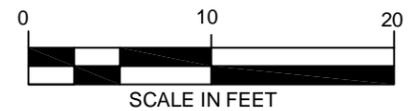
**FIGURE 3**

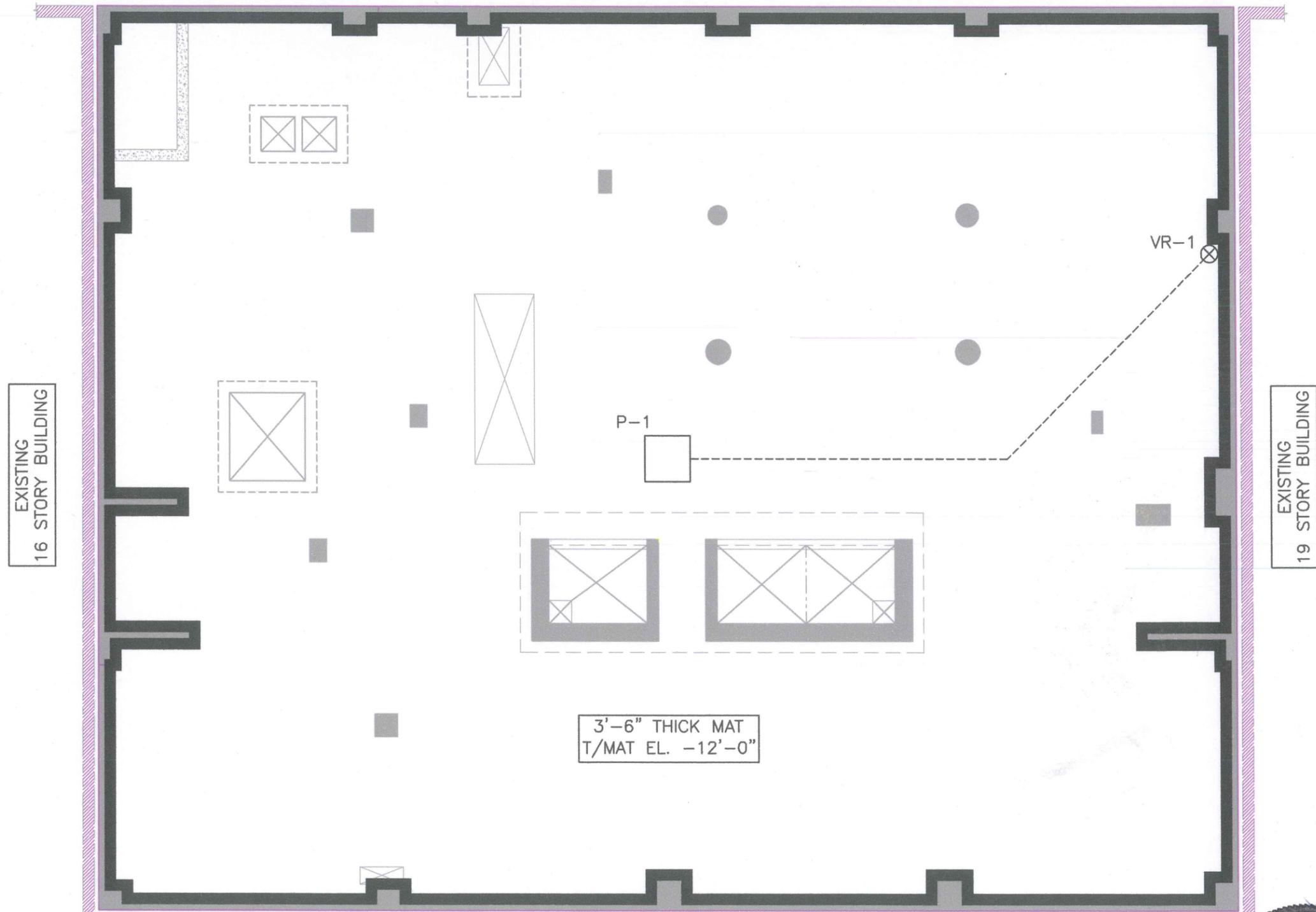
# EXCAVATION CROSS SECTION

Date  
**November 22, 2011**

Project Number  
**10173-001**

## LEGEND





EXISTING  
16 STORY BUILDING

EXISTING  
19 STORY BUILDING

3'-6" THICK MAT  
T/MAT EL. -12'-0"

**NOTES:**

1. DRAWING NOT TO BE USED FOR STRUCTURAL, ARCHITECTURAL, OR OTHER REFERENCE EXCEPT FOR SUB-SLAB DEPRESSURIZATION SYSTEM.
2. THE EXTENTS OF THE BUILDING CONSTRUCTION BENEATH THE FLOOR SLABS SHALL BE LINED WITH GAS VAPOR BARRIER. AS PART OF THE BUILDING CONSTRUCTION, THE GAS VAPOR BARRIER SHALL ALSO BE APPLIED VERTICALLY TO BELOW GRADE WALLS AND WALLS OF PITS AND SUMPS.
3. SLOPE HORIZONTAL PIPE A MINIMUM OF 1% UNIFORMLY TOWARDS SUB-SLAB DEPRESSURIZATION SYSTEM PIT OR TO CONDENSATION DRAINS WHEN PIPING CANNOT BE SLOPED TO PIT.
4. REFER TO SPECIFICATION SECTION "SUB-SLAB DEPRESSURIZATION SYSTEM" FOR ADDITIONAL REQUIREMENTS.



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New York, NY 10001

West 37th Street  
New York, NY

**FIGURE 4**

**SSDS LAYOUT  
CELLAR FLOOR  
PLAN**

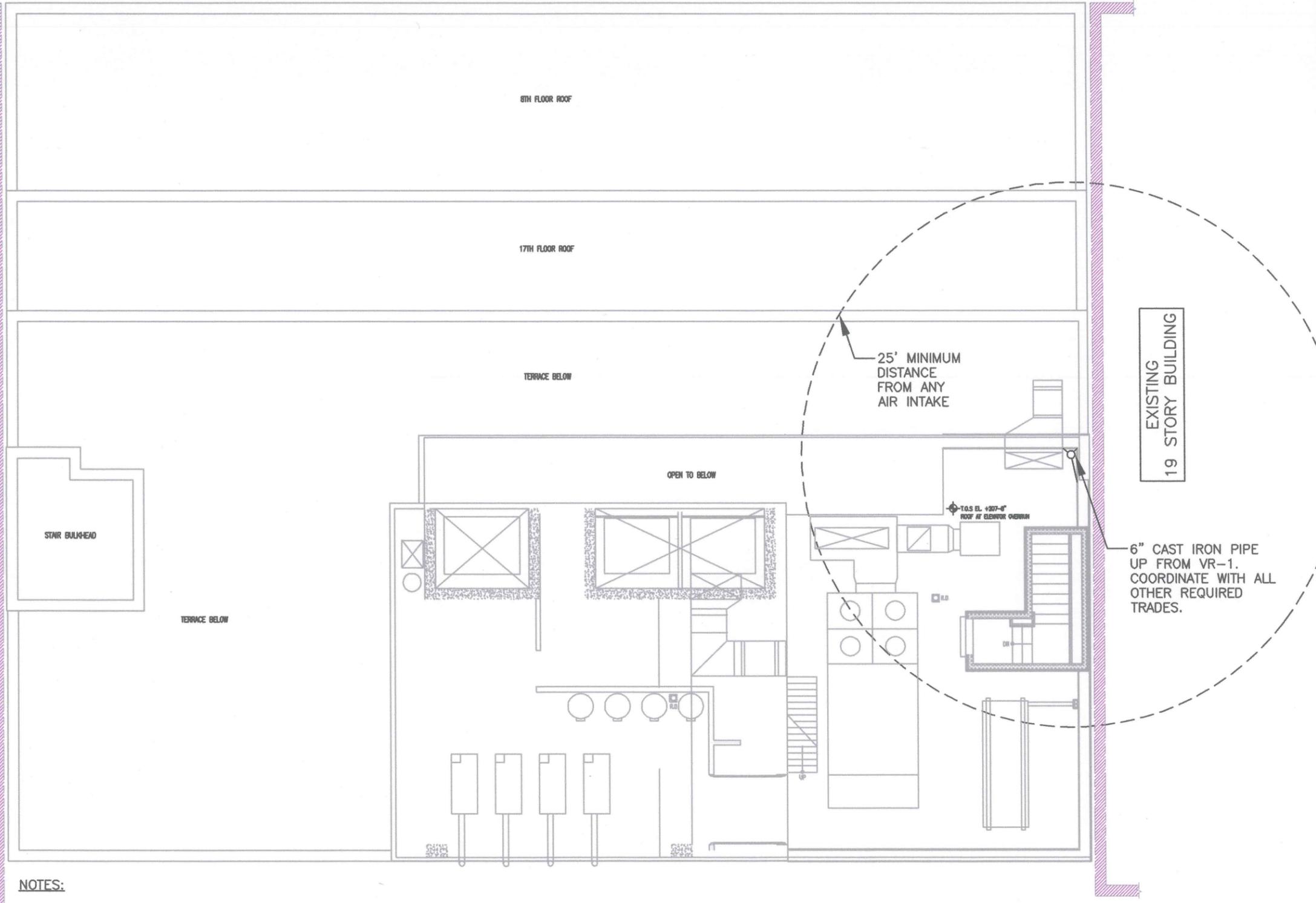
Date  
November 21, 2011

Project Number  
10173-001-3

**LEGEND**

- 6" DIAMETER CAST IRON PIPE BENEATH SLAB
- VR-1 ⊗ VERTICAL RISER EXTEND THROUGH ROOF
- P-1 □ SUB-SLAB DEPRESSURIZATION PIT
- EXTENT OF GAS VAPOR BARRIER UNDERNEATH THE SLAB & ALONG THE WALLS AND MINIMUM 12-INCH THICK CONTINUOUS GAS PERMEABLE AGGREGATE LAYER

EXISTING  
16 STORY BUILDING



**NOTES:**

1. CAST IRON SHALL BE 6" DIAMETER AS INDICATED ON THE DRAWINGS.
2. CONTRACTOR TO VERIFY THAT VENT STACK EXHAUST LOCATION IS A DISTANCE OF 25 FEET OR MORE FROM ANY FRESH AIR INTAKES OR OPERABLE WINDOWS (INCLUDING THOSE ON ADJOINING PROPERTIES). FINAL LOCATION AND HEIGHT OF VENT STACKS SHALL BE IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.
3. VENT STACK SHALL BE SECURELY ANCHORED WITH ADEQUATE STRUCTURAL SUPPORTS.
4. IF A CONFLICT ARISES BETWEEN THE SSDS PIPING AND STRUCTURAL, ARCHITECTURAL, OR MEP ELEMENTS OF THE BUILDING, THE SSDS PIPING CAN BE REALIGNED (HORIZONTALLY OR VERTICALLY) AS NECESSARY TO AVOID THE CONFLICT. SUBMIT SHOP DRAWING FOR APPROVAL PRIOR TO INSTALLATION.
5. CONTRACTOR TO COORDINATE INSTALLATION OF SSDS ROOF PENETRATION PRIOR TO WATERPROOFING OF THE ROOF.
6. SEE ARCHITECTURAL PLANS AND SPECS FOR WATERPROOFING INSTALLATION DETAILS.



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New York, NY 10001

West 37th Street  
New York, NY

**FIGURE 5**

**SSDS LAYOUT  
ROOF PLAN  
(21ST FLOOR)**

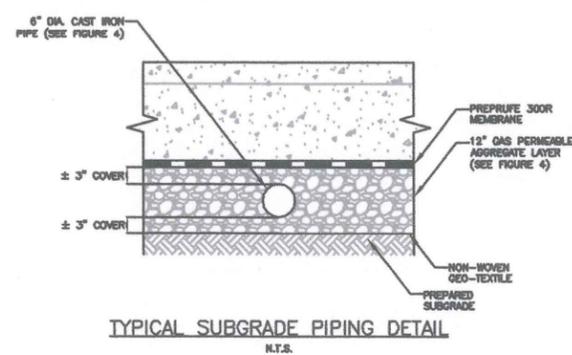
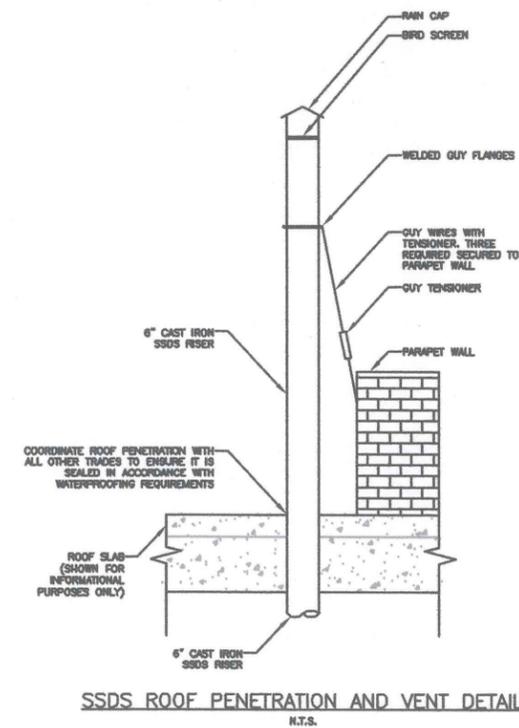
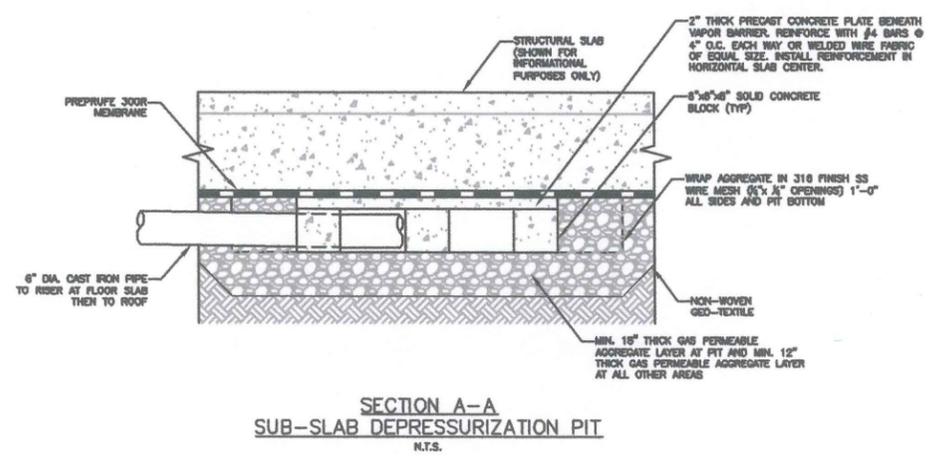
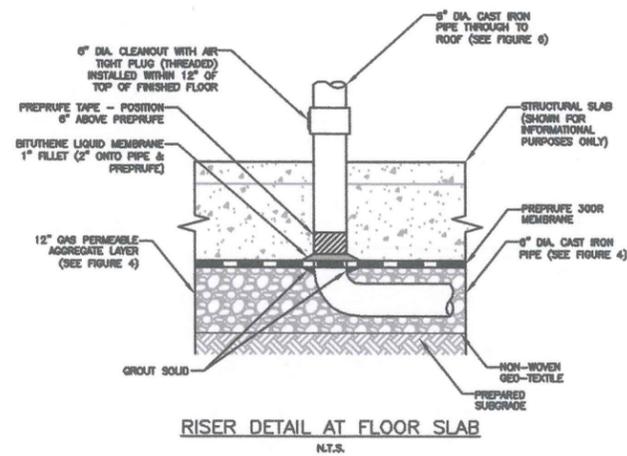
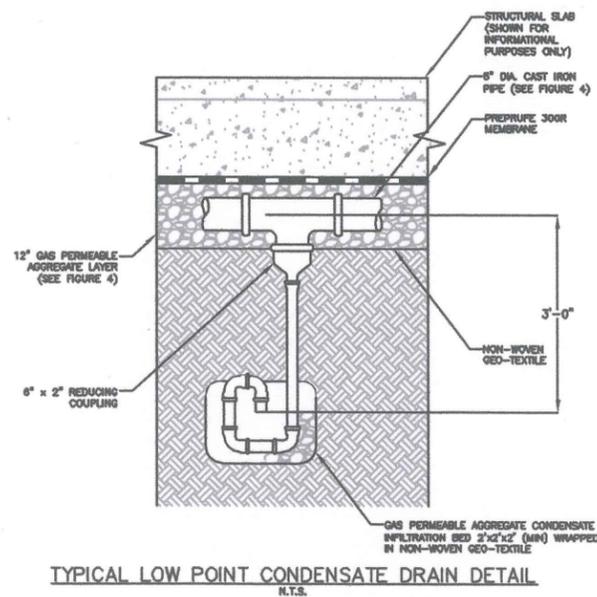
Date  
**November 21, 2011**

Project Number  
**10173-001-3**

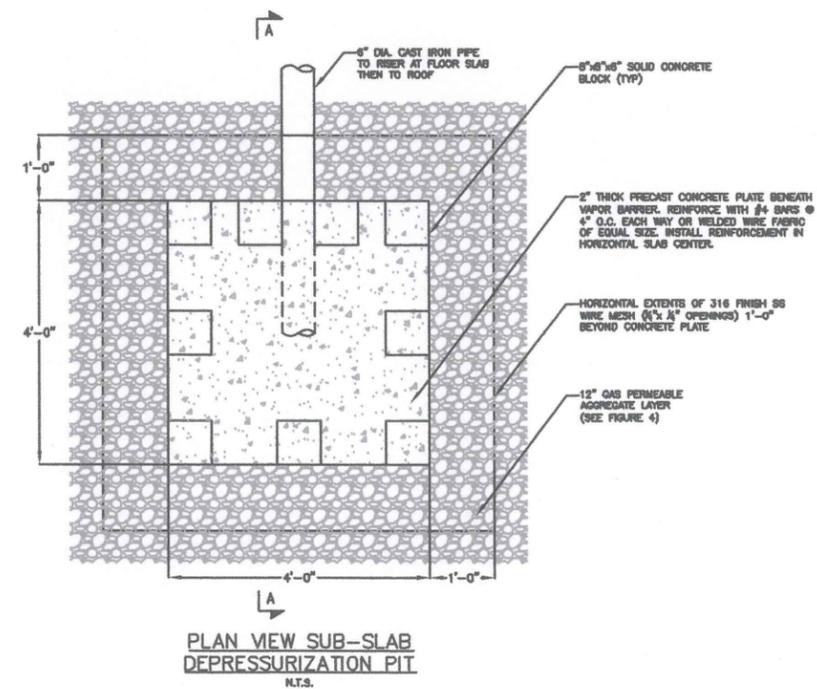
**LEGEND**



FILE: P:\Project Files\10173 - Albanese Development Corp\001 - West 37th Street\SSDS\Fig 6 - SSDS Details.dwg DATE: 12/5/2011



- NOTES:
1. CAST IRON SHALL BE 6" DIAMETER AS INDICATED ON THE DRAWINGS.
  2. CONTRACTOR TO VERIFY THAT VENT STACK EXHAUST LOCATION IS A DISTANCE OF 25 FEET OR MORE FROM ANY FRESH AIR INTAKES OR OPERABLE WINDOWS (INCLUDING THOSE ON ADJOINING PROPERTIES). FINAL LOCATION AND HEIGHT OF VENT STACKS SHALL BE IN ACCORDANCE WITH NEW YORK CITY BUILDING CODE.
  3. VENT STACK SHALL BE SECURELY ANCHORED WITH ADEQUATE STRUCTURAL SUPPORTS, SEE DETAIL ON THIS SHEET.
  4. IF A CONFLICT ARISES BETWEEN THE SSDS PIPING AND STRUCTURAL, ARCHITECTURAL OR MEP ELEMENTS OF THE BUILDING, THE SSDS PIPING CAN BE REALIGNED (HORIZONTALLY OR VERTICALLY) AS NECESSARY TO AVOID THE CONFLICT. SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO INSTALLATION.
  5. CONTRACTOR TO COORDINATE INSTALLATION OF SSDS ROOF PENETRATION PRIOR TO WATERPROOFING OF THE ROOF.
  6. SEE ARCHITECTURAL PLANS AND SPECS FOR WATERPROOFING INSTALLATION DETAILS.



Environmental Management & Consulting

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

West 37th Street  
New York, NY

FIGURE 6

# SSDS DETAILS

Date  
November 21, 2011

Project Number  
10173-001-3



# APPENDIX 1

## CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and West 37<sup>th</sup> Street Partners LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Brownfield 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 BCP, West 37<sup>th</sup> Street Partners LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Hannah Moore, 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](mailto: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 37<sup>th</sup> Street Partners, LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

New York Public Library  
455 5<sup>th</sup> Avenue  
New York, NY 10016  
212-930-0800

**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 37<sup>th</sup> Street Partners, LLC, reviewed and approved by OER prior to distribution and mailed by West 37<sup>th</sup> Street Partners, LLC. Public comment is solicited in public notices for all work plans developed under the NYC Brownfield 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 BCP project. See flow chart on the following page, which identifies when during the NYC BCP public notices are issued: These steps include:

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

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

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

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

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

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

## **APPENDIX 2**

### **SUSTAINABILITY STATEMENT**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Paperless Brownfield Cleanup Program.** West 37<sup>th</sup> Street Partners LLC is participating in OER's Paperless Brownfield Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

**Low-Energy Project Management Program.** West 37<sup>th</sup> Street Partners LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

**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.

## **APPENDIX 3**

### **SOIL/MATERIALS MANAGEMENT PLAN**

#### **1.1 SOIL SCREENING METHODS**

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

#### **1.2 STOCKPILE METHODS**

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

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

#### **1.3 CHARACTERIZATION OF EXCAVATED MATERIALS**

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

## **1.4 MATERIALS EXCAVATION, LOAD-OUT AND DEPARTURE**

The PE/QEP overseeing the remedial action will:

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

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

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

## **1.5 OFF-SITE MATERIALS TRANSPORT**

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

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

## **1.6 MATERIALS DISPOSAL OFF-SITE**

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

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

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

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

### **1.7 MATERIALS REUSE ON-SITE**

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC BCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed. No material is expected to be reused onsite.

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

### **1.8 DEMARCATION**

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

remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

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

## **1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES**

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. The backfill and cover soil quality objectives are listed in Table 1.

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

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

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

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

## **Source Screening and Testing**

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

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

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

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

### **1.10 FLUIDS MANAGEMENT**

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the

groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

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

### **1.11 STORM-WATER POLLUTION PREVENTION**

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

### **1.12 CONTINGENCY PLAN**

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

Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

### **1.13 ODOR, DUST AND NUISANCE CONTROL**

#### **Odor Control**

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

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

#### **Dust Control**

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

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

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and

corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

### **Other Nuisances**

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

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

## **APPENDIX 4**

# **CONSTRUCTION HEALTH AND SAFETY PLAN**

**312 West 37<sup>th</sup> Street Site**  
New York, New York  
Block 292, Lots 15 and 16

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# **CONSTRUCTION HEALTH AND SAFETY PLAN**

**Prepared For:**  
Albanese Development  
1050 Franklin Avenue  
Garden City, NY  
**FLS Project Number: 10173**

**Submitted to:**  
New York City Office of Environmental Remediation  
E-Designation Program  
c/o Dan Cole, Bureau Chief  
100 Gold Street, 2nd Floor  
New York, NY 10038

*Fleming  
Lee Shue*

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

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**NOVEMBER 2011**

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**Construction Health and Safety Plan  
312 West 37<sup>th</sup> Street Site  
New York, New York**

**1.0 INTRODUCTION**

Fleming-Lee Shue, Inc. (FLS) prepared this Construction Health and Safety Plan (CHASP) on behalf of Albanese Development for use and implementation by FLS employees providing environmental oversight and their representatives during construction of the proposed structure at the 312 West 37<sup>th</sup> Street Site (the Site) in New York, New York (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.

**Construction Health and Safety Plan  
312 West 37<sup>th</sup> Street Site  
New York, New York**

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 proposed future use of the Site will consist of a 21-story hotel building with a basement, which will cover 4/5 (8,000 sf) of the lot. A 2,000-sf courtyard will remain in the rear portion of the lot. The current zoning designation is C6-4M, a central high-density commercial district. The proposed use is consistent with existing zoning for the property. The first floor will contain the hotel lobby, and the basement will contain a gym and meeting rooms for guests, and a break room and offices for the hotel staff. The foundation excavation will extend to 16 feet below grade across the building footprint, with one central spot extending to 19 feet below grade associated with an elevator pit. Excavation is not anticipated to extend below the water table at 20 feet below grade.

## **1.2 Site Description and Previous Investigation Results**

### ***1.2.1 Site Description***

The Site is located at 312 37<sup>th</sup> Street in New York, New York. The tax map number designation is Block 760, Lot 51. The Site is currently a parking lot. Tenement buildings occupied the site in the early 20<sup>th</sup> century. No building has existed on the site since at least the 1950s. A small gasoline station operated onsite in the 1940s to the early 1950s. Two 550-gallon USTs were identified during a geophysical survey performed at the site in early 2011.

### ***1.2.2 Previous Site Investigation Results***

A Phase I Environmental Site Assessment was conducted by FLS in April 2011. FLS determined that historic usage of the site included a gasoline filling station containing

**Construction Health and Safety Plan  
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New York, New York**

two gasoline USTs. The tanks, fill lines and fill ports have been abandoned and are still present onsite, but their condition is unknown. A geophysical survey identified the presumed location of the USTs. The presence of the tanks was considered to represent a recognized environmental condition.

1. Elevation of the property is approximately 38 feet above mean sea level.
2. Depth to groundwater is approximately 20 feet at the Site.
3. Groundwater flow is generally from east to west beneath the Site.
4. Depth to bedrock is approximately 35 feet at the Site.
5. Soil stratigraphy encountered at the site included a surficial fill layer consisting of topsoil, sand, brick fragments, and concrete fragments ranging in thickness from 5 to 11 feet across the site. This fill layer is underlain by a clay confining layer ranging in thickness from 2 to 4 feet, beneath which is fine-medium sand with some coarse sand and gravel that extends to 20 feet below grade.
6. Soil/fill samples collected during the RI showed no volatile organic compounds (VOCs) exceeding NYSDEC Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (UUSCOs). Several VOCs in some samples, including PCE and TCE, were identified but at extremely low levels (typically below 4 ug/kg). Five semi-volatile organic compounds (SVOCs) in three shallow soil samples and in one deep sample exceed UUSCOs. Of these, only one SVOC exceeded Track 2 Restricted CommercialSCOs (RCSCOs) in three samples. The SVOCs identified are polycyclic aromatic hydrocarbon compounds (PAH) and are observed at relatively low concentrations. Several metals including lead, mercury, barium, zinc and copper exceed UUSCOs in shallow soil and one deep soil sample. Of these, only barium (3 samples) and lead (3 samples) exceeded Track 2 RCSCOs. Overall, the occurrence of PAHs and metals is consistent with findings during the collection of soil samples and suggests that historical fill is responsible for the observed low to moderate levels of contamination. One PCB exceeds UUSCOs in two shallow samples, and two pesticides exceed UUSCOs in one shallow and one deep sample. No PCBs or pesticides exceed Track 2 RCSCOs in any sample onsite. No contaminant source areas were identified during this remedial investigation.
7. Groundwater samples collected during the RI showed no SVOCs or pesticides exceeding New York State 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). One pesticide exceeded GQS in three samples. One VOC (cis 1,2-dichloroethene) marginally exceeding GQS in one groundwater sample. PCE and TCE were identified in groundwater samples at low concentrations below GQS. Several metals exceeded GWS in dissolved samples, including magnesium (one sample), manganese (4 samples), sodium (4 samples), and selenium (2 samples). Metals findings indicate that there is likely minor to moderate saline intrusion in local groundwater but no metals contamination source onsite. While some VOCs were identified at low levels in groundwater, none of these compounds

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were identified in onsite soils above corresponding groundwater protection standards in 6NYCRR Part 375-6.8.

8. Soil vapor samples collected during the RI showed numerous VOCs detected at generally low to moderate concentrations, including three compounds listed in the NYSDOH Final Guidance on Soil Vapor Intrusion (October 2006) Decision Matrices. These include TCE and PCE which were identified in all soil vapor samples and range from 7-12 ug/m<sup>3</sup> and 46-176 ug/m<sup>3</sup>, respectively.

## **2.0 POTENTIAL CHEMICAL AND PHYSICAL HAZARDS**

### **2.1 *Potential Chemical Hazards***

This CHASP focuses on the following chemicals of concern:

- SVOCs
  - PAHs
- Metals
  - Lead
  - Barium
  - Copper
  - Mercury
  - Zinc
- Pesticides
  - 4,4'-DDT

Attachment II lists the exposure limits, physical and chemical properties, recommended protection levels and symptoms of exposure to the chemicals known to be present at the site. 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 scaffolds, confined spaces and other construction equipment are addressed in Sections 3.11 and 4.2 of this CHASP. A discussion of heat stress and cold stress and related illnesses is provided in Attachment III.

### **2.3 *Biological Hazards***

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

- Bites from animals, rats (and other rodents) that can lead to a serious infection,
- Exposure to bacteria transmitted by rodents (particularly rats) via their urine or mucous secretions, resulting in fever, and

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- Bites or stings from insects resulting in skin inflammation, disease, or allergic response.

### **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, with a contingency to upgrade to Level C protection if total organic compound concentrations in the breathing zone consistently reach or exceed 5 parts per million (ppm) as measured with a photoionization detector (PID). If PID readings in the breathing zone consistently reach or exceed 25 ppm, work will be stopped and the Site HSO and Project Manager contacted. 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;

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- 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.

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**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):

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- 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. 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;

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- 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.

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- 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.

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- 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 regarding 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.

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**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. A PID (to monitor total volatile organic concentrations) will be used to measure worker breathing zone ambient on-site concentrations during on-site activities. The equipment will be calibrated daily and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book.

The following response actions will be taken based on PID readings in the breathing zone. All work will be performed in level D PPE unless breathing zone volatile organic concentrations exceed 5 ppm. Once sustained levels of 5 ppm are measured, work will be stopped.

PARAMETER	INSTRUMENT	PID READING	ACTION LEVELS/RESPONSE
Volatile organics	Photoionization detector (PID)	> 5 ppm	Temporarily halt work activities and monitor until readings decrease to below 5ppm.
		>5ppm - <25ppm	Halt work activities, upgrade to Level C; continue monitoring
		>25ppm	Shut down work activities

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/m<sup>3</sup>

Range: 0.001 to 10 mg/m<sup>3</sup>

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/m<sup>3</sup> over the integrated period not to exceed 15 minutes.

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## **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 wash of hands and face.

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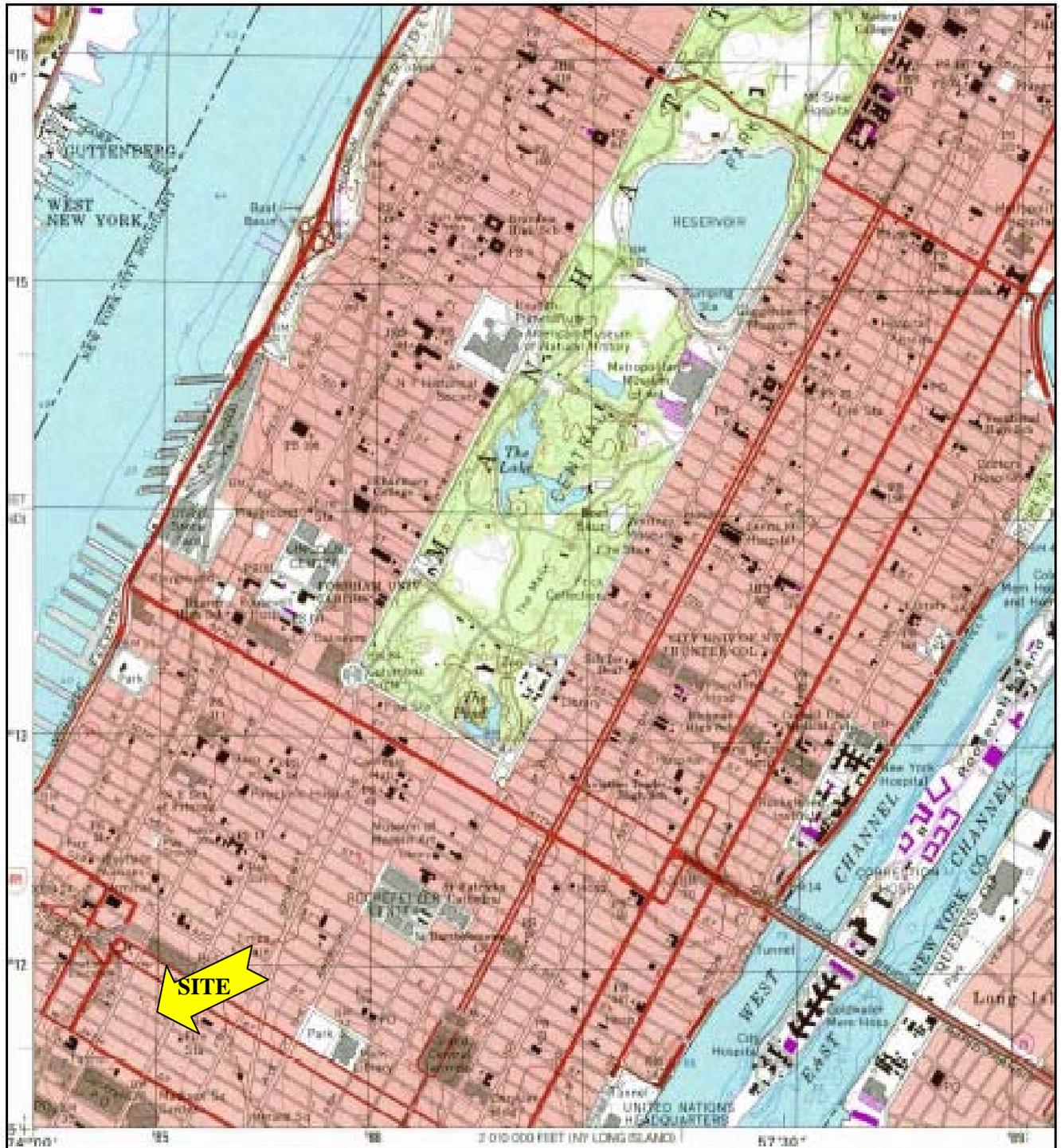
**7.0 EMERGENCY AND CONTINGENCY PLAN**

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).

**FIGURE 1**  
**Site Location Map**



**FIGURE 1: Site Location Map**

**SITE:** 312 West 37<sup>th</sup> Street  
 Block 760, Lot 51  
 New York, New York

**FLS Project No.** 10173-001



**FIGURE 2**  
**Route to the Hospital**



**Trip to:**

St Vincents Midtown Hospital

415 W 51st St

New York, NY 10019

(212) 459-8000

**1.28 miles**

**4 minutes**

Notes

**To investors who want to retire comfortably.**

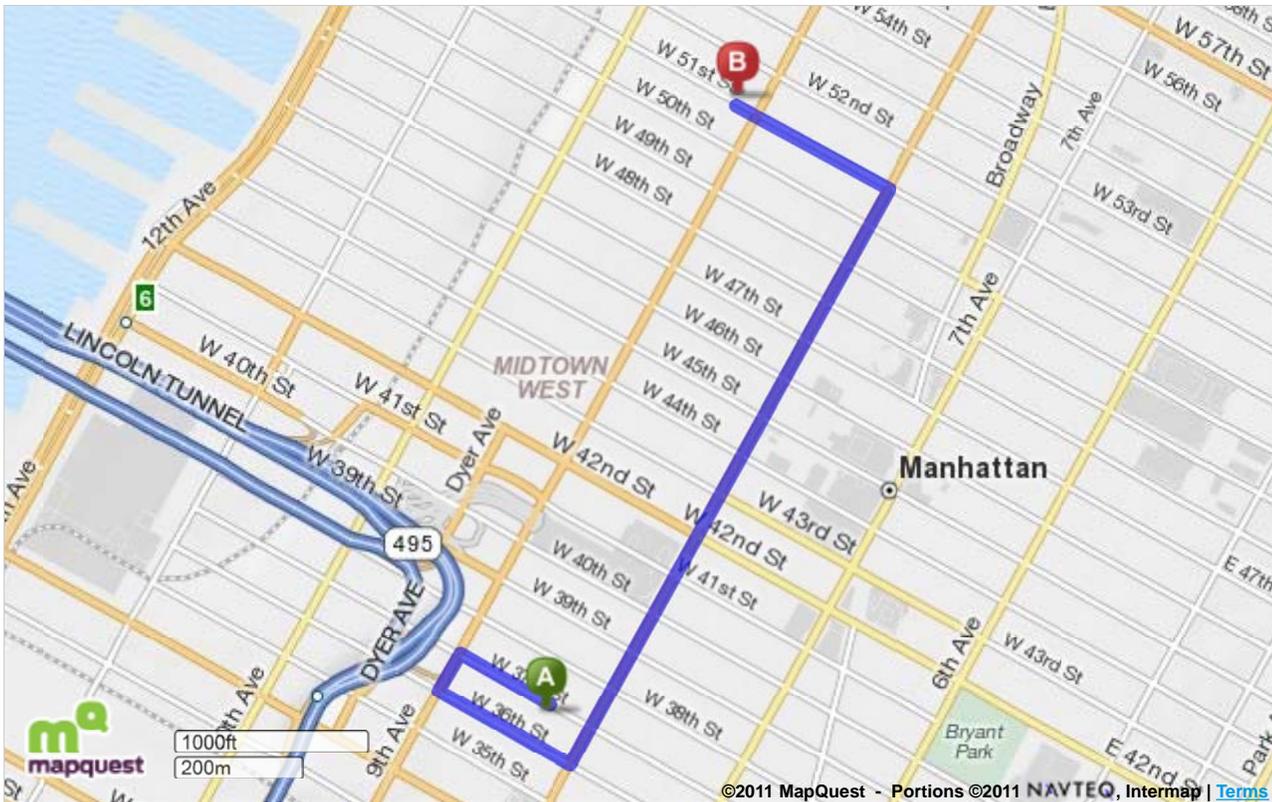
If you have a \$500,000 portfolio, download the guide written by *Forbes* columnist and money manager Ken Fisher's firm. It's called "**The 15-Minute Retirement Plan.**" Even if you have something else in place right now, it *still* makes sense to request your guide!

[Click Here to Download Your Guide!](#)

Fisher Investments

	<b>312 W 37th St</b> New York, NY 10018-4208	<b>Miles Per Section</b>	<b>Miles Driven</b>
	1. Start out going <b>northwest</b> on <b>W 37th St</b> toward <b>9th Ave.</b>	<b>Go 0.1 Mi</b>	0.1 mi
	2. Take the 1st <b>left</b> onto <b>9th Ave.</b> <i>T S Ma Restaurant is on the corner</i> <i>If you reach 10th Ave you've gone about 0.1 miles too far</i>	<b>Go 0.05 Mi</b>	0.2 mi
	3. Turn <b>left</b> onto <b>W 36th St.</b> <i>Thai Select is on the corner</i> <i>If you reach W 35th St you've gone a little too far</i>	<b>Go 0.2 Mi</b>	0.3 mi
	4. Take the 1st <b>left</b> onto <b>8th Ave.</b> <i>If you reach 7th Ave you've gone about 0.1 miles too far</i>	<b>Go 0.7 Mi</b>	1.1 mi
	5. Turn <b>left</b> onto <b>W 51st St.</b> <i>W 51st St is just past W 50th St</i> <i>House of Brews is on the left</i> <i>If you reach W 52nd St you've gone a little too far</i>	<b>Go 0.2 Mi</b>	1.3 mi
	6. <b>415 W 51ST ST</b> is on the <b>right.</b> <i>Your destination is just past 9th Ave</i> <i>If you reach 10th Ave you've gone about 0.1 miles too far</i>		1.3 mi
	<b>St Vincents Midtown Hospital</b> 415 W 51st St, New York, NY 10019 (212) 459-8000	<b>1.3 mi</b>	<b>1.3 mi</b>

Total Travel Estimate: **1.28 miles - about 4 minutes**



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\$32 for a Wine-Tasting Course at Abigail's Cafe (\$65... on Fort Greene-Clinton Hill Patch

**Get the Deal!**

**TABLE 1**  
**Project Team Organization**

**TABLE 1**  
**Project Team Organization**

**PERSONNEL**

Mr. Arnold Fleming, P.E.  
Mr. Matthew Frankenberry  
Mr. Jesse Mausner, P.G.  
Mr. Bill Maniquez  
Mr. David Grunat

**RESPONSIBILITIES**

President, FLS  
Client Representative/Site  
Manager  
Senior Geologist/Project  
Manager  
Professional III/HSO  
(alternate)  
Professional III/HSO  
(alternate)

**TABLE 2**  
**Emergency Contacts and Phone Numbers**

**TABLE 2**  
**Emergency Contacts and Phone Numbers**

<b>Company</b>	<b>Individual Name</b>	<b>Title</b>	<b>Contact Number</b>
FLS	Arnold Fleming	Project Director	212-675-3225 (office)
FLS	Jesse Mausner	Project Manager/HSO	212-675-3225 (office)
FLS	Bill Maniquez	Field Supervisor	212-675-3225 (office) 646-584-2319 (cell)
FLS	Dave Grunat	HSO (an alternate)	212-675-3225 (office) 646-841-3100 (cell)
Albanese Org.	Matt Frankenberry	Site Contact	516-746-6000 (office)
<b>Police/Fire Department</b>			<b>911</b>

**ATTACHMENT I**  
**Acknowledgment Form**



**ATTACHMENT II**  
**Profiles of Chemicals of Concern**  
**Material Safety Data Sheets**

## Health Hazards for Contaminants of Concern

Contaminant	Recognized and Suspected Health Hazards
PAHs	<b>Suspected</b> carcinogen; cardiovascular or blood toxicant; gastrointestinal or liver toxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Calcium	<b>Suspected</b> carcinogen; cardiovascular or blood toxicant; endocrine toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant
Copper	<b>Suspected</b> cardiovascular or blood toxicant; developmental toxicant; gastrointestinal or liver toxicant; kidney toxicant; reproductive toxicant; respiratory toxicant
Lead	<b>Recognized</b> carcinogen; developmental toxicant; reproductive toxicant
	<b>Suspected</b> cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; respiratory toxicant; skin or sense organ toxicant
Mercury	<b>Recognized</b> developmental toxicant
	<b>Suspected</b> cardiovascular or blood toxicant; endocrine toxicant; gastrointestinal or liver toxicant; immunotoxicant; kidney toxicant; neurotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant
Nickel	<b>Suspected</b> cardiovascular or blood toxicant; developmental toxicant; gastrointestinal or liver toxicant; kidney toxicant; reproductive toxicant; respiratory toxicant
Zinc	<b>Suspected</b> cardiovascular or blood toxicant; developmental toxicant; immunotoxicant; reproductive toxicant; respiratory toxicant; skin or sense organ toxicant

**Add:**

- Barium
- Magnesium
- Manganese
- Sodium
- Selenium

# 4,4'-DDT

sc-238975



The Power is Question

## Material Safety Data Sheet

Hazard Alert Code  
Key:

EXTREME

HIGH

MODERATE

LOW

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### PRODUCT NAME

4,4'-DDT

### STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

### NFPA



### SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and  
Canada: 877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436  
2255 (1-800-CHEMCALL) or call +613 9573 3112

### PRODUCT USE

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

### SYNONYMS

C<sub>14</sub>H<sub>9</sub>Cl<sub>5</sub>, "1, 1' -(2, 2, 2-trichloroethylidene) bis [4-chlorobenzene]", "1, 1' -(2, 2, 2-trichloroethylidene) bis [4-chlorobenzene]", "1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)ethane", "1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)ethane", "ethane, 1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)", "ethane, 1, 1, 1-trichloro-2, 2-bis(p-chlorophenyl)", "benzene, 1, 1' -(, 2, 2-trichloroethylidene)bis(4-chloro)-", "benzene, 1, 1' -(, 2, 2-trichloroethylidene)bis(4-chloro)-", "alpha, alpha-bis(p-chlorophenyl)-beta, beta, beta-trichloroethane", "1, 1-bis-(p-chlorophenyl)-2, 2, 2-trichloroethane", "1, 1-bis-(p-chlorophenyl)-2, 2, 2-trichloroethane", "2, 2-bis(p-chlorophenyl)-1, 1, 1-trichloroethane", "2, 2-bis(p-chlorophenyl)-1, 1, 1-trichloroethane", "p, p' -DDT", "p, p' -DDT", "diphenyl trichloroethane", "dichlorodiphenyltrichloroethane", "p, p-dichlorodiphenyltrichloroethane", "p, p-dichlorodiphenyltrichloroethane", "4, 4' -dichlorodiphenyltrichloroethane", "4, 4' -dichlorodiphenyltrichloroethane", Agritan, Anofex, Arkotine, Azotox, "Bosan supra", Bovidermal, Chlorophenothane, Chlorophenotoxum, Citox, Clofenotane, Dedelo, Deoval, Ditoxan, Dibovan, Dicophane, Didigam, Didimac, Dodat, Dykol, Estonate, Genitox, Gesafid, Gesapon, Gesarex, Gesarol, Guesapon, Guesarol, Gyron, Havero-extra, Hildit, Ivoran, Ixodex, Kopsal, Mutoxin, Neocid, OMS-16, Parachlorodicum, Peb1, Pentachlorin, Zeidane, Zerdane, insecticide

## Section 2 - HAZARDS IDENTIFICATION

### CANADIAN WHMIS SYMBOLS



### EMERGENCY OVERVIEW

#### RISK

Limited evidence of a carcinogenic effect.

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

## POTENTIAL HEALTH EFFECTS

### ACUTE HEALTH EFFECTS

#### SWALLOWED

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

#### EYE

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

#### SKIN

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

#### INHALED

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

### CHRONIC HEALTH EFFECTS

- There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.

There is some evidence to provide a presumption that human exposure to the material may result in impaired fertility on the basis of: some evidence in animal studies of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects but which is not a secondary non-specific consequence of other toxic effects.

The following chronic health effects can occur some time after exposure to DDT and can last for months or years. There is some evidence that it causes cancer in humans and it has been shown to cause liver cancer in animals.

DDT may damage the liver and kidneys, damage the developing fetus and decrease fertility in males and females, and cause central nervous system degeneration.

High doses of o,p'-DDT fed to immature female rats exert clear oestrogenic effects. Males fed 1 ppm o,p'-DDT from birth had significantly heavier bodies, testes and seminal vesicles at day 112. In a another study adult male rats treated with o,p'-DDT showed decreased corticosterone formed from progesterone in the adrenals and lowered unchanged progesterone. In brain metabolism, treatment with o,p'-DDT increased dihydrotestosterone from testosterone while androstenediol decreased. The authors concluded that the effects of o,p'-DDT administration are a decrease in plasma testosterone and in androgen biosynthesis, and an increase in plasma oestradiol.

Exposure to organochlorine pesticides for long periods can cause multiple nervous system infections and disorders involving the brain and autonomic nerves with headache, dizziness, "pins and needles", tremor in the limbs, disturbances in nerves supplying blood vessels, pain in the bowel and stiffening of the bile duct, rapid heartbeat, hollow heart sounds and a tight pain in the chest. There can be blood problems with loss of platelets and white blood cells, change in blood cell distribution, anemia, loss of appetite and weight. There may be disturbed behavior. Some organochlorines may have female sex hormone-like effects, causing withering of the testicles, reduced fertility and disturbed sexual activity.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

### HAZARD RATINGS

Flammability: 1  Min Max

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

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



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

## Section 4 - FIRST AID MEASURES

### SWALLOWED

- - Give a slurry of activated charcoal in water to drink. NEVER GIVE AN UNCONSCIOUS PATIENT WATER TO DRINK.
  - At least 3 tablespoons in a glass of water should be given.
  - Although induction of vomiting may be recommended (IN CONSCIOUS PERSONS ONLY), such a first aid measure is dissuaded because to the risk of aspiration of stomach contents. (i) It is better to take the patient to a doctor who can decide on the necessity and method of emptying the stomach. (ii) Special circumstances may however exist; these include non-availability of charcoal and the ready availability of the doctor.
- NOTE: If vomiting is induced, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. NOTE: Wear protective gloves when inducing vomiting.
- REFER FOR MEDICAL ATTENTION WITHOUT DELAY.
  - In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
  - If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
  - If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.
- (ICSC20305/20307).

### EYE

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

### SKIN

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

### INHALED

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

### NOTES TO PHYSICIAN

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

## Section 5 - FIRE FIGHTING MEASURES

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

## EXTINGUISHING MEDIA

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

## FIRE FIGHTING

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

## GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

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

Combustion products include: carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

## FIRE INCOMPATIBILITY

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

## PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

Respirator:

Particulate

## Section 6 - ACCIDENTAL RELEASE MEASURES

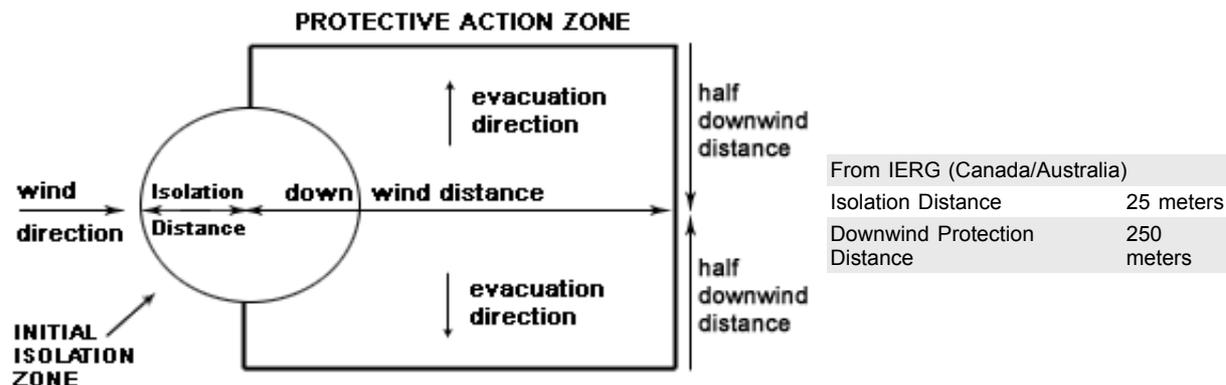
### MINOR SPILLS

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

### MAJOR SPILLS

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

## PROTECTIVE ACTIONS FOR SPILL



## FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 151 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

## ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

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

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

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

### RECOMMENDED STORAGE METHODS

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

For low viscosity materials

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

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

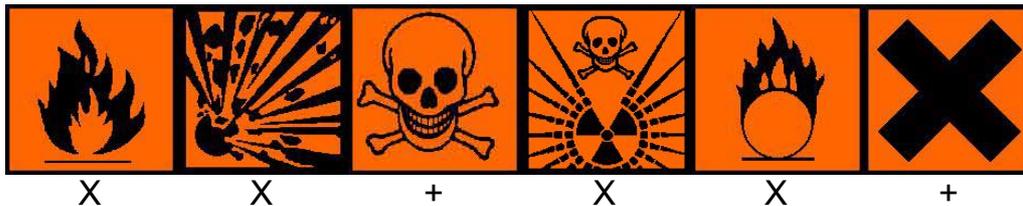
- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

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

### STORAGE REQUIREMENTS

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

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together

O: May be stored together with specific preventions

+: May be stored together

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

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

Canada - Northwest Territories

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

#### EMERGENCY EXPOSURE LIMITS

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

#### MATERIAL DATA

DDT:

■ for DDT:

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

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

#### PERSONAL PROTECTION



Consult your EHS staff for recommendations

#### EYE

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

## HANDS/FEET

- Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

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

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

## OTHER

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

## RESPIRATOR

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

\* - Negative pressure demand \*\* - Continuous flow

Explanation of Respirator Codes:

Class 1 low to medium absorption capacity filters.

Class 2 medium absorption capacity filters.

Class 3 high absorption capacity filters.

PAPR Powered Air Purifying Respirator (positive pressure) cartridge.

Type A for use against certain organic gases and vapors.

Type AX for use against low boiling point organic compounds (less than 65°C).

Type B for use against certain inorganic gases and other acid gases and vapors.

Type E for use against sulfur dioxide and other acid gases and vapors.

Type K for use against ammonia and organic ammonia derivatives

Class P1 intended for use against mechanically generated particulates of sizes most commonly encountered in industry, e.g. asbestos, silica.

Class P2 intended for use against both mechanically and thermally generated particulates, e.g. metal fume.

Class P3 intended for use against all particulates containing highly toxic materials, e.g. beryllium.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

## ENGINEERING CONTROLS

- 
- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:
  - (a): particle dust respirators, if necessary, combined with an absorption cartridge;
  - (b): filter respirators with absorption cartridge or canister of the right type;
  - (c): fresh-air hoods or masks
- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.

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

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

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)

grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)
--	------------------------------

Within each range the appropriate value depends on:

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

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

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### PHYSICAL PROPERTIES

Solid.

Does not mix with water.

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

### APPEARANCE

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

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

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

### STORAGE INCOMPATIBILITY

- - Avoid strong bases.
- Avoid reaction with oxidizing agents.

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

## Section 11 - TOXICOLOGICAL INFORMATION

DDT

### TOXICITY AND IRRITATION

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

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

Oral (human infant) LDLo: 150 mg/kg

Oral (man) TDLo: 6 mg/kg

Oral (human) TDLo: 16 mg/kg

Oral (human) LDLo: 500 mg/kg

Oral (human) TDLo: 5 mg/kg

Dermal (rat) LD50: 1931 mg/kg

Dermal (rabbit) LD50: 300 mg/kg

#### ■ For DDT:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

seen at doses of 83 mg/kg/day in females (but not males) , and in males (but not females) at doses of 40 mg/kg/day. In other studies, however, no carcinogenic activity was observed in rats at doses less than 25 mg/kg/day; no carcinogenic activity was seen in mice with at doses of 3-23 mg/kg/day over an unspecified period, and in other hamster studies there have been no indications of carcinogenic effects.

The available epidemiological evidence regarding DDT's carcinogenicity in humans, when taken as a whole, does not suggest that DDT and its metabolites are carcinogenic in humans at likely dose levels. In several epidemiological studies, no significant associations were seen between DDT exposure and disease, but in one other study, a weak association was observed. In this latter study, which found a significant association between long-term, high DDT exposures and pancreatic cancers in chemical workers, there were questions raised as to the reliability of the medical records of a large proportion of the cancer cases.

Organ Toxicity: Acute human exposure data and animal studies reveal that DDT can affect the nervous system, liver, kidney. Increased tumor production in the liver and lung has been observed in test animals. An association with pancreatic cancer was suggested in humans in one study.

Fate in Humans & Animals: DDT is very slowly transformed in animal systems. Initial degradates in mammalian systems are 1,1-dichloro-2,2-bis(p-dichlorodiphenyl)ethylene (DDE) and 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane (DDD), which are very readily stored in fatty tissues. These compounds in turn are ultimately transformed into bis(dichlorodiphenyl) acetic acid (DDA) via other metabolites at a very slow rate. DDA, or conjugates of DDA, are readily excreted via the urine.

Levels of DDT or metabolites may occur in fatty tissues (e.g. fat cells, the brain, etc.) at levels of up to several hundred times that seen in the blood. DDT or metabolites may also be eliminated via mother's milk by lactating women.

WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.

ADI: 0.002 mg/kg/day

NOEL: 0.25 mg/kg/day

## CARCINOGEN

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

## SKIN

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

## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

DDT:

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

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

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

■ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

■ For DDT

log Kow : 6.19

Half-life (hr) air: 170

Half-life (hr) H<sub>2</sub>O surface water: 5500

Half-life (hr) soil: 17000

BCF : 12000-40000

Environmental fate:

Breakdown in Soil and Groundwater: DDT is very highly persistent in the environment, with a reported half life of between 2-15 years and is immobile in most soils. Routes of loss and degradation include runoff, volatilization, photolysis and biodegradation (aerobic and anaerobic). These processes generally occur only very slowly. Breakdown products in the soil environment are DDE and DDD, which are also highly persistent and have similar chemical and physical properties.

Due to its extremely low solubility in water, DDT will be retained to a greater degree by soils and soil fractions with higher proportions of soil organic matter. It may accumulate in the top soil layer in situations where heavy applications are (or were) made annually; e.g., for apples. Generally DDT is tightly sorbed by soil organic matter, but it (along with its metabolites) has been detected in many locations in soil and groundwater where it may be available to organisms. This is probably due to its high persistence; although it is immobile or only very slightly mobile, over very long periods of time it may be able to eventually leach into groundwater, especially in soils with little soil organic matter.

Residues at the surface of the soil are much more likely to be broken down or otherwise dissipated than those below several inches. Studies in Arizona have shown that volatilization losses may be significant and rapid in soils with very low organic matter content (desert soils) and high irradiance of sunlight, with volatilization losses reported as high as 50% in 5 months. In other soils (Hood River and Medford) this rate may be as low as 17- 18% over 5 years. Volatilisation loss will vary with the amount of DDT applied, proportion of soil organic matter, proximity to soil-air interface and the amount of sunlight.

Breakdown of Chemical in Surface Water: DDT may reach surface waters primarily by runoff, atmospheric transport, drift, or by direct application (e.g. to control mosquito-borne malaria). The reported half-life for DDT in the water environment is 56 days in lake water and approximately 28 days in river water. The main pathways for loss are volatilization, photodegradation, adsorption to water-borne particulates and sedimentation. Aquatic organisms, as noted above, also readily take up and store DDT and its metabolites. Field and laboratory studies in the United Kingdom demonstrated that very little breakdown of DDT occurred in estuary sediments over the course of 46 days.

Breakdown of Chemical in Vegetation: DDT does not appear to be taken up or stored by plants to a great extent. It was not translocated into alfalfa or soybean plants, and only trace amounts of DDT or its metabolites were observed in carrots, radishes and turnips all grown in DDT-treated soils. Some accumulation was reported in grain, maize and rice-plants, but little translocation occurred and residues were located primarily in the roots.

Ecotoxicity:

Effects on Birds:

Bird dietary LD<sub>50</sub>: mallard duck 2240 mg/kg, Japanese quail 841 mg/kg, pheasant 1334 mg/kg

Reported dietary LD<sub>50</sub>s in such species as bobwhite quail, California quail, red-winged blackbird, cardinal, house sparrow, blue jay, sandhill crane and clapper rail also indicate slight toxicity both in acute 5-day trials and over longer periods of up to 100 days. In birds, exposure to DDT occurs mainly through the food web through predation on aquatic and/or terrestrial species having body burdens of DDT, such as fish, earthworms and other birds.

There has been much concern over chronic exposure of bird species to DDT and effects on reproduction, especially eggshell thinning and embryo deaths. The mechanisms of eggshell thinning are not fully understood. It is thought that this may occur from the major metabolite, DDE, and that predator species of birds are the most sensitive to these effects. Laboratory studies on bird reproduction have demonstrated the potential of DDT and DDE to cause subtle effects on courtship behavior, delays in pairing and egg laying and decreases in egg weight in ring doves and Bengalese finches. The implications of these for long-term survival and reproduction of wild bird species is unclear.

There is evidence that synergism may be possible between DDT's metabolites and organophosphate (cholinesterase-inhibiting) pesticides to produce greater toxicity to the nervous system and higher mortality. Aroclor (polychlorinated biphenyls, or PCBs) may result in additive effects on eggshell thinning.

Effects on Aquatic Species

Fish LC<sub>50</sub> (96 h): coho salmon 4 ug/l, rainbow trout 8.7 ug/l, northern pike 2.7 ug/l, black bullhead 4.8 ug/l, bluegill sunfish 8.6 ug/l, largemouth bass 1.5 ug/l, walleye 2.9 ug/l, fathead minnow 21.5 ug/l, channel catfish 12.2 ug/l, largemouth bass 1.5 ug/l, guppy 56 ug/l

DDT is very highly toxic to many aquatic invertebrate species. Reported 96-hour LC<sub>50</sub>s in various aquatic invertebrates (e.g., stoneflies, midges, crayfish, sow bugs) range from 0.18 ug/L to 7.0 ug/L, and 48-hour LC<sub>50</sub>s are 4.7 ug/L for daphnids and 15 ug/L for sea shrimp. Other reported 96-hour LC<sub>50</sub>s for various aquatic invertebrate species are from 1.8 ug/L to 54 ug/L. Early developmental stages are more susceptible than adults to DDT's effects. The reversibility of some effects, as well as the

development of some resistance, may be possible in some aquatic invertebrates . DDT is very highly toxic to fish species as well. . Observed toxicity in coho and chinook salmon was greater in smaller fish than in larger . It is reported that DDT levels of 1 ng/L were sufficient to affect the hatching of coho salmon eggs DDT may be moderately toxic to some amphibian species and larval stages are probably more susceptible than adults In addition to acute toxic effects, DDT may bioaccumulate significantly in fish and other aquatic species, leading to long-term exposure. This occurs mainly through uptake from sediment and water into aquatic flora and fauna, and also fish . Fish uptake of DDT from the water will be size-dependent with smaller fish taking up relatively more than larger fish . A half- time for elimination of DDT from rainbow trout was estimated to be 160 days . The reported bioconcentration factor for DDT is 1,000 to 1,000,000 in various aquatic species, and bioaccumulation may occur in some species at very low environmental concentrations . Bioaccumulation may also result in exposure to species which prey on fish or other aquatic organisms (e.g., birds of prey).

**Effects on Other Animals (Nontarget species)**

Earthworms are not susceptible to acute effects of DDT and its metabolites at levels higher than those likely to be found in the environment, but they may serve as an exposure source to species that feed on them. DDT is non-toxic to bees; the reported topical LD50 for DDT in honeybees is 27 ug/bee . Laboratory studies indicate that bats may be affected by DDT released from stored body fat during long migratory periods.

- Outbreaks of poisoning from food contaminated with organochlorines are characterized by headache, nausea, vomiting, restlessness, irritability, vertigo, muscle twitching, confusion, stupor, coma and convulsions.

The organochlorine pesticides are highly soluble in lipids and most organic solvents but have low water solubilities and low vapor pressure.

Adsorption in various soils depends strongly on the presence of soil organic matter. Once adsorbed they do not readily desorb. Such compounds do not as a consequence leach or diffuse in soils and transport to the hydrosphere from contaminated soils will be largely as a result of the erosion of soil particles or sediments, rather than by desorption and dissolution.

When organochlorines are poorly adsorbed, as in sandy soils, vaporization losses are significant. Volatilization from water or soil may also occur.

The actual evaporation rate depends on factors such as temperature, soil properties, soil water content and other physicochemical properties such as water solubility and degree of adsorption. The importance of soil moisture in volatilization led to the use of the term "co-distillation".

The effect observed in soil however is more accurately described as displacement of the sorbed pesticides by water molecules. As a result compounds which otherwise possess low water solubility are quite volatile from water.

Degradation of the organochlorines is slow compared to other classes of insecticide and in soil and water is due mainly to the action of micro- organisms. Pathways include dechlorination and dehydrochlorination. Oxidation is only moderately important. Epoxidations and rearrangements are common amongst the cyclodiene pesticides. These rearrangement reactions produce complicated "cage-like" structures that are toxic.

Bioaccumulation of the some organochlorines (notably DDT and dieldrin) are higher in aquatic ecosystems than in terrestrial ecosystems. Physicochemical properties such as high lipid solubility, low water solubility and chemical stability are the most significant factors behind such bioaccumulation.

The effects of bioaccumulation are manifest at the top of the food chain where, for example, predatory fish and birds, suffer from acute and chronic toxicity and reproductive failures. Effects may range from obvious toxicity to subtle behavioral changes. Evidence exists that the population effects are reversible with time.

- DO NOT discharge into sewer or waterways.

■ The material is classified as an ecotoxin\* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l

\* Classification of Substances as Ecotoxic (Dangerous to the Environment)

Appendix 8, Table 1

Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993 Commission of the European Communities.

**Ecotoxicity**

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

**Section 13 - DISPOSAL CONSIDERATIONS**

**US EPA Waste Number & Descriptions**

**B. Component Waste Numbers**

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

**Disposal Instructions**

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

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

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

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

**Section 14 - TRANSPORTATION INFORMATION**



DOT:

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

Hazardous materials descriptions and proper shipping names:

Organochlorine pesticides, solid, toxic

#### Air Transport IATA:

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

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

#### Maritime Transport IMDG:

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

Limited Quantities: 5 kg

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

## Section 15 - REGULATORY INFORMATION

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

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

## Section 16 - OTHER INFORMATION

### LIMITED EVIDENCE

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

### REPRODUCTIVE HEALTH GUIDELINES

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

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
DDT	0.01 mg/m <sup>3</sup>	1000	R	3	-

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

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■ Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:  
[www.chemwatch.net/references](http://www.chemwatch.net/references).

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

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# **ATTACHMENT III**

## **Heat Stress/Cold Stress and Related Illnesses**

## 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 known 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°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 Equipment 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 than 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 from 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**  
**Injuries and Illnesses Incident Report Form**  
**(OSHA 301)**

# 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 5**

**PROPOSED DEVELOPMENT PLAN**



## **APPENDIX 6**

# **Design Diagrams and Specifications for Vapor Barrier/Waterproofing Membrane and Sub-slab Depressurization System**

## PREPRUFE® 300R & 160R

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

### 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:

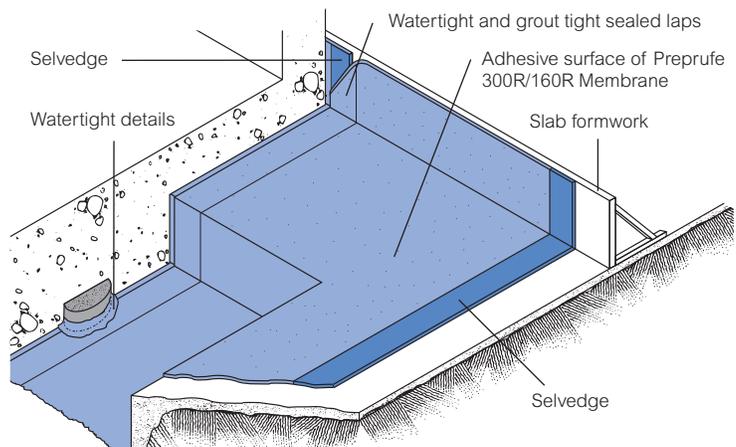
- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe Tape HC**—as above for use in Hot Climates (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.
- **Adcor™ ES**—waterstop for joints in concrete walls and floors
- **Preprufe Tieback Covers**—preformed cover for soil retention wall tieback heads
- **Preprufe Preformed Corners**—preformed inside and outside corners

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth 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.

### 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



Drawings are for illustration purposes only. Please refer to [graceconstruction.com](http://graceconstruction.com) for specific application details.

## Installation

The most current application instructions, detail drawings and technical letters can be viewed at [graceconstruction.com](http://graceconstruction.com). For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvage 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 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

**Horizontal**—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. 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 0.5 in. (12 mm) out of alignment.

### Membrane Installation

Preprufe can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe in cold or marginal weather conditions 55°F (<13°C) 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. Alternatively, Preprufe Low Temperature (LT) is available for low temperature condition applications. Refer to Preprufe LT data sheet for more information.

**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 (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvage. 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 Letter 15 for information on suitable rebar chairs for Preprufe.

**Vertical substrates**—Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvage using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner.

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 3 in. (75 mm) 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 edges and roll firmly (see Figure 3). Immediately remove printed plastic release liner from the tape.

### Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit [graceconstruction.com](http://graceconstruction.com). This manual gives comprehensive guidance and standard details.

### Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power 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 (0.5 in. (12 mm) 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 6 in. (150 mm) 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 selvage 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 membrane and tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly 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 1500 psi (10 N/mm<sup>2</sup>) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to Grace Tech Letter 17 for information on removal of formwork for Preprufe.

Figure 1

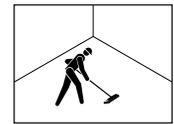


Figure 2

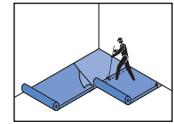
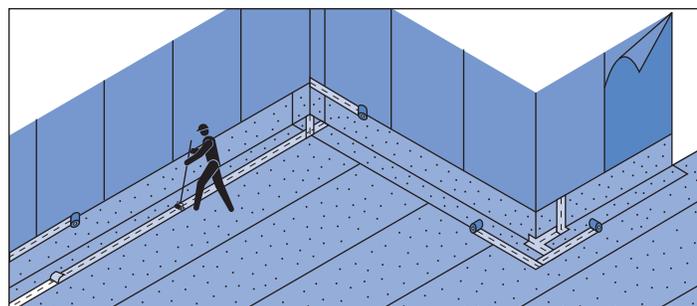
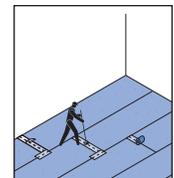


Figure 3

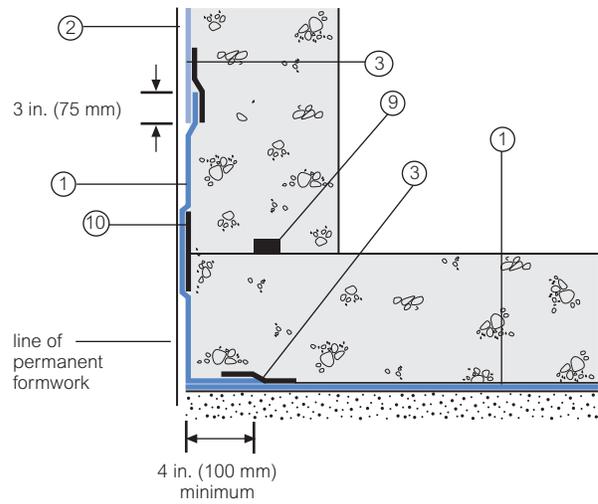


## Detail Drawings

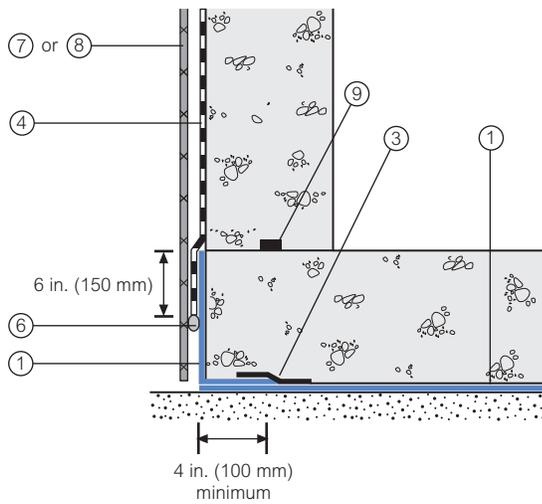
Details shown are typical illustrations and not working details. For a list of the most current details, visit us at [graceconstruction.com](http://graceconstruction.com).

For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

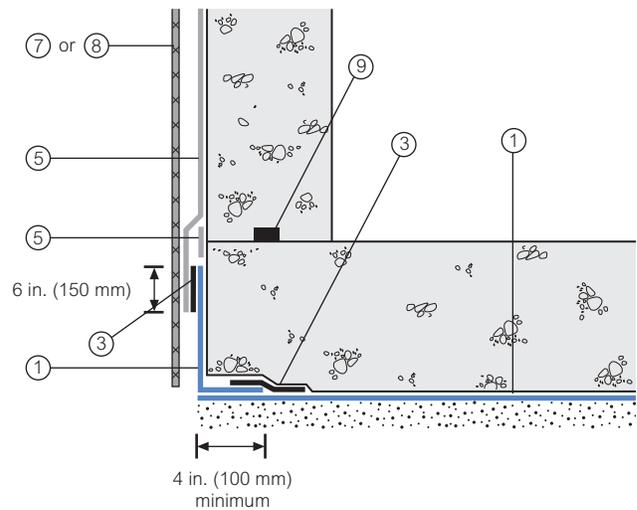
### Wall base detail against permanent shutter



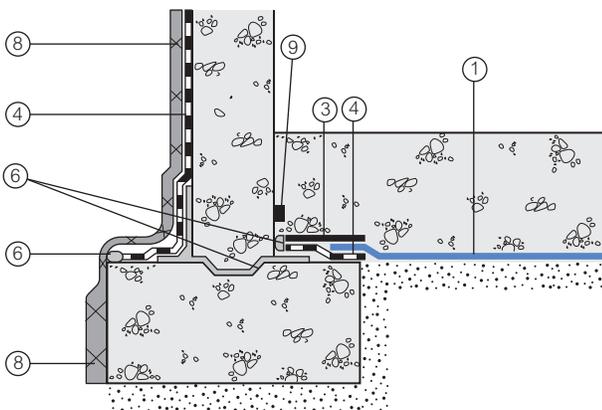
### Bituthene wall base detail (Option 1)



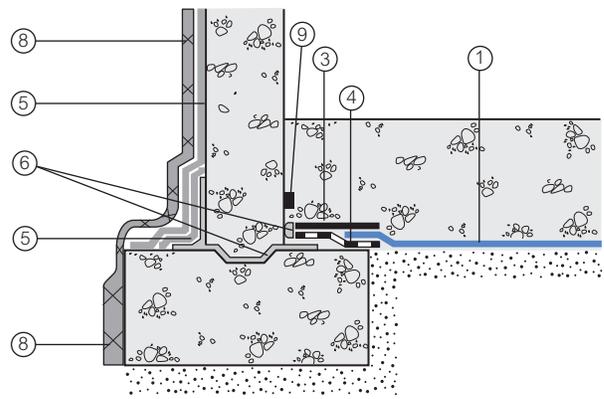
### Procor wall base detail (Option 1)



### 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®
- 9 Adcor ES
- 10 Preprufe CJ Tape

## Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft <sup>2</sup> (36 m <sup>2</sup> )	460 ft <sup>2</sup> (42 m <sup>2</sup> )	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)
* LT denotes Low Temperature (between 25°F (-4°C) and 86°F (+30°C)) HC denotes Hot Climate (50°F (>+10°C))			
<b>Ancillary Products</b>			
Bituthene Liquid Membrane—1.5 US gal (5.7 liter) or 4 US gal (15.1 liter)			

## Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified <sup>1</sup>
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified <sup>2</sup>
Elongation	660%	580%	ASTM D412, modified <sup>3</sup>
Tensile strength	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified <sup>4</sup>
Lap peel adhesion	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D1876, modified <sup>5</sup>
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	0.01 perms (0.6 ng/(Pa × s × m <sup>2</sup> ))	ASTM E96, method B
Water absorption	0.5%	0.5%	ASTM D570

### Footnotes:

- Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) 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.
- Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
- 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 2 in. (50 mm) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute.

### 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.

[www.graceconstruction.com](http://www.graceconstruction.com)

For technical assistance call toll free at 866-333-3SBM (3726)

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**GRACE**

**SECTION 02221**  
**SUB-SLAB DEPRESSURIZATION SYSTEM**

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK**

- A. Furnish and install a sub-slab depressurization system (SSDS) as specified, as shown on the Drawings. The Contractor shall furnish and install a SSDS complete and ready for use. The SSDS shall depressurize the entire building floor slab (as shown on the Drawings), creating a differential pressure: lower pressure in the gas permeable aggregate layer below the floor slab than in the building interior.
- B. Furnish and install a geotextile placed directly on the compacted subbase, and a minimum 12-inch thick gas permeable aggregate layer beneath the entire floor slab with one (1) 4-foot x 4-foot sub-slab depressurization pit. Sub-slab depressurization pit ("sub-slab pit") P-1 shall connect to a single 6-inch diameter vertical riser extending through the building and above the roof. The SSDS riser shall terminate 10-feet above the parapet wall (as shown on the Drawings).
- C. All materials and equipment furnished under this section shall be new, in first-class condition, supplied directly from original equipment manufacturers, and installed in accordance with the manufacturers' recommendations.
- D. Perform and certify results of inspections and tests as specified.

**1.02 STANDARDS AND REGULATIONS**

- A. Comply with applicable portions of the Building Code of the City of New York. Where requirements for products, materials, equipment, methods and other portions of the work specified herein exceed minimum requirements of New York City Building Code, Contractor shall comply with such requirements specified herein.
- B. Standards issued by the organizations listed below may be referenced in this section.
  - 1. American Society for Testing and Materials (ASTM)
  - 2. American Standards Association (ASA)

3. American National Standards Institute (ANSI)
4. Cast Iron Soil Pipe and Fitting Handbook (2006)

### **1.03 RESTRICTIONS AND QUALITY CONTROL**

- A. Pre-installation Meeting: The Contractor shall arrange for and convene a pre-installation meeting prior to the start of work of this Section to review installation procedures, protection, and coordination with other work. Attendance of parties directly affecting work of this Section, including designer of the SSDS, Contractor, and Contractor's installer shall be required. The Contractor shall schedule the pre-installation meeting at a time and at a location that is agreeable to the Architect and Engineer. The meeting shall be held on a date which is a minimum of ten (10) business days prior to start of the work of this Section.
- B. Quality Control Inspections can be performed by the designer of the SSDS at the request of the Owner.
- C. Contractor to verify that SSDS stack exhaust location is a distance of 25 feet or more from any air intakes and operable windows (including those on adjoining properties). Final locations and heights of vent stacks shall be in accordance with New York City Building Codes.

### **1.04 SUBMITTALS**

- A. Product Data: Submit manufacturers' product data, including installation instructions for:
  1. Cleanout Test Tee
  2. Non-woven geotextile
  3. Pipes and fittings
  4. Grace Preprufe (300R and 160R) Vapor Barrier
- B. Samples - Submit representative samples of the following for approval:
  1. Non-woven Geotextile

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to site in manufacturers' original, unopened container and packaging, with labels clearly identifying product and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturers' instructions.
- C. Protect materials during handling and installation to prevent damage.
- D. Delivery, Storage and Handling of Pipe Materials:
1. Deliver pipe materials properly protected, and undamaged.
  2. Properly protect all piping to prevent damage to the pipe and the introduction of foreign material into the pipe. For protecting piping from pre-installation contamination, all piping shall be shipped to job site with suitable caps, sheet metal covers or plugs. Pipe caps shall not be removed until just before installation.
  3. Examine all pipe and fittings before laying pipe. Do not install any piece that is found to be defective. Protect all materials during handling and installation to prevent damage.

**PART 2 - PRODUCTS****2.01 MATERIALS AND ACCESSORIES****A. NON-WOVEN GEOTEXTILE**

Geotextile material to be placed on prepared subgrade below the gas permeable aggregate layer shall be a non-woven polypropylene type, such as Mirafi N-Series product type 140NL or approved equal and having the following properties:

Property/Test Method	Units	Value
<b>MECHANICAL PROPERTIES</b>		
<b>Grab Tensile Strength</b>		
ASTM D 4632	kN (lbs)	0.40 (90)
<b>Grab Tensile Elongation</b>		
ASTM D 4632	%	50

Property/Test Method	Units	Value
<b>Mullen Burst Strength</b>		
ASTM D 3786	kPa (psi)	1205 (175)
<b>Trapezoidal Tear Strength</b>		
ASTM D 4533	kN (lbs)	0.18 (40)
<b>Puncture Strength</b>		
ASTM D 4833	kN (lbs)	0.24 (55)
<b>UV Resistance at 500 hrs.</b>		
ASTM D 4355	% Strength retained	70
<b>HYDRAULIC PROPERTIES</b>		
<b>Apparent Opening Size (AOS)</b>		
ASTM D 4751	mm (US Sieve)	0.25 (60)
<b>Permittivity</b>		
ASTM D 4491	sec-1	2.0
<b>Flow Rate</b>		
ASTM D 4491	L/min/m <sup>2</sup> (Gal/min/ft <sup>2</sup> )	5907 (145)
<p><i>NOTE: All Mechanical Properties and Hydraulic Properties shown are Minimum Average Roll Values (MARV).</i></p>		

**B. GAS PERMEABLE AGGREGATE LAYER**

Gas permeable aggregate layer shall be clean, ¾" stone. No fines passing a ¼" sieve shall be included in gas permeable aggregate mix.

**C. SUB-SLAB PIT, PIPE, AND APPURTENANCES**

1. Install sub-slab depressurization pit as shown on the Drawings. The sub-slab depressurization pit shall be 4-foot by 4-foot in area. Pits shall be constructed with solid concrete blocks supporting and covered by 2-inch thick precast concrete plates reinforced with No. 4 rebar 4-inches on center each way, or an equivalent welded wire fabric of equal size, throughout the center of the plate.
2. Pipe shall be installed as shown on the Drawings and shall terminate in and slope uniformly to the sub-slab depressurization pit. Condensate drains must be installed at all low points in the piping that are not sloped back to the SSDS pit.

3. All vertical and horizontal SSDS pipes will be cast iron unless otherwise noted on the drawings.

D. GAS VAPOR BARRIER

The Gas Vapor Barrier shall be constructed of Grace Preprufe (300R and 160R) Membrane, in accordance with manufacturer's installation procedures.

E. SUB-SLAB PIPE, BUILDING PENETRATIONS AND RISER PIPE

Pipe, fittings, unions, cleanouts, sleeves, supports, and related accessories shall be furnished in accordance with the requirements for plumbing sanitary vent piping in Division 15.

F. CONDENSATE DRAINS

1. Condensate drains shall be installed at all low points in SSDS piping not sloped to the SSDS pit.
2. Condensate drains shall be of same construction as shown on Contract Drawings.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION/INSPECTION**

At a minimum, inspection by and approval from the Contractor's Professional Engineer at all milestones identified on the following Inspection Schedule shall be required prior to commencing each subsequent phase of work. Additional inspections, examinations and quality control measures may be required in accordance with manufacturers' recommendations and are the responsibility of the Contractor.

A. INSPECTION SCHEDULE

#	Inspection Schedule - Milestone Description
1	Completion of Subbase preparation following foundation and footing installation and installation of geotextile.
2	Delivery to the site of gas permeable aggregate layer, prior to use.
3	Installation of sub-slab depressurization pit and riser "stub-out" prior to completion of gas permeable aggregate layer.
4	Completion of installation of gas permeable aggregate layer.
5	Completion of all SSDS subsurface components prior to installation of sheet membrane waterproofing/gas vapor

#	Inspection Schedule - Milestone Description
	barrier system.
6	Completion of installation of all portions of interior riser prior to enclosure within sheetrock/interior walls.
7	Implementation of pressure test of completed interior riser pipes. <b>See Article 3.01(B) regarding test requirements.</b>
9	Completion of SSDS riser stack on roof top.

B. INTERIOR RISER PRESSURE TESTING

1. The interior riser shall be subject to a pressure test to ensure all components of the SSDS that pass through the facility interior are airtight at 10.0 psig air pressure.
2. A cleanout shall be permanently installed on the riser pipe with invert within 12-inches above finished floor of the pipe entry into the building and below the cleanout shall be an uninterrupted straight pipe run, without couplings, joints or fittings. A pressure-stop balloon shall be inflated between the foundation floor and the cleanout creating an airtight seal. A temporary airtight seal shall be placed at the riser termination on the roof. A static pressure of at least 10.0 psig shall be applied to the pipe at the cleanout location and maintained for a minimum of 30 minutes. All materials, gauges and equipment for this test shall be provided by the Contractor.
3. If the pipe riser does not successfully maintain pressure, it is the responsibility of the Contractor to identify and seal all leaks.
4. **Caution:** Materials under pressure can explode, causing serious injury or death. Extreme care should be exercised in conducting any air test. Persons conducting an air test must exercise care to avoid application of pressure to system under test by using pressure regulating and relief devices. Persons conducting the test are cautioned to inspect for tightness of all system components prior to the beginning of the test and to avoid adjustment of the system while under pressure. Proper protective equipment should be worn by individuals in an area where an air test is being conducted.

### 3.02 SURFACE PREPARATION

Preparation of all surfaces prior to the installation of the SSDS shall be as specified in the Contract Documents and Plans.

### 3.03 INSTALLATION

All components of the SSDS shall be installed as specified in the Contract Documents and as shown on the Drawings.

#### A. INSTALLATION OF THE GEOTEXTILE ABOVE PREPARED SOIL SUBGRADE

Following the completion of the building foundation walls and footings, the subbase shall be excavated to the depth required to install the gas permeable aggregate layer below the elevation of the bottom of the floor slab to the extent of the SSDS, as shown on the Contract Drawings. The non-woven geotextile shall be placed on the subbase, overlapped and secured in accordance with the manufacturer's recommendations.

#### B. INSTALLATION OF THE GAS PERMEABLE AGGREGATE AND SUB-SLAB DEPRESSURIZATION SYSTEM PIT

1. The gas permeable aggregate layer shall be placed and compacted below the SSDS depressurization pit location as shown on the Contract Drawings.
2. The sub-slab pit and pipe shall be assembled and installed as shown on the Contract Drawings.
3. Following inspection, gas permeable aggregate shall be placed and compacted to the bottom of slab elevation, as shown on the drawings.

#### C. INSTALLATION OF THE GAS VAPOR BARRIER SYSTEM

The gas vapor barrier system shall be installed in accordance with manufacturer's installation procedures.

#### D. INSTALLATION OF PIPING, RISER AND RELATED WORK

1. Vent riser shall be as identified in the Contract Documents and Drawings. Vent riser shall be installed, tested, labeled and enclosed in the

interior wall cavities.

2. The installation of piping, fittings, joints, supports and related accessories shall be in accordance with the requirements of Division 15.
3. Condensate drains must be installed at all low points in the piping that are not sloped back to the SSDS pit. If SSDS lateral pipe intersects a grade beam, the pipe may pass under the grade beam with the proper installation of a condensate drain or may pass through the grade beam with use of a pipe sleeve, with prior approval from the structural engineer.
4. Continuous weather resistant tape labeling on all interior riser pipe beginning at the floor slab elevation and continuing to the roof penetration shall be permanently installed on the riser and shall read:

**CAUTION: DO NOT ALTER  
SUBSURFACE VAPOR VENT PIPE**

Lettering shall be minimum one-inch in height.

5. Piping (General)
  - a. The run and arrangements of all pipes shall be approximately as shown on drawings or specified and as directed during installation, and shall be as straight and direct as possible.
  - b. Roughing underground or concealed in the floor or wall construction shall be properly installed and inspected before any of the roughing is covered up. Should any work be covered up before being inspected it shall be uncovered and recovered at the expense of the Contractor.
  - c. All lines of piping and branches for fixtures passing through or in connection with waterproofing/vapor barrier shall be brought to the proper locations and levels so that fixtures and piping may be installed without disturbing the waterproofing/vapor barrier.

- d. The SSDS vent stack shall be securely anchored with adequate structural supports as shown on the Contract Drawings.

6. Cleanouts

- a. A Cleanout installed on sub-slab depressurization riser shall be of equivalent size of the riser diameter (6-inch) to facilitate pressure testing. Cleanouts shall be gas tight.

### 3.04 PROTECTION

It is the responsibility of the Contractor to ensure that no damage occurs to components of the SSDS prior to, during or following installation of system, or during any subsequent performance of construction for the facility. This includes the installation of all subsurface utilities required for the operation of building systems. Contractor's Professional Engineer shall visually inspect the condition of the SSDS immediately prior to enclosing/covering. Any damages to the SSDS during performance of the Work shall be repaired and tested at no additional cost.

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
Submittal Schedule		
Inspection Schedule		
Product Data:		
1. Cleanout Test Tee		
2. Non-Woven Geotextile		
3. Pipes and Fittings		
Samples:		
Non-Woven Geotextile		
Manufacturer's Instructions:		
Installation of Fire Stop Materials for Sleeves for Pipes		
Vertical Riser Test Results		
Professional Engineer's Report on Inspection and Approval of Work		

END OF SECTION

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