TRIANGLE COURT

BROOKLYN, NEW YORK

Remedial Action Work Plan

NYC BCP Number: 11CBCP008K
E-Designation Site Number: 11EHAZ062K

Prepared for:
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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC 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, Sean Morgan, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the Triangle Court Site 11CBCP008K.

I, Timothy Fisher am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the Triangle Court Site 11CBCP008K.

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.

Sean Morgan

Name

080752-1

NYS PE License Number

Signature

3/25/11

Date

STATE OF NEW YORK
SEAN MICHAEL MORGAN
No. 080752-1
LICENSED PROFESSIONAL ENGINEER

Timothy J. Fisher

QEP Name

QEP Signature

3/25/2011

Date

EXECUTIVE SUMMARY

Triangle Court, LLC has enrolled in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate a 18,250-square foot site located at 456 Grand Street in Brooklyn, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 456 Grand Street in the Williamsburg section in Brooklyn, New York and is identified as Block 2399 and Lot 1 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 18,250-square feet and is bounded by Grand Steet to the north, Borinquen Place to the south, an undeveloped vacant lot (460 Grand Street) to the east, and Keap Street to the west. A map of the site boundary is shown in Figure 1. Currently, the Site is a fenced vacant unpaved lot.

Summary of Proposed Redevelopment Plan

The proposed future use of the Site will consist of mixed use and will include a single six story residential/commercial structure with a single subterranean level. The subterranean level will house valet parking, the ground floor will include 8,000 square feet of retail commercial space split into five separate store fronts, the second through sixth floors will include 40,000 square feet of rental apartment units (50 total number of units). The current zoning designation is manufacturing (M1-2) and residential (R6A). The proposed site use is consistent with existing zoning for the property. The subterranean level will cover the entire footprint of the site. The ground level building will cover the majority of the site, the remaining space will consist of a paved access ramp to the subterranean parking, trash dumpsters, handicap parking, and landscape areas contained in planters. Since the subterranean parking will encompass the entire site footprint, the portions at the ground level outside the building footprint will be constructed directly above the subsurface structure. To allow for the construction of the proposed structure the entire footprint of the site will be excavated to an approximate depth of 12 feet below ground

surface. Based on the site dimensions (18,250 ft^2) and planned depth of the excavation (12 feet) approximately 219,000 ft^3 or 8,111 yd^3 of soil will be excavated. Based on an estimate weight of 1.5 tons/yd^3 this is a total of 12,167 tons of soil. During the recent Phase II investigation ground water was encountered at a depth of 10 feet below ground surface, therefore it is expected the excavation will extend into the ground water table. 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 SCGs; 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. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establish Track 1 Soil Cleanup Objectives (SCOs). 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. Installation of a vapor/waterproof membrane system beneath entire building slab. A single level underground parking garage will be built below grade and will be ventilated in conformance with NYC building.
6. 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.

7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
8. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
9. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
10. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
11. 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.

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 potential 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 Timothy Fisher and can be reached at 914-495-9935.

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

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

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager Timothy Fisher at 914-495-9935 or NYC Office of Environmental Remediation Project Manager Breanna Gribble at 212-442-7126.

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 8am to 3pm Monday to Friday.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that includes project details, 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 Meir Babaev at 718-480-4444, the NYC Office of Environmental Remediation Project Manager Breanna Gribble at 212-442-7126, 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. Loaded trucks leaving the Site will not stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document

repositories located at Brooklyn Public Library, Leonard Branch located at 81 Devoe Street, Brooklyn, New York..

Long-Term Site Management. To provide long-term protection after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined in the property's deed. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

Triangle Court, LLC has enrolled in the New York City Brownfield Cleanup Program (NYC BCP) to investigate and remediate a property located at 456 Grand Street in the Williamsburg section of Brooklyn, 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 456 Grand Street in the Williamsburg section in Brooklyn, New York and is identified as Block 2399 and Lot 1 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 18,250-square feet and is bounded by Grand Street to the north, Borinquen Place to the south, an undeveloped vacant lot (460 Grand Street) to the east, and Keap Street to the west. A map of the site boundary is shown in Figure 1. Currently, the Site is a fenced vacant unpaved lot.

1.2 PROPOSED REDEVELOPMENT PLAN

The proposed future use of the Site will consist of mixed use and will include a single six story residential/commercial structure with a single subterranean level. The subterranean level will house valet parking, the ground floor will include 8,000 square feet of retail commercial space split into five separate store fronts, the second through sixth floors will include 40,000 square feet of rental apartment units (50 total number of units). The layout of the proposed site development is presented in Figure 3a through Figure 3f. The current zoning designation is manufacturing (M1-2) and residential (R6A). The proposed site use is consistent with existing

zoning for the property. The subterranean level will cover the entire footprint of the site. The ground level building will cover the majority of the site, the remaining space will consist of a paved access ramp to the subterranean parking, trash dumpsters, handicap parking, and landscape areas contained in planters. Since the subterranean parking will encompass the entire site footprint, the portions at the ground level outside the building footprint will be constructed directly above the subsurface structure. To allow for the construction of the proposed structure the entire footprint of the site will be excavated to an approximate depth of 12 feet below ground surface. Based on the site dimensions (18,250 ft^2) and planned depth of the excavation (12 feet) approximately 219,000 ft^3 or 8,111 yd^3 of soil will be excavated. Based on an estimate weight of 1.5 tons/yd^3 this is a total of 12,167 tons of soil. During the recent Phase II investigation ground water was encountered at a depth of 10 feet below ground surface, therefore it is expected the excavation will extend into the ground water table. The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

Figure 1 shows the surrounding land usage. The surrounding properties are a mix of commercial and residential use. There are no surface water bodies or regulated wetlands on or adjacent to the Site. The nearest surface water body is the East River located approximately 0.9-miles west of the Site.

Sensitive Receptors

A review of OER's *SPEED* application shows no hospitals or day care centers are located within a 500-foot radius of the site. Two public schools are located within a 500-foot radius of the site, they include:

- PS 019 Roberto Clemente located approximately 330 feet southwest of the site, and
- PS 319 located approximately 440 feet south-southwest of the site.

Figure 1 shows the surrounding land usage with sensitive receptors indicated.

1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, Triangle Court*", dated February, 2011 (RIR).

Summary of Past Uses of Site and Areas of Concern

According to Sanborn maps the subject site is depicted as commercial stores and residences in 1905, stores and an open-air moving picture screen in 1916, the Republic Theatre (built in 1921) from at least 1942 to 1965, and a gasoline station from at least 1978 to 2007 (Shell serivce station).

The AOCs identified for this site include:

- Petroleum storage and dispensation structures associated with the Former Shell Service Station

Summary of the Work Performed under the Remedial Investigation

Triangle Court, LLC undertook the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);
2. Installed three soil borings across the entire project Site, and collected six soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed three temporary groundwater monitoring wells throughout the site and collected three groundwater samples for chemical analysis to evaluate groundwater quality. Ground water flow direction was determined during historical site investigations;
4. Installed three soil vapor probes around Site and collected four samples for chemical analysis. One sample from each soil vapor probe location and a ambient air sample for the purpose of comparison.

Summary of Environmental Findings

1. Elevation of the property ranges from 15 to 25 feet.
2. Depth to groundwater ranges from 7.58 to 14.06 feet at the Site.

3. Groundwater flow is generally from northeast to southwest beneath the Site.

4. Depth to bedrock is greater than 15 feet at the Site.

5. The stratigraphy, from ground surface to approximately 15 feet below ground surface (ft bgs), consists of 5 to 10 feet of historic fill underlain by a brown to grey, sandy silt with trace gravel extending to the water table.

6. Petroleum contamination from a spill associated with former use of the property as a gasoline station was remediated under the authority of DEC and the spill was closed in 2010. Remediation included excavation and removal of two areas roughly 30 by 30feet including buried USTs and the fuel dispensing areas. Removal in these areas was generally to a depth of 12 feet. Piping delivery lines and associated soil were also removed and disposed offsite. Addition groundwater remediation was performed after the removal was complete and resulted in lowering BTEX to approximately 400-700 ug/l before the spill was closed by DEC. Findings in this RI indicate that groundwater quality has continued to improve since that time.

7. Soil/fill samples collected during the RI showed concentrations of metals (barium, chromium, lead, zinc, and mercury) at levels above Track 1 unrestricted SCOs and typical of historic fill materials. These levels are generally below Track 2 SCOs for commercial and residential uses. PCBs are below Track 1 SCOs. VOCs are below Track 1 SCOs in all samples and at all depths except for one VOC (acetone) which is slightly above Track 1 SCOs at 10-12 feet depth in one sample. SVOCs exceed Track 1 SCOs in shallow samples and are consistent with historical fill. Deep soils (10-12 feet) are below Track 1 SCOs. Several pesticides are above Track 1 SCOs in shallow (0-2) soils but meet Track 1 SCOs in deep soils.

8. Groundwater samples collected during the RI showed that VOCs meet TOGS groundwater standards except for ethylbenzene and toluene in one sample. One SVOCs exceeds groundwater standards. Findings are attributed historic gasoline releases managed under the former petroleum spill and results show significant improvement from sampling performed at the time of closure of the petroleum spill by DEC. No

pesticides were identified above TOGS standards. Metals in unfiltered groundwater samples are unremarkable and generally meet TOGS standards.

9. Based on the results of this RI, we conclude that there is no evidence to suspect disposal of significant quantities of hazardous waste.

10. Soil vapor samples collected during the R I showed low level occurrences of constituents that are residual impacts attributed to residual effects of former gasoline filling station activities and managed under the petroleum spill cleanup. A concentration of hexane was above the OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soil (Subsurface Vapor Intrusion Guidance), November 2002, Table 2(a) Target Deep Soil Gas Concentration and Target Shallow Soil Gas Concentration.

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

2.0 REMEDIAL ACTION OBJECTIVES

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

Groundwater

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

Soil

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

Soil Vapor

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

3.0 REMEDIAL ALTERNATIVES ANALYSIS

For Triangle Court, the site development activites involve complete removal of soil and fill within the property boundary to a depth of 12 to 14 feet bgs. This will include removal of approximately 8,111 yd^3 of soil and fill and eliminates residual impacted sources. In addition, the installation of a concrete slab across the Site coupled with the installation of a vapor/waterproofing membrane beneath the concrete foundation and foundation wall surfaces, and a ventilated subterranean parking level will serve as Engineering Controls. There is no remedial alternative analysis since excavation activities will remove residual impact sources.

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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.

The Track 1 alternative will result in excavation of all soil with contaminant concentration above Track 1 SCOs and would:

- Eliminate the risk of ingestion exposures or other direct contact with contaminated on-Site soils consistent with remedial action objectives;
- Eliminate the risk of leaching into groundwater and ingestion exposures or direct contact with groundwater with contamination derived from the Site consistent with remedial action objectives; and
- Eliminate potential sources for on-Site production of soil vapors, and prevent migration of on-Site derived vapors into occupied structures and eliminate associated inhalation exposures consistent with remedial action objectives.

3.2. BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

The Track 1 alternative would address the chemical-specific SCGs for soil by excavation and removal of all material above the Track 1 SCOs. 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.

The Track 1 alternative would result in some short-term impacts due to the quantity of excavation and transport required to remove all historic fill and other material necessary to achieve Track 1 SCOs throughout the Site. These impacts could include higher air quality impacts caused by greater soil excavation, handling and load out, and associated truck traffic. Focused attention to means and methods employed during the remedial action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of this additional activity.

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.

The Track 1 alternative would be effective over the long-term by providing a permanent cleanup of on-Site contamination through removal of all soils in excess of the Track 1 SCOs and would eliminate any potential on-Site sources of soil vapors and groundwater contamination consistent with remedial action objectives.

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.

The Track 1 alternative will provide maximum reduction of toxicity, mobility and volume of contaminated material on-Site by excavation and removal of all soils that exceed the Track 1 unrestricted use 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.

The Track 1 alternative is both feasible and implementable. It uses standard materials and services and well established technology. The reliability of the remedy is high. There are no special difficulties associated with any of the activities proposed but will require a long period of time to accomplish due to the large quantity of soil and fill material that would require removal.

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 for the Track 1 alternative is higher than a no-removal remedial action. Higher costs are driven by higher total volume of soil/fill that would be excavated and transported from the Site and disposed of at an off-Site location.

The Track 1 alternative satisfies the threshold balancing criterion and other criterion listed here, and 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, the alternative will be 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 alternative 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.

The Track 1 alternative for remedial action at the site is compatable 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 residential and commercial properties and the proposed alternative provides comprehensive protection of public health and the environment for these uses. Improvements in the current brownfield condition of the property achieved by the alternative is also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. The alternative is equally protective of natural resources and cultural resources. This RAWP will be subject to 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.

The alternative has the potential to utilize sustainable means to achieve the cleanup goals. This program contemplates the utilization of several green remediation methods that are compatible with the alternative. The full list of green remediation activities considered in this program is included in the Sustainability Statement.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan.
2. Perform a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establish Track 1 Soil Cleanup Objectives (SCOs). 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. Installation of a vapor/waterproof membrane system beneath entire building slab. A single level underground parking garage will be built below grade and will be ventilated in conformance with NYC building.
6. 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.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.

8. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.

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

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

11. 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.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track 1 Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are listed in Table 1. Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 3. The location of planned excavations is shown in Figure 4.

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.

The criterion attached in Appendix 6 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.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is 12,167 tons.

The proposed disposal locations for Site-derived impacted materials will be established at a later date will be reported promptly to the OER Project Manager.

End-Point Sampling

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 (including non-detect results). Full chain of custody will be maintained and forms will be reported in the RAR. 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

Quality Assurance/Quality Control for chemical analytical program and assessment of usability of the data will be provided by Lancaster Laboratories, Inc. of Lancaster, Pennsylvania. Quality control samples will include at a minimum one field blank, one lab blank, and one trip blank, and one matrix spike/matrix spike duplicate (MSMSD) for every 20 (or fewer) samples.

Import and Reuse of Soils

It is not expected that backfill soil will be needed or soil will be reused/relocated on-site. If either is required, import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 3.

4.3 ENGINEERING CONTROLS

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

- Composite cover system;
- Installation of a vapor/waterproof membrane system beneath entire building slab;
- Ventilated single level underground parking garage below grade.

Composite Cover System

The entire property will be covered by an engineered cover system. This cover system will be comprised of the building slab beneath the entire property. 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

The building design for the foundation includes an exterior vapor/waterproofing system to prevent infiltration of vapor and moisture into the structure below grade, and construction of a ventilated parking garage in one story below grade. A sheet vapor/waterproofing membrane will be installed, including foundation wall surfaces and underslab surfaces. The proposed vapor/waterproofing membrane will serve as a vapor barrier. Since the proposed building footprint encompasses the site boundaries, the vapor/waterproofing membrane will cover the footprint of the site. The vapor/waterproofing membrane is a permanent engineering control for the Site. A W. R. Grace & Co.-Conn. (GRACE) Preprufe® 160R vapor/waterproofing barrier will be used on the foundation sidewalls. This product has a thickness of 0.8 millimeter (mm). A GRACE Preprufe® 300R vapor/waterproofing barrier will be used on the foundation slab. . This product has a thickness of 1.2 mm. Additional specifications for each of these products is provided in Appendix 5.

Ventilation

A single level underground parking garage will be built beneath the entire structure and will be ventilated according to NYC building code. The ventilation system will act as a tertiary engineering control to mitigate fugitive soil vapors.

4.4 INSTITUTIONAL CONTROLS

Institutional Controls will not be required because the site will be remediated to Track 1 SCOs.

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).

Known and Potential Sources

According to Sanborn maps the subject site is depicted as commercial stores and residences in 1905, stores and an open-air moving picture screen in 1916, the Republic Theatre (built in 1921) from at least 1942 to 1965, and a gasoline station from at least 1978 to 2007 (Shell serivce station).

The AOCs identified for this site include:

- Petroleum storage and dispensation structures associated with the Former Shell Service Station

Nature, Extent, Fate and Transport of Contaminants

The Phase II ESA performed by Triangle Court, LLC at the site in February 2011 identified VOCs, SVOCs, metals, and pesticide impacts to the unsaturated soil at concentrations above SCOs. VOC impacts were reported in a single sample location at a depth of 10-12 feet bgs. SVOC impacts were reported at two sample locations at a depth of 0-2 feet bgs and at a single sample location at a depth of 5-7 feet bgs. Metals were reported above SCOs at each sample location. Pesticides were reported at three sample locations at a depth of 0-2 feet bgs and a single sample location at a depth of 5-7 feet bgs. Ground water samples collected during the Phase II ESA exhibited VOC concentrations above applicable standards at two sample locations and VOC/SVOC concentrations above applicable standards at one sample location. Soil vapor samples collected during the Phase II ESA exhibited only a single compound concentration above the applicable guidance values. This sample was collected from a depth of 7-8 feet bgs.

Potential Routes of Exposure

Historically the site operated as a gasoline service station, activities associated with these operations have resulted in impacts to the unsaturated soil and ground water beneath the site. The environmental media that is affected is soil, ground water and soil vapor. The potential transport mechanisms include direct contact with soil and or ground water and airborne via dust or vapors. The routes of exposure include ingestion, dermal contact, and inhalation. The potential receptor population includes, during construction, current neighborhood residents and future site residents and site workers; and after construction, building occupants..

Existence of Human Health Exposure

Under current site conditions exposure is unlikely as the site is a vacant and access is limited by a locked fence. Future ingestion, dermal contact, and inhalation exposures are possible during active site redevelopment activities. Site workers would be most susceptible to these exposures in the form of dermal contact with impacted soil, inhalation of soil vapors and dust. Neighborhood residents would be most susceptible to inhalation of dust. Following the completion of redevelopment activities site residents and site workers would be most susceptible to soil vapors.

Receptor Populations

As stated above the potential receptor populations include site workers, site residents, and neighborhood residents.

Overall Human Health Exposure Assessment

To eliminate/mitigate the potential of ingestion during active redevelopment activities site workers will have the appropriate training (OSHA-40hr) and will review the site specific health and safety plan to understand the impacts associated with the soil and ground water at the site. The site will be fenced to limit public access. Vehicles entering and exiting the site will be inspected and cleaned as necessary to avoid the transport of impacted soil beyond the site boundaries. To eliminate/mitigate the potential of dermal contact during active redevelopment activities site workers will wear Level D personal protective equipment (PPE). Vehicles entering and exiting the site will be inspected and cleaned as necessary to avoid the transport of impacted soil beyond the site boundaries. To eliminate/mitigate the potential of inhalation particulate air monitoring will be performed during redevelopment activities and air monitoring of volatile organic compounds will be performed. At the completion of redevelopment activities ingestion and dermal contact will be eliminated by site building. Inhalation will be eliminated/mitigated by engineering controls in the form of a moisture/vapor barrier, remedial cover (building slab), and a ventilated underground parking structure.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 PROJECT ORGANIZATION AND OVERSIGHT

Principal personnel who will participate in the remedial action include QEP Timothy Fisher, Project Manager and Professional Engineer (PE) Sean Morgan, Senior Engineer.

5.2 SITE SECURITY

Site access will be controlled by Triangle Court, LLC through gated entrances to the fenced property. Barriers will be installed as needed to delineate and restrict access to the work area. For work areas of limited size, barrier tape will be sufficient to delineate and restrict access. For larger worker areas, temporary fencing will be provided.

5.3 WORK HOURS

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Timothy Fisher. 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 (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

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

5.6 AGENCY APPROVALS

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

5.7 SITE PREPARATION

Pre-Construction Meeting

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

Mobilization

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

Utility Marker Layouts, Easement Layouts

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

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

Dewatering

As necessary, submersible pumps will be are used to extract groundwater from gravel lined sumps in the excavation. Extracted groundwater will be conveyed to a storage tank or treatment system. Depending on the selected discharge option, a NYC DEP sewer use permit will be obtained to discharge groundwater to the combined sewers network.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. A Site map showing the location(s) of proposed equipment and material staging areas, truck wash, stockpile areas, and other pertinent remedial management features will be prepared by the Subcontractor prior to start of construction activities.

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 prepared by the Subcontractor prior to start of construction activities.

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 – in the event Track 1 is not achieved.

- 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, Sean Morgan, 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 Triangle Court Site 11CBCP008K.

I, Timothy Fisher, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the Triangle Court Site 11CBCP008K .

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 two month remediation (earthwork and concrete work) period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	0	>1
Remedial Excavation	4	7
Demobilization	11	>1
Submit Remedial Action Report	21	10

APPENDIX 1
CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Triangle Court, 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, Triangle Court, 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, Breanna Gribble, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841

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

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

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. Triangle Court will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

- Brooklyn Public Library, Leonard Branch
- 81 Devoe Street, Brooklyn, New York, 11211
- Telephone Number: 718-486-3365
- Hours of operation: Monday 1pm-8pm, Tuesday & Friday 10am-6pm, Wednesday & Thursday 1pm-6pm, Saturday & Sunday closed.

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use. A CD containing the final RAWP will be placed in the above listed library which provides the primary public repository for this project's documents.

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 Triangle Court, reviewed and approved by OER prior to distribution and mailed by Triangle Court. 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.**

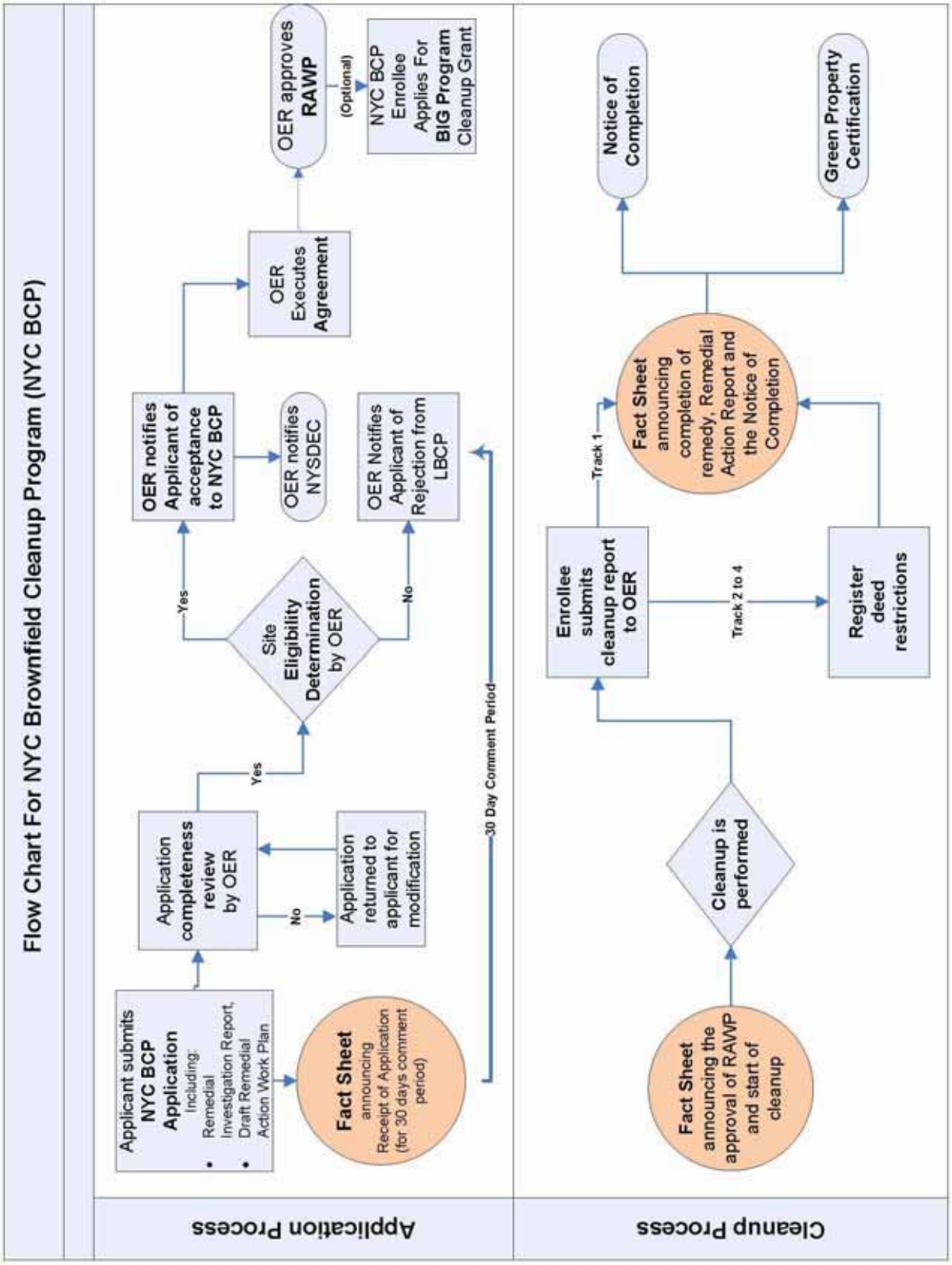
  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes 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. Signage for the project will include a sturdy placard mounted on the property line at the primary construction entrance to the property that includes the NYC BCP Fact Sheet announcing the remedial action. The fact sheet will be laminated and permanently affixed to the placard. The Fact Sheet will be visible and legible on the public right-of-way and will be posted in the immediate vicinity of building and other permits.

- **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.


Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)
Application Process
Cleanup Process
Applicant submits NYC BCP Application Including: • Remedial Investigation Report, • Draft Remedial Action Work Plan
Fact Sheet announcing Receipt of Application (for 30 days comment period)
Application completeness review by OER
No
Application returned to applicant for modification
Yes
Site Eligibility Determination by OER
Yes
No
OER notifies Applicant of acceptance to NYC BCP
OER notifies NYSDEC
OER Notifies Applicant of Rejection from LBCP
30 Day Comment Period
OER Executes Agreement
OER approves RAWP
(Optional)
NYC BCP Enrollee Applies For BIG Program Cleanup Grant
Fact Sheet announcing the approval of RAWP and start of cleanup
Cleanup is performed
Enrollee submits cleanup report to OER
Track 1
Track 2 to 4
Register deed restrictions
Fact Sheet announcing completion of remedy, Remedial Action Report and the Notice of Completion
Notice of Completion
Green Property Certification

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. Triangle Court, 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. Triangle Court, 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.

The outbound truck transport route is to turn left onto Grand Street, turn left onto Union Avenue, turn left onto Metropolitan Avenue, turn left onto Marcy Avenue, slight left onto Interstate 278 (Brooklyn-Queens Expressway). Inbound truck transport route is exit 32 off of the Brooklyn-Queens Expressway northbound, merge onto Rodney Street, turn right onto Metropolitan Avenue, turn right onto Union Avenue, turn right onto Grand Street – arrive at site. . This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

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

The Remedial Action Report will include an itemized account of the destination of all 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). The facility that has been selected to received the impacted soil/fill excavated from this site is Clean Earth of Carteret, New Jersey.

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.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses

and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in Table 2. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC 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. Reuse of soil and fill is not expected.

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 2. No backfill soil from off-site source sources is anticipated to be imported.

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. Backfill soil quality limits applicable to this project, if any, are Track 1 SCOs.

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

HEALTH AND SAEFTY PLAN

APPENDIX 5

DESIGN DIAGRAMS AND SPECIFICATIONS FOR VAPOR BARRIER/WATERPROOFING MEMBRANE

APPENDIX 6

GENERIC PROCEDURES FOR MANAGEMENT OF UNDERGROUND STORAGE TANKS IDENTIFIED UNDER THE NYC BCP

TABLES

TABLE 1
Phase II Investigation
Soil Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Analytical Parameter	NYSDEC Soil Cleanup Objective - Unrestricted Use	Soil Sample Locations and Concentrations					
		SB-1_0-2ft	SB-1_10-12ft	SB-2_0-2ft	SB-2_8-10ft	SB-3_0-2ft	SB-3_5-7ft
Metals (mg/kg)[1]							
Aluminum	--	7,870	14,200	7,820	6,400	12,500	10,800
Arsenic	13 [c]	< 1.15	< 1.11	< 1.11	< 1.05	< 5.76	< 1.13
Antimony	--	4.91	2.25 J	4.97	< 1.00	< 5.47	4.02 J
Barium	350 [c]	**546**	35.0	289	20.3	131	58.0
Beryllium	7.2	0.360 J	0.547 J	0.358 J	0.285 J	0.493 J	0.385 J
Cadmium	2.5 [c]	1.09 J	0.167 J	0.904 J	< 0.148	< 0.806	0.282 J
Calcium	--	41,900	993	49,600	531	38,200	43,600
Chromium	1[b]	**19.7**	**22.2**	**15.3**	**12.0**	**21.4**	**15.3**
Cobalt	--	5.16	10.8	4.78	3.18	4.30 J	3.85
Copper	50	39.9	16.9	25.0	6.81	16.4	11.2
Iron	--	13,700	18,600	15,200	9,350	45,400	14,100
Lead	63 [c]	**138**	8.29	**211**	5.07	**89.9**	15.3
Magnesium	--	3,240	2,390	3,460	1,270	4,850	4,930
Manganese	1600 [c]	223	412	220	61.2	318	371
Nickel	30	19.2	15.0	16.9	7.35	12.9	11.9
Potassium	--	1,050	1,720	1,400	1,080	1,130	1,220
Selenium	3.9[c]	< 1.13	< 1.09	< 1.09	< 1.03	< 5.65	< 1.10
Silver	2	0.250 J	< 0.200	0.293 J	< 0.190	< 1.04	< 0.203
Sodium	--	317	139 J	468	200 J	1,430	1,090
Thallium	--	< 1.67	< 1.61	< 1.61	< 1.53	< 8.35	< 1.63
Vanadium	--	34.4	34.4	28.1	19.4	40.3	24.4
Zinc	109 [c]	**427**	32.4	**430**	22.0	**157**	35.5
Total Mercury	0.18 [c]	**0.532**	0.0046 J	1.38	< 0.0030	0.308	0.0120 J

TABLE 1
Phase II Investigation
Soil Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Analytical Parameter	NYSDEC Soil Cleanup Objective - Unrestricted Use	Soil Sample Locations and Concentrations					
		SB-1_0-2ft	SB-1_10-12ft	SB-2_0-2ft	SB-2_8-10ft	SB-3_0-2ft	SB-3_5-7ft
PCBs / Pesticides (ug/kg)[1]							
Aldrin	5 [c]	< 4.0	< 0.37	< 3.8	< 0.36	< 3.9	< 1.9
alpha-BHC	20	< 2.0	< 0.19	< 2.0	< 0.18	< 2.0	< 0.97
beta-BHC	36	< 2.3	< 0.21	< 2.2	< 0.21	< 2.2	< 1.1
Lindane	100	**130**	< 0.19	**230**	0.36 J	56	21
Chlordane (alpha)	94	< 2.0	< 0.19	2.0 J	< 0.18	< 2.0	< 0.97
Gamma Chlordane	NS	< 2.0	< 0.19	< 2.0	< 0.18	< 2.0	< 0.97
4,4'-DDD	3.3 [b]	**47**	< 0.37	< 27	< 0.36	< 3.9	< 1.9
4,4'-DDE	3.3 [b]	**120**	< 0.37	**27**	< 0.36	**11 J**	**4.3 J**
4,4'-DDT	3.3 [b]	**21**	< 0.37	< 18	< 0.36	< 14	< 1.9
delta-BHC [g]	40	< 3.7	< 0.35	< 3.6	< 0.34	< 3.6	< 1.8
Dieldrin	5 [c]	< 4.0	< 0.37	< 3.8	< 0.36	< 3.9	< 1.9
Endosulfan I [d, f]	2400	< 2.6	< 0.25	< 2.5	< 0.24	< 2.6	< 1.3
Endosulfan II [d, f]	2400	< 4.0	< 0.37	< 7.5	< 0.36	< 5.9	< 1.9
Endosulfan sulfate [d, f]	2400	31	< 0.37	< 28	< 0.36	< 24	< 1.9
Endrin	14	< 4.0	< 0.37	< 3.8	< 0.36	< 3.9	< 1.9
Endrin Aldehyde	--	5.6 J	< 0.37	< 6.6	< 0.36	< 6.2	< 1.9
Endrin Ketone	--	< 4.0	< 0.37	< 3.8	< 0.36	< 3.9	< 1.9
Heptachlor	42	**19**	< 0.19	**25**	< 0.18	8.7 J	2.6 J
Heptachlor Epoxide	--	< 2.0	< 0.19	< 2.0	< 0.18	< 2.0	< 0.97
Methoxychlor	--	< 20	< 1.9	< 20	< 1.8	< 20	< 9.7
Toxaphene	--	< 130	< 12	< 130	< 12	< 130	< 63
Dibenzofuran [f]	7000	6,400	< 38	**16,000**	< 36	580 J	290
PCB-1016	100	< 20	< 3.7	< 19	< 3.6	< 3.9	< 3.8
PCB-1221	100	< 20	< 3.7	< 19	< 3.6	< 3.9	< 3.8
PCB-1232	100	< 20	< 3.7	< 19	< 3.6	< 3.9	< 3.8
PCB-1242	100	< 20	< 3.7	< 19	< 3.6	< 3.9	< 3.8
PCB-1248	100	< 20	< 3.7	< 19	< 3.6	< 3.9	< 3.8
PCB-1254	100	< 20	< 3.7	< 19	< 3.6	< 3.9	34
PCB-1260	100	< 20	< 3.7	67 J	< 3.6	13 J	< 3.8

TABLE 1
Phase II Investigation
Soil Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Analytical Parameter	NYSDEC Soil Cleanup Objective - Unrestricted Use	Soil Sample Locations and Concentrations					
		SB-1_0-2ft	SB-1_10-12ft	SB-2_0-2ft	SB-2_8-10ft	SB-3_0-2ft	SB-3_5-7ft
Semivolatile organic compounds (ug/kg)[1]							
Acenaphthene	20000	4,400 J	< 38	12,000	< 36	680 J	230
Acenapthylene [f]	100000 [a]	8,600	< 38	21,000	< 36	1,700	79 J
Anthracene [f]	100000 [a]	23,000	< 38	61,000	< 36	3,400	730
Benz(a)anthracene [f]	1000[c]	**54,000**	< 38	**100,000**	< 36	**11,000**	**1,100**
Benzo(a)pyrene	1000[c]	**41,000**	< 38	**87,000**	< 36	**9,200**	830
Benzo(b)fluoranthene[f]	1000[c]	**51,000**	< 38	**110,000**	< 36	**12,000**	920
Benzo(g,h,i)perylene [f]	100000	24,000	< 38	52,000	< 36	6,000	530
Benzo(k)fluoranthene[f]	800 [c]	**25,000**	< 38	**43,000**	< 36	**5,200**	520
4-Bromophenyl-phenylether	--	< 1,000	< 38	< 960	< 36	< 200	< 38
Butylbenzylphthalate	--	< 2,000	< 75	< 1,900	< 72	< 390	6,100
Di-n-butylphthalate	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
Carbazole	--	6,600	< 38	17,000	< 36	1,200	300
4-Chloro-3-methylphenol	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
4-Chloroaniline	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
bis(2-Chloroethoxy)methane	--	< 1,000	< 38	< 960	< 36	< 200	< 38
bis(2-Chloroethyl)ether	--	< 1,000	< 38	< 960	< 36	< 200	< 38
2-Chloronaphthalene	--	< 1,000	< 38	< 960	< 36	< 200	< 38
2-Chlorophenol	--	< 1,000	< 38	< 960	< 36	< 200	< 38
4-Chlorophenyl-phenylether	--	< 1,000	< 38	< 960	< 36	< 200	< 38
2,2'-oxybis(1-Chloropropane)	--	< 1,000	< 38	< 960	< 36	< 200	< 38
Chrysene [f]	1000[c]	**47,000**	< 38	**99,000**	< 36	**10,000**	**1,100**
Dibenz(a,h)anthracene[f]	330 [b]	**6,900**	< 38	**15,000**	< 36	**1,600**	160 J
Dibenzofuran	--	6,400	< 38	16,000	< 36	580 J	290
1,2-Dichlorobenzene[f]	1.1	< 1,000	< 38	< 960	< 36	< 200	< 38
1,3-Dichlorobenzene[f]	2.4	< 1,000	< 38	< 960	< 36	< 200	< 38
1,4-Dichlorobenzene	1.8	< 1,000	< 38	< 960	< 36	< 200	< 38
3,3'-Dichlorobenzidine	--	< 3,000	< 110	< 2,900	< 110	< 590	< 110

TABLE 1
Phase II Investigation
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Triangle Court Project
456 Grand Street, Brooklyn, New York

Analytical Parameter	NYSDEC Soil Cleanup Objective - Unrestricted Use	Soil Sample Locations and Concentrations					
		SB-1_0-2ft	SB-1_10-12ft	SB-2_0-2ft	SB-2_8-10ft	SB-3_0-2ft	SB-3_5-7ft
2,4-Dichlorophenol	--	< 1,000	< 38	< 960	< 36	< 200	< 38
Diethylphthalate	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
2,4-Dimethylphenol	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
Dimethylphthalate	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
4,6-Dinitro-2-methylphenol	--	< 5,000	< 190	< 4,800	< 180	< 980	< 190
2,4-Dinitrophenol	--	< 10,000	< 380	< 9,600	< 360	< 2,000	< 380
2,4-Dinitrotoluene	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
2,6-Dinitrotoluene	--	< 1,000	< 38	< 960	< 36	< 200	< 38
bis(2-Ethylhexyl)phthalate	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
Fluoranthene [f]	100000 [a]	91,000	< 38	**240,000**	< 36	16,000	2,000
Fluorene	30000	9,300	< 38	21,000	< 36	810 J	300
Hexachlorobenzene	--	< 1,000	< 38	< 960	< 36	< 200	< 38
Hexachlorobutadiene	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
Hexachlorocyclopentadiene	--	< 5,000	< 190	< 4,800	< 180	< 980	< 190
Hexachloroethane	--	< 1,000	< 38	< 960	< 36	< 200	< 38
Indeno(1,2,3-cd)pyrene [f]	500 [c]	**23,000**	< 38	**50,000**	< 36	**5,400**	**510**
Isophorone	--	< 1,000	< 38	< 960	< 36	< 200	< 38
2-Methylnaphthalene	--	2,400 J	< 38	6,000	< 36	< 200	140 J
2-Methylphenol	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
4-Methylphenol	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
Naphthalene [f]	12000	3,000 J	< 38	10,000	< 36	310 J	250
2-Nitroaniline	--	< 1,000	< 38	< 960	< 36	< 200	< 38
3-Nitroaniline	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
4-Nitroaniline	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
Nitrobenzene	--	< 1,000	< 38	< 960	< 36	< 200	< 38
2-Nitrophenol	--	< 1,000	< 38	< 960	< 36	< 200	< 38
4-Nitrophenol	--	< 5,000	< 190	< 4,800	< 180	< 980	< 190
N-Nitroso-di-n-propylamine	--	< 1,000	< 38	< 960	< 36	< 200	< 38
N-Nitrosodiphenylamine	--	< 1,000	< 38	< 960	< 36	< 200	< 38
Di-n-octylphthalate	--	< 2,000	< 75	< 1,900	< 72	< 390	480
Pentachlorophenol	800 [b]	< 5,000	< 190	< 4,800	< 180	< 980	< 190
Phenanthrene [f]	100000	90,000	< 38	**220,000**	< 36	12,000	2,800
Phenol	330 [b]	< 1,000	< 38	< 960	< 36	< 200	< 38
Pyrene [f]	100000	100,000	< 38	**180,000**	37 J	21,000	2,500
1,2,4-Trichlorobenzene	--	< 1,000	< 38	< 960	< 36	< 200	< 38
2,4,5-Trichlorophenol	--	< 2,000	< 75	< 1,900	< 72	< 390	< 76
2,4,6-Trichlorophenol	--	< 1,000	< 38	< 960	< 36	< 200	< 38

TABLE 1
Phase II Investigation
Soil Analytical Data
Triangle Court Project
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Analytical Parameter	NYSDEC Soil Cleanup Objective - Unrestricted Use	Soil Sample Locations and Concentrations					
		SB-1_0-2ft	SB-1_10-12ft	SB-2_0-2ft	SB-2_8-10ft	SB-3_0-2ft	SB-3_5-7ft
Volatile organic compounds (ug/kg)[1]							
Acetone	50	22	**61**	41	< 8	25	28
Benzene	60	0.8 J	< 0.5	1 J	< 0.5	0.9 J	2 J
Bromodichloromethane	--	< 1	< 1	< 1	< 1	< 1	< 1
Bromoform	--	< 1	< 1	< 1	< 1	< 1	< 1
Bromomethane	--	< 2	< 2	< 2	< 2	< 2	< 2
Methyl ethyl ketone (2-butanone)	120	< 4	7 J	< 5	< 4	< 5	< 5
Carbon Disulfide	--	< 1	< 1	1 J	< 1	2 J	1 J
Carbon tetrachloride[f]	760	< 1	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	1100	< 1	< 1	< 1	< 1	< 1	< 1
	--	< 2	< 2	< 2	< 2	< 2	< 2
Chloroform	370	< 1	< 1	< 1	< 1	< 1	1 J
Chloromethane	--	< 2	< 2	< 2	< 2	< 2	< 2
Dibromochloromethane	--	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane[f]	270	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	20[c]	< 1	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene[f]	330	< 1	< 1	< 1	< 1	< 1	< 1
cis -1,2-Dichloroethene[f]	250	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene[f]	190	< 1	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	--	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,3-Dichloropropene	--	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropene	--	< 1	< 1	< 1	< 1	< 1	< 1
Ethylbenzene[f]	1000	< 1	< 1	< 1	< 1	1 J	< 1
2-Hexanone	--	< 3	< 3	< 4	< 3	< 4	< 4
4-Methyl-2-pentanone	--	< 3	< 3	< 4	< 3	< 4	< 4
Methylene chloride	50	< 2	< 2	< 2	< 2	< 2	< 2
Styrene	--	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	--	< 1	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	1300	< 1	< 1	10	< 1	< 1	< 1
Toluene	700	4 J	< 1	1 J	< 1	8	2 J
1,1,1-Trichloroethane[f]	680	< 1	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane		< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	470	< 1	< 1	< 1	< 1	< 1	< 1
Vinyl chloride[f]	20	< 1	< 1	< 1	< 1	< 1	< 1
Xylene (mixed)	260	5	< 1	< 1	< 1	6	2 J

Notes:

[1] - NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives (SCOs)

[a] The SCOs for unrestricted use were capped at a maximum value of 100 ppm. See Technical Support Document (TSD), section 9.3.

[b] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.

[c] For constituents where the calculated SCO was lower than the rural soil background concentration, as determined by the Department and Department of Health rura
this use of the site.

[d] SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.

[e] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO

[f] Protection of ecological
of ecological resources SCO according to the TSD.

ug/kg - microgram per kilogram
mg/kg - milligrams per kilogram
< - Not detected at or above indicated laboratory reporting limit
J - Laboratory estimated value
-- No guidance value
BOLD - A bolded dection signifies and exceedance of one or more of the SCOs

TABLE 2
Phase II Investigation
Ground Water Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Analytical Parameter	TOGS 1.1.1 - Standard	TOGS 1.1.1 - Guidance	TW-1	TW-2	TW-3
Volatile organic compounds (ug/L)					
Acetone	--	50	< 6	**63**	< 6
Benzene	1	--	< 0.5	< 1	< 0.5
Bromodichloromethane	--	50	< 1	< 2	< 1
Bromoform	--	50	< 1	< 2	< 1
Bromomethane	5*	--	< 1	< 2	< 1
2-Butanone	--	50	< 3	23	< 3
Carbon Disulfide	--	--	< 1	< 2	< 1
Carbon Tetrachloride	5	--	< 1	< 2	< 1
Chlorobenzene	5*	--	< 0.8	< 2	< 0.8
Chloroethane	5**	--	< 1	3 J	< 1
Chloroform	7	--	< 0.8	**14**	**22**
Chloromethane	--	--	< 1	< 2	< 1
Dibromochloromethane	--	50	< 1	< 2	< 1
1,1-Dichloroethane	5*	--	< 1	< 2	< 1
1,2-Dichloroethane	0.6	--	< 1	< 2	< 1
1,1-Dichloroethene	5*	--	< 0.8	< 2	< 0.8
cis-1,2-Dichloroethene	5*	--	< 0.8	< 2	< 0.8
trans-1,2-Dichloroethene	5*	--	< 0.8	< 2	< 0.8
1,2-Dichloropropane	1	--	< 1	< 2	< 1
cis-1,3-Dichloropropene	0.4	--	< 1	< 2	< 1
trans-1,3-Dichloropropene	0.4	--	< 1	< 2	< 1
Ethylbenzene	5*	--	< 0.8	**120**	< 0.8
2-Hexanone	--	50	< 3	< 6	< 3
4-Methyl-2-pentanone	--	--	< 3	< 6	< 3
Methylene Chloride	5*	--	< 2	< 4	< 2
Styrene	5**	--	< 1	< 2	< 1
1,1,2,2-Tetrachloroethane	5*	--	< 1	< 2	< 1
Tetrachloroethene	5*	--	< 0.8	< 2	< 0.8
Toluene	5*	--	< 0.7	< 1	< 0.7
1,1,1-Trichloroethane	5*	--	< 0.8	< 2	< 0.8
1,1,2-Trichloroethane	1	--	< 0.8	< 2	< 0.8
Trichloroethene	5*	--	< 1	< 2	< 1
Vinyl Chloride	2	--	< 1	< 2	< 1
Xylene (Total)	5*	--	< 0.8	**190**	< 0.8

TABLE 2
Phase II Investigation
Ground Water Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Analytical Parameter	TOGS 1.1.1 - Standard	TOGS 1.1.1 - Guidance	TW-1	TW-2	TW-3
Semivolatile organic compounds (ug/L)					
Acenaphthene	--	20	< 5	< 1	< 1
Acenaphthylene	--	--	< 5	< 1	< 1
Anthracene	--	50	< 5	< 1	< 1
Benzo(a)anthracene	--	--	< 5	< 1	< 1
Benzo(a)pyrene	ND	--	< 5	< 1	< 1
Benzo(b)fluoranthene	--	0.002	< 5	< 1	< 1
Benzo(g,h,i)perylene	--	--	< 5	< 1	< 1
Benzo(k)fluoranthene	--	0.002	< 5	< 1	< 1
4-Bromophenyl-phenylether	--	--	< 5	< 1	< 1
Butylbenzylphthalate	--	--	< 10	< 2	< 2
Di-n-butylphthalate	--	--	< 10	< 2	< 2
Carbazole	--	--	< 5	< 1	< 1
4-Chloro-3-methylphenol	--	--	< 5	< 1	< 1
4-Chloroaniline	5**	--	< 5	< 1	< 1
bis(2-Chloroethoxy)methane	5**	--	< 5	< 1	< 1
bis(2-Chloroethyl)ether	1	--	< 5	< 1	< 1
2-Chloronaphthalene	--	10	< 10	< 2	< 2
2-Chlorophenol	--	--	< 5	< 1	< 1
4-Chlorophenyl-phenylether	--	--	< 10	< 2	< 2
2,2'-oxybis(1-Chloropropane)	--	--	< 5	< 1	< 1
Chrysene	--	0.002	< 5	< 1	< 1
Dibenz(a,h)anthracene	--	--	< 5	< 1	< 1
Dibenzofuran	--	--	< 5	< 1	< 1
1,2-Dichlorobenzene	3	--	< 5	< 1	< 1
1,3-Dichlorobenzene	3	--	< 5	< 1	< 1
1,4-Dichlorobenzene	3	--	< 5	< 1	< 1
3,3'-Dichlorobenzidine	5**	--	< 10	< 2	< 2
2,4-Dichlorophenol	1	--	< 5	< 1	< 1
Diethylphthalate	--	--	< 10	< 2	< 2
2,4-Dimethylphenol	--	50	< 15	< 3	< 3
Dimethylphthalate	--	--	< 10	< 2	< 2
4,6-Dinitro-2-methylphenol	--	--	< 25	< 5	< 5
2,4-Dinitrophenol	--	10	< 50	< 10	< 10
2,4-Dinitrotoluene	5**	--	< 5	< 1	< 1
2,6-Dinitrotoluene	5*	--	< 5	< 1	< 1
bis(2-Ethylhexyl)phthalate	5	--	< 10	< 2	< 2
Fluoranthene	--	50	< 5	< 1	< 1
Fluorene	--	50	< 5	< 1	< 1
Hexachlorobenzene	0.4	--	< 5	< 1	< 1
Hexachlorobutadiene	0.5	--	< 5	< 1	< 1
Hexachlorocyclopentadiene	5*	--	< 25	< 5	< 5
Hexachloroethane	5*	--	< 5	< 1	< 1
Indeno(1,2,3-cd)pyrene	--	0.002	< 5	< 1	< 1
Isophorone	--	50	< 5	< 1	< 1
2-Methylnaphthalene	--	--	< 5	82	< 1

TABLE 2
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Ground Water Analytical Data
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Analytical Parameter	TOGS 1.1.1 - Standard	TOGS 1.1.1 - Guidance	TW-1	TW-2	TW-3
2-Methylphenol	--	--	< 5	< 1	< 1
4-Methylphenol	--	--	< 10	< 2	< 2
Naphthalene	--	10	< 5	**160**	< 1
2-Nitroaniline	5**	--	< 5	< 1	< 1
3-Nitroaniline	5**	--	< 5	< 1	< 1
4-Nitroaniline	5**	--	< 5	< 1	< 1
Nitrobenzene	0.4	--	< 5	< 1	< 1
2-Nitrophenol	--	--	< 5	< 1	< 1
4-Nitrophenol	--	--	< 50	< 10	< 10
N-Nitroso-di-n-propylamine	--	--	< 5	< 1	< 1
N-Nitrosodiphenylamine	--	50	< 10	< 2	< 2
Di-n-octylphthalate	--	--	< 10	< 2	< 2
Pentachlorophenol	1	--	< 15	< 3	< 3
Phenanthrene	--	50	< 5	< 1	< 1
Phenol	1	--	< 5	< 1	< 1
Pyrene	--	50	< 5	< 1	< 1
1,2,4-Trichlorobenzene	--	--	< 5	< 1	< 1
2,4,5-Trichlorophenol	--	--	< 5	< 1	< 1
2,4,6-Trichlorophenol	--	--	< 5	< 1	< 1

TABLE 2
Phase II Investigation
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Triangle Court Project
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Analytical Parameter	TOGS 1.1.1 - Standard	TOGS 1.1.1 - Guidance	TW-1	TW-2	TW-3
PCBs / Pesticides (ug/L)					
Aldrin	ND	--	< 0.0019	< 0.0019	< 0.0019
Alpha BHC	0.01	--	< 0.0029	< 0.0028	< 0.0029
Beta BHC	0.04	--	< 0.0028	< 0.0027	< 0.0028
Gamma BHC - Lindane	0.05	--	< 0.0019	< 0.0019	0.0022 J
Alpha Chlordane	--	--	< 0.0019	< 0.0019	< 0.0019
Gamma Chlordane	--	--	< 0.0038	< 0.0023	< 0.0023
p,p-DDD	0.3	--	< 0.0048	< 0.0047	0.027
p,p-DDE	0.2	--	< 0.0048	< 0.0047	0.0078 J
p,p-DDT	0.2	--	< 0.0048	< 0.0047	< 0.0048
Delta BHC	0.4	--	< 0.0028	< 0.0027	< 0.0028
Dieldrin	0.004	--	< 0.0050	< 0.0050	< 0.0050
Endosulfan I	--	--	< 0.0041	< 0.0041	< 0.0041
Endosulfan II	--	--	< 0.014	< 0.014	< 0.014
Endosulfan Sulfate	--	--	< 0.0051	< 0.0051	< 0.0051
Endrin	ND	--	< 0.0052	< 0.0052	< 0.0052
Endrin Aldehyde	5**	--	< 0.019	< 0.019	< 0.019
Endrin Ketone	5**	--	< 0.0048	< 0.0047	< 0.0048
Heptachlor	0.04	--	< 0.0019	< 0.0019	< 0.0019
Heptachlor Epoxide	0.03	--	< 0.0022	< 0.0022	< 0.0022
Methoxychlor	35	--	< 0.029	< 0.028	< 0.029
Toxaphene	0.06	--	< 0.95	< 0.95	< 0.95
PCB-1016	0.09	--	< 0.095	< 0.095	< 0.095
PCB-1221	0.09	--	< 0.095	< 0.095	< 0.095
PCB-1232	0.09	--	< 0.095	< 0.095	< 0.095
PCB-1242	0.09	--	< 0.095	< 0.095	< 0.095
PCB-1248	0.09	--	< 0.095	< 0.095	< 0.095
PCB-1254	0.09	--	< 0.095	< 0.095	< 0.095
PCB-1260	0.09	--	< 0.095	< 0.095	< 0.095

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Analytical Parameter	TOGS 1.1.1 - Standard	TOGS 1.1.1 - Guidance	TW-1	TW-2	TW-3
Metals (mg/L)					
Aluminum	100	--	10.6	5.88	26.4
Antimony	25	--	< 0.0100	< 0.0100	< 0.0100
Arsenic	3	--	< 0.0098	< 0.0098	0.0126 J
Barium	1000	--	0.0645	0.0741	0.235
Beryllium	3	--	< 0.0014	< 0.0014	< 0.0014
Cadmium	5	--	< 0.0020	0.0024 J	< 0.0020
Calcium	--	--	142	63.7	20.0
Chromium	50	--	0.0189 J	0.0152 J	0.0481
Cobalt	--	--	0.0085 J	0.0089 J	0.0159
Copper	200	--	0.0050 J	0.0064 J	0.0646
Iron	300	--	11.7	60.8	35.8
Lead	25	--	< 0.0069	0.0144 J	0.148
Magnesium	--	35000	15.0	9.54	5.63
Manganese	300	--	0.961	0.493	0.333
Nickel	100	--	0.0118 J	0.0062 J	0.0363
Potassium	--	--	24.7	4.25	4.25
Selenium	10	--	< 0.0089	< 0.0089	< 0.0089
Silver	50	--	< 0.0023	< 0.0023	< 0.0023
Sodium	20000	--	185	26.7	8.72
Thallium	--	0.5	< 0.0140	< 0.0140	< 0.0140
Vanadium	--	--	0.0312	0.0182	0.0592
Zinc	--	2,000	0.0280 J	0.0319 J	0.182
Mercury	0.7	--	< 0.000050	< 0.000050	< 0.000050

Notes:
1. Standard / Guidance values are the NYSDEC's TOGS, dated October 22, 1993, revised June 1998.
< - Not detected at or above indicated laboratory reporting limit
-- No Standard / Guidance Value
ug/L - Micrograms per liter
mg/L - Milligrams per liter
J - Laboratory estimated value.

TABLE 3
Phase II Investigation
Soil Vapor Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Compound	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 Csoil-gas		Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 Csoil-gas		VP-1		VP-2		VP-3		Surface	
		(ppbv)	(ug/m3)	(ppbv)	(ug/m3)	ppb (v)	ug/m3	ppb (v)	ug/m3	ppb (v)	ug/m3	ppb (v)	ug/m3
Acetone	NC	1.50E+03	3.50E+03	1.50E+04	3.50E+04	21	50	540	1300	20 J	47 J	6.4	15
Acetonitrile	NC	3.60E+02	6.00E+02	3.60E+03	6.00E+03	< 0.50	< 0.84	150 J	250 J	< 5	< 8.4	2.6	4.4
Acrolein	NC	8.70E-02	2.00E-01	8.70E-01	2.00E+00	< 0.50	< 1.1	< 50	< 110	< 5	< 11	< 0.50	< 1.1
Acrylonitrile	NC	9.20E+00	2.00E+01	9.20E+01	2.00E+02	< 0.50	< 1.1	< 50	< 110	< 5	< 11	< 0.50	< 1.1
Benzene	C	9.80E+01	3.10E+02	9.80E+02	3.10E+03	2.5	8.1	< 20	<64	< 2	< 6.4	0.54 J	1.7 J
Bromobenzene	--	--	--	--	--	< 0.20	< 1.3	< 20	< 130	< 2	< 13	< 0.20	< 1.3
Bromodichloromethane	C	**	**	**	**	< 0.20	< 1.3	< 20	< 130	< 2	< 13	< 0.20	< 1.3
Bromoform	C	9.70E+00	5.00E+01	9.70E+01	5.00E+02	< 0.20	< 2.1	< 20	< 210	< 2	< 21	< 0.20	< 2.1
Bromomethane	--	--	--	--	--	< 0.20	< 0.78	< 20	< 78	< 2	< 7.8	< 0.20	< 0.78
1,3-Butadiene	C	3.90E+00	8.70E+00	3.90E+01	8.70E+01	< 0.50	< 1.1	< 50	< 110	< 5	< 11	< 0.50	< 1.1
2-Butanone	NC	3.40E+03	1.00E+04	3.40E+04	1.00E+05	5.2	15	< 50	< 150	< 5	< 15	2.3	6.9
tert-Butyl Alcohol	--	--	--	--	--	0.72	2.2 J	< 20	< 61	< 2	< 6.1	< 0.20	< 0.61
Carbon Disulfide	NC	2.20E+03	7.00E+03	2.20E+04	7.00E+04	0.72	2.2 J	170	540	< 2	< 6.3	< 0.20	< 0.62
Carbon Tetrachloride	C	2.60E+01	1.60E+02	2.60E+02	1.60E+03	< 0.20	< 1.3	< 20	< 130	< 2	< 13	< 0.20	< 1.3
Chlorobenzene	NC	1.30E+02	6.00E+02	1.30E+03	6.00E+03	< 0.20	< 0.92	< 20	< 92	< 2	< 92.	< 0.20	< 0.92
Chlorodifluoromethane	NC	1.40E+05	5.00E+05	**	**	0.27	0.96 J	< 20	< 71	< 2	< 7.1	0.31 J	1.1 J
Chloroethane	NC	3.80E+04	1.00E+05	3.80E+05	1.00E+06	< 0.20	< 0.53	< 20	< 53	< 2	< 5.3	< 0.20	< 0.53
Chloroform	C	2.20E+01	1.10E+02	2.20E+02	1.10E+03	1.7	8.2	< 20	< 98	12	58	< 0.20	< 0.98
Chloromethane	NC	4.40E+02	9.00E+02	4.40E+03	9.00E+03	< 0.20	< 0.41	< 20	< 41	< 2	< 4.1	0.76 J	1.6 J
3-Chloropropene	--	--	--	--	--	< 0.20	< 0.63	< 20	< 63	< 2	< 6.3	< 0.20	< 0.63
Cumene	NC	8.10E+02	4.00E+03	8.10E+03	4.00E+04	0.35	1.7 J	< 20	< 98	< 2	< 9.8	< 0.20	< 0.98
Dibromochloromethane	C	1.20E+01	1.00E+02	1.20E+02	1.00E+03	< 0.20	< 1.7	< 20	< 170	< 2	< 17	< 0.20	< 1.7
1,2-Dibromoethane	NC	2.60E-01	2.00E+00	2.60E+00	2.00E+01	< 0.20	< 1.5	< 20	< 150	< 2	< 15	< 0.20	< 1.5
Dibromomethane	NC	4.90E+01	3.50E+02	4.90E+02	3.50E+03	< 0.20	< 1.4	< 20	< 140	< 2	< 14	< 0.20	< 1.4
1,2-Dichlorobenzene	NC	3.30E+02	2.00E+03	3.30E+03	2.00E+04	< 0.20	< 1.2	< 20	< 120	< 2	< 12	< 0.20	< 1.2
1,3-Dichlorobenzene	NC	1.70E+02	1.10E+03	1.70E+03	1.10E+04	< 0.20	< 1.2	< 20	< 120	< 2	< 12	< 0.20	< 1.2
1,4-Dichlorobenzene	NC	1.30E+03	8.00E+03	1.30E+04	8.00E+04	< 0.20	< 1.2	< 20	< 120	< 2	< 12	< 0.20	< 1.2
Dichlorodifluoromethane	NC	4.00E+02	2.00E+03	4.00E+03	2.00E+04	0.68	3.4 J	< 20	< 99	< 2	< 9.9	0.69 J	3.4 J
1,1-Dichloroethane	NC	1.20E+03	5.00E+03	1.20E+04	5.00E+04	< 0.20	< 0.81	< 20	< 81	< 2	< 8.1	< 0.20	< 0.81
1,2-Dichloroethane	C	2.30E+01	9.40E+01	2.30E+02	9.40E+02	< 0.20	< 0.81	< 20	< 81	< 2	< 8.1	< 0.20	< 0.81
1,1-Dichloroethene	NC	5.00E+02	2.00E+03	5.00E+03	2.00E+04	< 0.20	< 0.79	< 20	< 79	< 2	< 7.9	< 0.20	< 0.79
cis-1,2-Dichloroethene	NC	8.80E+01	3.50E+02	8.80E+02	3.50E+03	< 0.20	< 0.79	< 20	< 79	< 2	< 7.9	< 0.20	< 0.79
trans-1,2-Dichloroethene	NC	1.80E+02	7.00E+02	1.80E+03	7.00E+03	< 0.20	< 0.79	< 20	< 79	< 2	< 7.9	< 0.20	< 0.79
Dichlorofluoromethane	--	--	--	--	--	< 0.20	< 0.84	< 20	< 84	< 2	< 8.4	< 0.20	< 0.84
1,2-Dichloropropane	NC	8.70E+00	4.00E+01	8.70E+01	4.00E+02	< 0.20	< 0.92	< 20	< 92	< 2	< 9.2	< 0.20	< 0.92
cis-1,3-Dichloropropene	--	--	--	--	--	< 0.20	< 0.91	< 20	< 91	< 2	< 9.1	< 0.20	< 0.91
trans-1,3-Dichloropropene	--	--	--	--	--	< 0.20	< 0.91	< 20	< 91	< 2	< 9.1	< 0.20	< 0.91
1,4-Dioxane	--	--	--	--	--	< 0.20	< 0.72	< 20	< 72	< 2	< 7.2	< 0.20	< 0.72
Ethyl Acetate	NC	8.70E+03	3.20E+04	8.70E+04	3.20E+05	< 0.20	< 0.72	< 20	< 72	< 2	< 7.2	< 0.20	< 0.72
Ethyl Acrylate	--	--	--	--	--	< 0.20	< 0.82	< 20	< 82	< 2	< 8.2	< 0.20	< 0.82
Ethyl Methacrylate	NC	6.80E+02	3.20E+03	6.80E+03	3.20E+04	< 0.20	< 0.93	< 20	< 93	< 2	< 9.3	< 0.20	< 0.93
Ethylbenzene	C	5.10E+02	2.20E+03	5.10E+03	2.20E+04	7.2	31	< 20	< 87	5.3 J	23 J	< 0.20	< 0.87
4-Ethyltoluene	--	--	--	--	--	1.5	7.4	< 20	< 98	< 2	< 9.8	< 0.20	< 0.98
Freon 113	NC	3.90E+04	3.00E+05	3.90E+05	3.00E+06	< 0.50	< 3.8	< 50	< 380	< 5	< 38	< 0.50	< 3.8
Freon 114	--	--	--	--	--	< 0.20	< 1.4	< 20	< 140	< 2	< 14	< 0.20	< 1.4
Heptane	--	--	--	--	--	1.5	6	210	880	44	180	< 0.20	< 0.82
Hexachlorobutadiene	C	1.00E+01	1.10E+02	1.00E+02	1.10E+03	< 0.50	< 5.3	< 50	< 530	< 5	< 53	< 0.50	< 5.3
Hexachloroethane	C	6.30E+01	6.10E+02	6.30E+02	6.10E+03	< 0.20	< 1.9	< 20	< 190	< 2	< 19	< 0.20	< 1.9
Hexane	NC	5.70E+02	2.00E+03	5.70E+03	2.00E+04	3	11	**630**	**2,200**	79	280	0.32 J	1.1 J
2-Hexanone	--	--	--	--	--	< 0.50	< 2.0	< 50	< 200	< 5	< 20	< 0.50	< 2.0
Isooctane	--	--	--	--	--	1.1	5.2	2400	11,000	28	<130	< 0.20	< 0.93
Methyl Acrylate	NC	3.00E+02	1.10E+03	3.00E+03	1.10E+04	< 0.20	< 0.70	< 20	< 70	< 2	< 7	< 0.20	< 0.70
Methyl Iodide	NC	2.00E+02	8.00E+02	2.00E+03	8.00E+03	< 0.20	< 1.2	< 20	< 120	< 2	< 12	< 0.20	< 1.2

TABLE 3
Phase II Investigation
Soil Vapor Analytical Data
Triangle Court Project
456 Grand Street, Brooklyn, New York

Compound	Basis of Target Concentration C=cancer risk NC=noncancer risk	Target Shallow Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 Csoil-gas		Target Deep Soil Gas Concentration Corresponding to Target Indoor Air Concentration Where the Soil Gas to Indoor Air Attenuation Factor=0.01 Csoil-gas		VP-1		VP-2		VP-3		Surface	
		(ppbv)	(ug/m3)	(ppbv)	(ug/m3)	ppb (v)	ug/m3	ppb (v)	ug/m3	ppb (v)	ug/m3	ppb (v)	ug/m3
Methyl Methacrylate	NC	1.70E+03	7.00E+03	1.70E+04	7.00E+04	< 0.20	< 0.82	410	1700	< 2	< 8.2	< 0.20	< 0.82
Alpha Methyl Styrene	--	--	--	--	--	< 0.20	< 0.97	< 20	< 97	< 2	< 9.7	< 0.20	< 0.97
Methyl t-Butyl Ether	NC	8.30E+03	3.00E+04	8.30E+04	3.00E+05	< 0.20	< 0.72	< 20	< 72	< 2	< 7.2	< 0.20	< 0.72
4-Methyl-2-Pentanone	NC	2.00E+02	8.00E+02	8.00E+03	2.00E+03	< 0.50	< 2.0	< 50	< 200	< 5	< 20	< 0.50	< 2.0
Methylene Chloride	NC	1.50E+03	5.20E+03	1.50E+04	5.20E+04	0.35 J	1.2 J	240	840	< 2	< 6.9	0.29 J	1 J
Octane	--	--	--	--	--	1.1	5.1	51	240	43	200	< 0.20	<0.93
Pentane	--	--	--	--	--	7.7	23	390	1200	120	390	0.63 J	1.9 J
Propene	--	--	--	--	--	140	240	< 20	< 34	120	220	0.94 J	1.6 J
Styrene	NC	2.30E+03	1.00E+04	2.30E+04	1.00E+05	< 0.20	< 0.85	22 J	96 J	< 2	< 8.5	< 0.20	< 0.85
1,1,1,2-Tetrachloroethane	C	4.80E+01	3.30E+02	4.80E+02	3.30E+03	< 0.20	< 1.4	< 20	< 140	< 2	< 14	< 0.20	< 1.4
1,1,2,2-Tetrachloroethane	C	6.10E+00	4.20E+01	6.10E+01	4.20E+02	< 0.20	< 1.4	< 20	< 140	< 2	< 14	< 0.20	< 1.4
Tetrachloroethene	C	1.20E+02	8.10E+02	1.20E+03	8.10E+03	0.68 J	4.6 J	< 20	< 140	< 2	< 14	< 0.20	2.5 J
Toluene	NC	1.10E+03	4.00E+03	1.10E+04	4.00E+04	24	92	20 J	77 J	11	40	0.67 J	< 3.7
1,2,4-Trichlorobenzene	NC	2.70E+02	2.00E+03	2.70E+03	2.00E+04	< 0.50	< 3.7	< 50	< 370	< 5	< 37	< 0.50	<1.1
1,1,1-Trichloroethane	NC	4.00E+03	2.20E+04	4.00E+04	2.20E+05	0.5 J	2.7 J	< 20	< 110	< 2	< 11	< 0.20	<1.1
1,1,2-Trichloroethane	C	2.80E+01	1.50E+02	2.80E+02	1.50E+03	< 0.20	< 1.1	< 20	< 110	< 2	< 11	< 0.20	< 1.1
Trichloroethene	C	4.10E+00	2.20E+01	4.10E+01	2.20E+02	< 0.20	< 1.1	< 20	< 110	< 2	< 11	< 0.20	< 1.1
Trichlorofluoromethane	NC	1.20E+03	7.00E+03	1.20E+04	7.00E+04	0.4 J	2.2 J	< 20	< 110	< 2	< 11	0.32 J	1.8 J
1,2,3-Trichloropropane	NC	8.10E+00	4.90E+01	8.10E+01	4.90E+02	< 0.20	< 1.2	< 20	< 120	< 2	< 12	< 0.20	< 1.2
1,2,4-Trimethylbenzene	NC	1.20E+01	6.00E+01	1.20E+02	6.00E+02	4.6	22	< 20	< 98	2.4 J	12 J	< 0.20	<0. 98
1,3,5-Trimethylbenzene	NC	1.20E+01	6.00E+01	1.20E+02	6.00E+02	1.3	6.5	< 20	< 98	< 2	< 9.8	< 0.20	<0. 98
Vinyl Acetate	NC	5.70E+02	2.00E+03	5.70E+03	2.00E+04	< 0.50	< 1.8	< 50	< 1180	< 5	< 18	< 0.50	< 1.8
Vinyl Chloride	C	1.10E+02	2.80E+02	1.10E+03	2.80E+03	< 0.20	< 0.51	< 20	< 51	< 2	< 5.1	< 0.20	< 0.51
m/p-Xylene	NC	1.60E+04	7.00E+04	1.60E+05	7.00E+05	17	75	< 20	< 87	19	84	0.31 J	1.3 J
o-Xylene	NC	1.60E+04	7.00E+04	1.60E+05	7.00E+05	8.1	35	< 20	< 87	5.6 J	24 J	< 0.20	< 0.87

Notes:
Table 2 (a) of EPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soil (Subsurface Vapor Intrusion Guidance), November 200
< - Not detected at or above indicated laboratory reporting limit.
-- No Standard / Guidance Value
ppbv - part per billion by volume
ug/m3 - micrograms per cubic meter
J - Laboratory estimated value.

FIGURES

triangle court

NYCityMap

NYC E-Designation Sites (E)

NYS Brownfield and Voluntary Cleanup Program Sites (BCP/VCP)

Public School

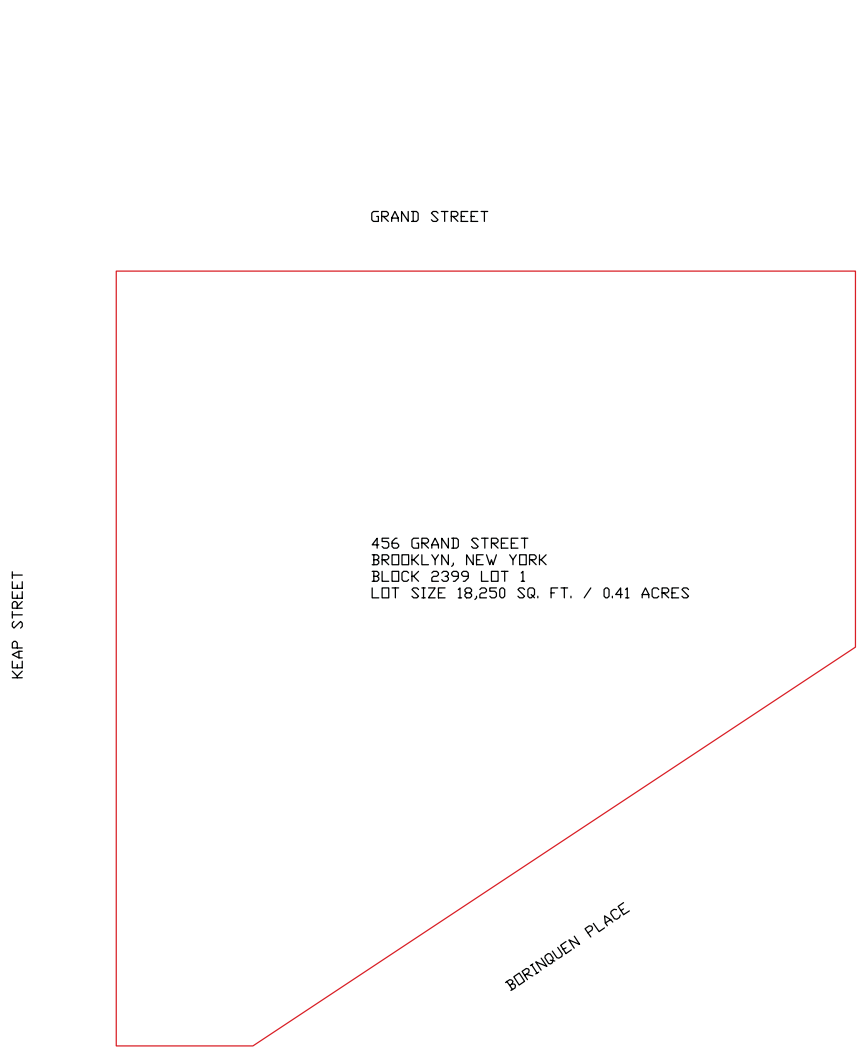
FIGURE 1

SITE LOCATION & SENSITIVE RECEPTOR MAP

456 GRAND STREET
BROOKLYN, NEW YORK

PROJECT NO.: V0010RA104	DRAWN BY: LKO
PREPARED BY: TF	DATE: 02/21/2011
FILE NAME: V0010RA104-1	

anteagroup



LEGEND

PROPERTY BOUNDARY

GRAPHIC SCALE

0 12.5 25

(IN FEET)
1 inch = 25 ft.

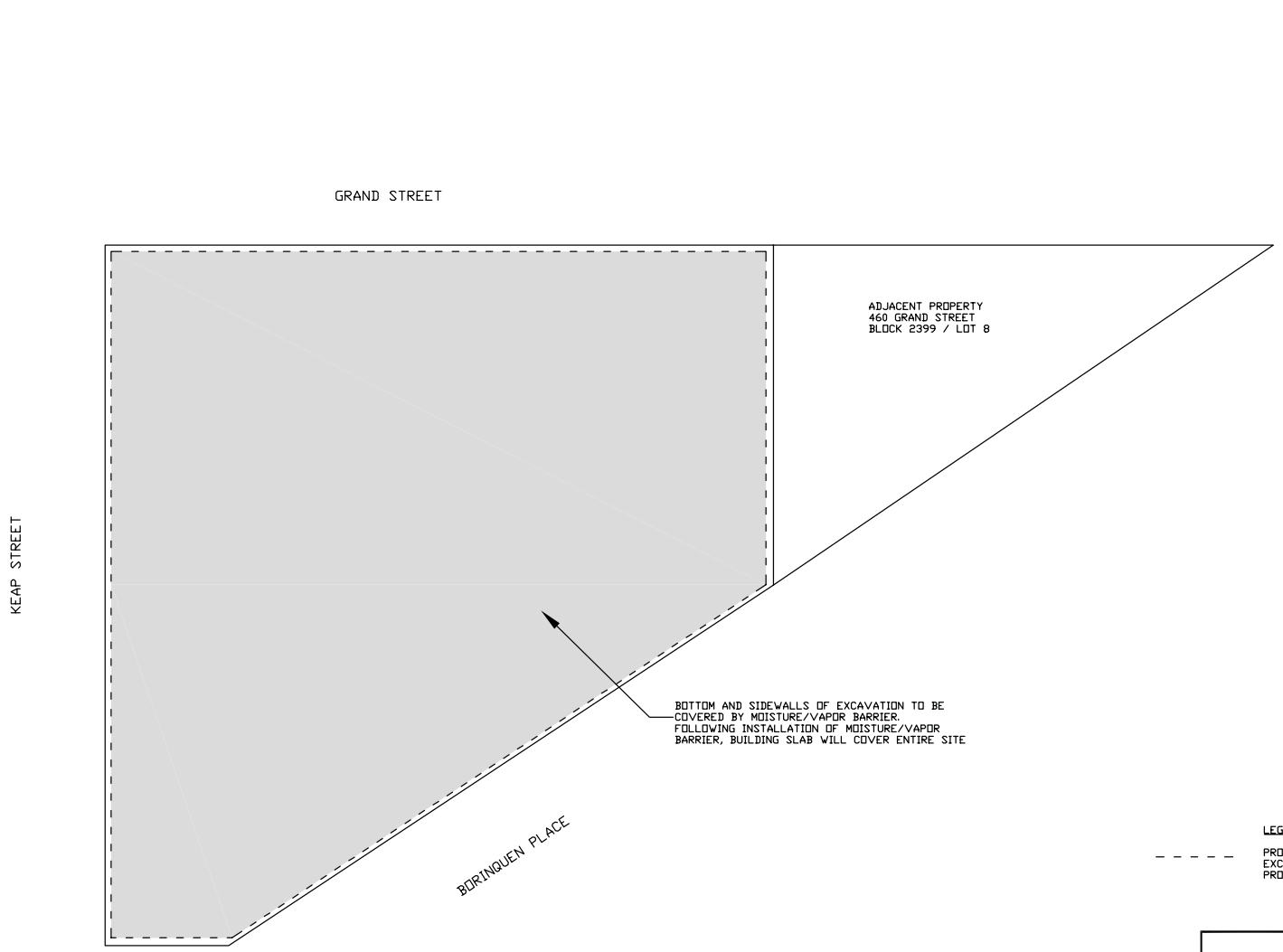
FIGURE 2

SITE PLAN

456 GRAND STREET
BROOKLYN, NEW YORK

PROJECT NO.:	DRAWN BY:
PREPARED BY:	DATE: 02/25/2011
FILE NAME:	

anteagroup



LEGEND

PROPOSED LIMITS OF EXCAVATION. EXCAVATION PROPOSED TO 12 FEET BGS.

GRAPHIC SCALE

0 12.5 25

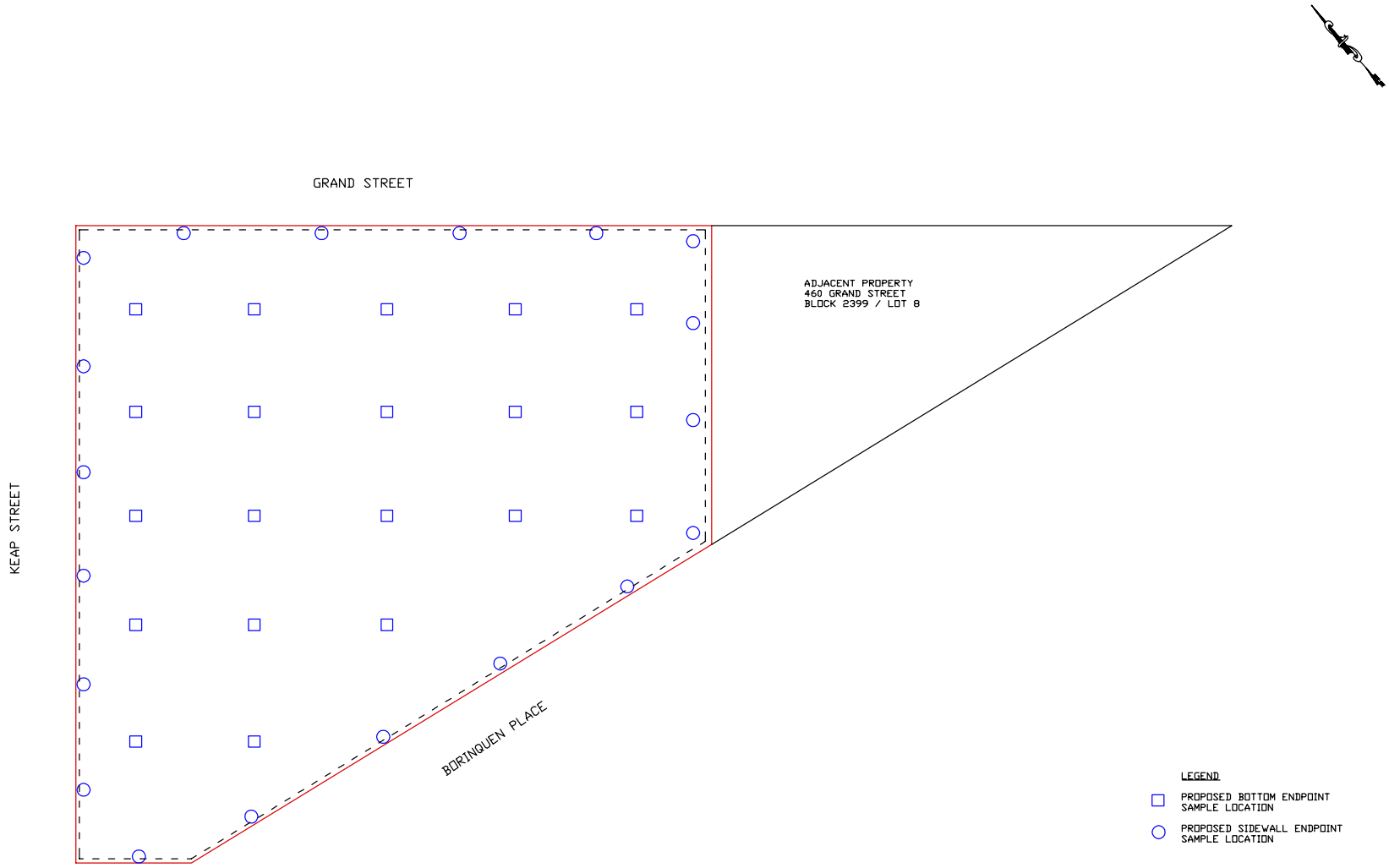
(IN FEET)
1 inch = 25 ft.

FIGURE 4
PLANNED EXCAVATION

456 GRAND STREET
BROOKLYN, NEW YORK

PROJECT NO.:	DRAWN BY:
PREPARED BY:	DATE: 02/23/2011
FILE NAME:	

anteagroup



LEGEND

- PROPOSED BOTTOM ENDPOINT SAMPLE LOCATION
- PROPOSED SIDEWALL ENDPOINT SAMPLE LOCATION

GRAPHIC SCALE

0 12.5 25

(IN FEET)
1 inch = 25 ft.

FIGURE 5
PROPOSED ENDPOINT SAMPLE LOCATIONS

456 GRAND STREET
BROOKLYN, NEW YORK

PROJECT NO.: [illegible]	DRAWN BY: [illegible]
PREPARED BY: [illegible]	DATE: 03/17/2011
FILE NAME: [illegible]	

anteagroup

APPENDIX 1
CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Triangle Court, 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, Triangle Court, 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, Breanna Gribble, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841

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

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

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. Triangle Court will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

- Brooklyn Public Library, Leonard Branch
- 81 Devoe Street, Brooklyn, New York, 11211
- Telephone Number: 718-486-3365
- Hours of operation: Monday 1pm-8pm, Tuesday & Friday 10am-6pm, Wednesday & Thursday 1pm-6pm, Saturday & Sunday closed.

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use. A CD containing the final RAWP will be placed in the above listed library which provides the primary public repository for this project's documents.

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 Triangle Court, reviewed and approved by OER prior to distribution and mailed by Triangle Court. 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.**

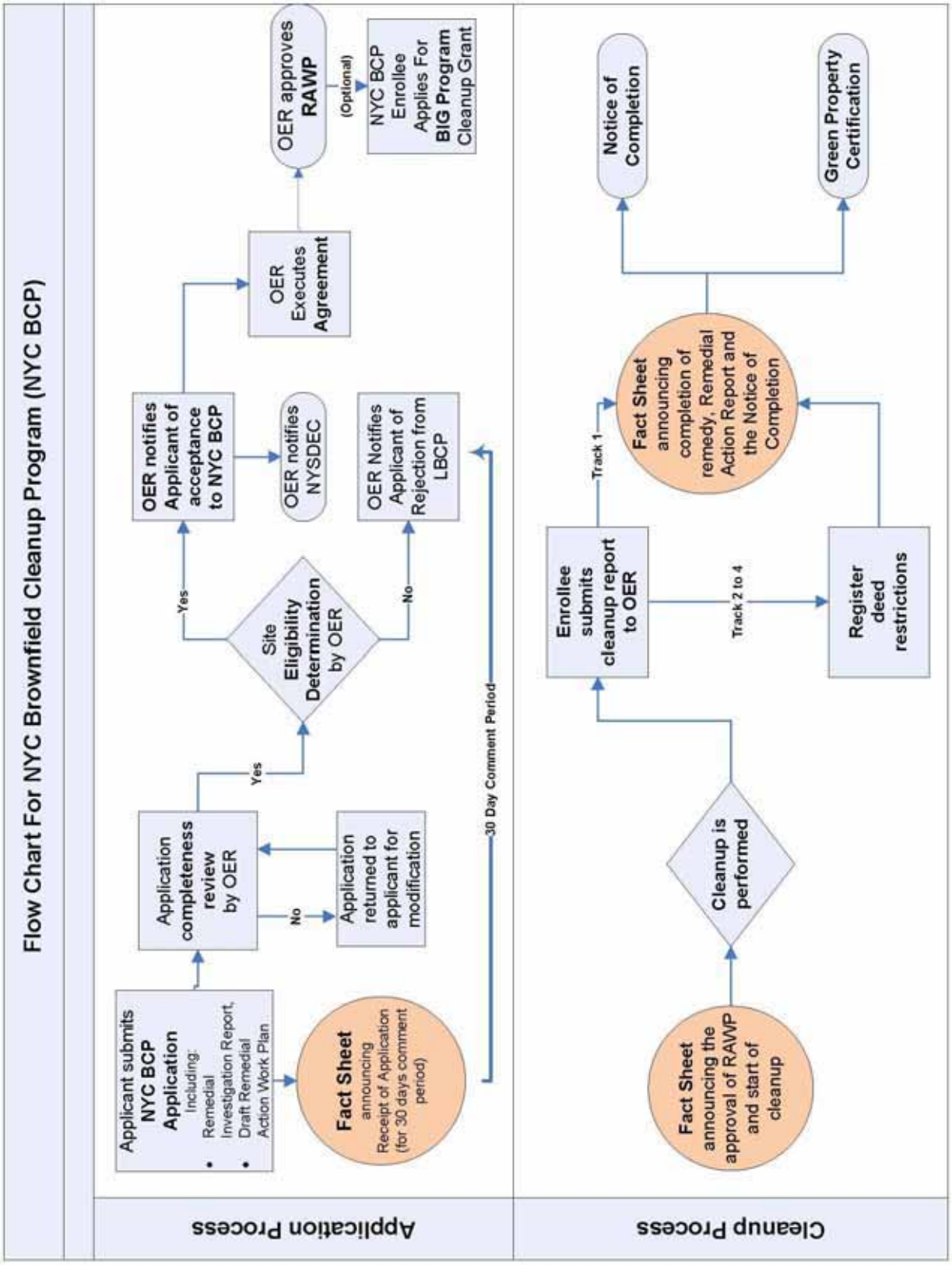
  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes 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. Signage for the project will include a sturdy placard mounted on the property line at the primary construction entrance to the property that includes the NYC BCP Fact Sheet announcing the remedial action. The fact sheet will be laminated and permanently affixed to the placard. The Fact Sheet will be visible and legible on the public right-of-way and will be posted in the immediate vicinity of building and other permits.

- **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.


Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)
Application Process
Cleanup Process
Applicant submits NYC BCP Application Including: • Remedial Investigation Report, • Draft Remedial Action Work Plan
Fact Sheet announcing Receipt of Application (for 30 days comment period)
Application completeness review by OER
No
Application returned to applicant for modification
Yes
Site Eligibility Determination by OER
Yes
No
OER notifies Applicant of acceptance to NYC BCP
OER notifies NYSDEC
OER Notifies Applicant of Rejection from LBCP
30 Day Comment Period
OER Executes Agreement
OER approves RAWP
(Optional)
NYC BCP Enrollee Applies For BIG Program Cleanup Grant
Fact Sheet announcing the approval of RAWP and start of cleanup
Cleanup is performed
Enrollee submits cleanup report to OER
Track 1
Track 2 to 4
Register deed restrictions
Fact Sheet announcing completion of remedy, Remedial Action Report and the Notice of Completion
Notice of Completion
Green Property Certification

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. Triangle Court, 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. Triangle Court, 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.

The outbound truck transport route is to turn left onto Grand Street, turn left onto Union Avenue, turn left onto Metropolitan Avenue, turn left onto Marcy Avenue, slight left onto Interstate 278 (Brooklyn-Queens Expressway). Inbound truck transport route is exit 32 off of the Brooklyn-Queens Expressway northbound, merge onto Rodney Street, turn right onto Metropolitan Avenue, turn right onto Union Avenue, turn right onto Grand Street – arrive at site. . This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

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

The Remedial Action Report will include an itemized account of the destination of all 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 e 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.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses

and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in Table 2. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC 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. Reuse of soil and fill is not expected.

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 2. No backfill soil from off-site source sources is anticipated to be imported.

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. Backfill soil quality limits applicable to this project, if any, are Track 1 SCOs.

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

HEALTH AND SAEFTY PLAN

SITE HEALTH AND SAFETY PLAN
PETROLEUM CLASS III

- The Project Manager or Site Safety Officer (SSO) must review the Site Health and Safety Plan (SHSP) with all members of the field crew, including Antea Group employees and subcontractors, ***prior to beginning all field work***.
- All field team members working in the contamination zone, or who may be exposed during the course of their work, shall have completed OSHA 40-hour HAZWOPER and annual refresher training (29 CFR 1910.120), CPR and First Aid training. ***Documentation of training shall be readily available***.
- Each Antea Group team member must review, sign and date the SHSP and the Acknowledgement Agreement on page 15.
- Each subcontractor employee and visitor must review the SHSP and sign, date, and describe their affiliation on page 16.
- Signed plan is kept in the field for duration of project and returned to the project file upon completion of field activities.
- SHSP shall be revised or rewritten if site activities are changed significantly, if areas of differing hazard are involved, or as information about contaminants and hazards changes. Changing conditions may justify either increasing or decreasing SHSP restrictions or action levels, depending upon the additional information generated.

I. GENERAL INFORMATION

ANTEA GROUP PROJECT NUMBER	**V0010-RA10-4**		
Client:	The Babaev Group	Site Owner:	Triangle Court, LLC
Site Name:	Triangle Court	Client Claim/PO Number:	
Site Address:	456 Grand Street, Brooklyn, New York		
Project Manager:	Timothy Fisher		
Plan Prepared by:	Timothy Fisher	Date:	February 1, 2011
Approved by:	Timothy Fisher	Date:	February 1, 2011
Revised by:	Timothy Fisher	Date:	March 22, 2011
Revision Approved by:	Timothy Fisher	Date:	March 22, 2011

Place date(s) in appropriate box(es) for current phase(s) of site activities.

Site Activities	Soil Borings	Monitoring Well Installation	Tank Removal	Soil Excavation	Recovery Well Installation	Pilot Tests	Treatment System Construction	Soil and Ground Water Sampling	LNAPL Recovery	O&M
Site Assessment	X	X								
Remedial Investigation										
Site Remediation/ Construction Activities				X						

II. EMERGENCY CONTINGENCY PLAN

A. LOCAL EMERGENCY TELEPHONE NUMBERS (provide area code):

Can 911 be used at this site? Yes [X] No [ ] If yes, be certain it is activated and enhanced.

Since cellular telephones may not reach a local 911 operator, also supply the following information.

Ambulance	(718) 628-5757	Fire Department	(718) 999-2117
Hospital Emergency Room	(718) 250-8075	Police Department	(718) 963-4168 or 383-3879
Poison Control Center	(212) 764-7667	HazMat Response Unit	(718) 595-4659
(List utility companies as	(800) 272-4480		( )
appropriate)	( )		( )

B. EMERGENCY ROUTES:

Hospital* Name: Brooklyn Hospital Center Phone number: (718) 250-8000

Hospital Address: 121 DeKalb Avenue, Brooklyn, NY 11201

Directions to nearest hospital: Head southeast on Grand Street toward Borinquen Place / Hooper Street; turn right at Union Avenue, go 0.4 mile; turn right at Heywood Street (at Broadway), go 0.4 mile; after 3 blocks turn left onto Lee Avenue, go 0.2 mile, then continue on Norstrand Avenue, go 0.6 mile; turn right at DeKalb Avenue, go 1.4 mils

*** Hospital should be notified immediately if an injury occurs which requires medical attention.**

Estimated driving distance: 3.0 miles Estimated driving time: 10 minutes

Does hospital accept chemically contaminated patients? Yes [X] No [ ]

INCLUDE HIGHLIGHTED HOSPITAL ROUTE(S) ON SITE MAP AS LAST PAGE OF SITE HEALTH & SAFETY PLAN.

C. SITE RESOURCES:

If no, identify closest available resource with directions.

Water supply available on site:	Yes	[ ]	No	[X]	Bathrooms available on site:	Yes [ ]	No [X]
Telephone available on site:	Yes	[ ]	No	[X]	Electricity available on site:	Yes [ ]	No [X]
Other resources available on site:	Yes	[ ]	No	[X]	If "yes", identify:		

D. EMERGENCY CONTACTS:

			PHONE NUMBER (provide area codes)	
			Work	24-hr. Contact
1.	Project Manager:	Timothy Fisher	(914) 495-9935	(949) 375-1174
2.	Hub Manager:	Aaron Lapine	(914) 495-9934	(949) 244-4951
3.	Health and Safety Sr. Specialists:	Dustin Rusch	(920) 907-6218	(920) 251-4029
4.	Site Contact:	Tim Fisher	(914) 495-9935	(949) 375-1174
5.	Client Contact:	Meir Babaev	(917)-416-2701	
6.	Applicable Regulatory Agency:	OER – Breanna Gribble	(212) 442-7126	
7.	Site Owner:	Meir Babaev – Triangle Court, LLC	(917)-416-2701	

E. PROJECT HEALTH AND SAFETY TEAM:

Team Members (list)

Project Manager:	Timothy Fisher
Public Information:	
Antea Group on-site Personnel: (On-site personnel	On-site Antea Group Personnel
Are responsible for Antea Group site health and safety.)	On-site Antea Group Personnel
Antea Group Site Safety Officer:	Timothy Fisher or On-site Antea Group Personnel

PROJECT TEAM OSHA TRAINING RECORDS

Name	40 Hr Training Date	8-Hr Refresher Date	Site Supervisor Training Date
Erik Nimlos	2/22/2008	1/18/2011	1/19/2011
Tim Fisher	3/4/1999	4/22/2010	3/4/1999
Michael Coyne	11/4/2005	4/25/2010	10/24/2008
Melissa Shepard	7/23/2010	7/23/2010	11/1/2010
Matthew Del Balzo	2/18/2011	2/18/2011	
Armand Lucas	4/18/2010	7/28/2006	7/19/2006
Mara Grislis	4/22/2010	6/30/2006	12/8/2009
Jon Curran	4/22/2010	3/15/2001	3/15/2001
Igor Goldstein	2/11/1994	4/23/2010	5/24/1995

F. PERIMETER ESTABLISHMENT:

Map/Sketch attached:	**b**	**X**	**No**		**Site secured:**	**Yes**	**X**	**No**	
Perimeter identified:	**Yes**	**X**	**No**		**Zone(s) of Contamination identified:**	**Yes**	**X**	**No**	

Prevailing wind direction, if known (evacuation route and meeting location must be upwind or crosswind):

PRIMARY EVACUATION ROUTE AND MEETING LOCATION: **TBD on site**

SECONDARY EVACUATION ROUTE AND MEETING LOCATION: **TBD on site**

G. WORK ZONES:

An exclusion zone, contamination reduction zone and support zone will be identified for each site or site activity. The Exclusion Zone will be marked with yellow **CAUTION** tape, barricades and\or cones (each cone must be a minimum of 3-ft in height-not including the flag extension, total min. 42-inches), as needed. No person will be allowed in the exclusion zone or contamination reduction zone without approval from the Antea Group Site Safety Officer.

H. SITE SECURITY:

When work scheduling requires that an excavation be left open overnight, security fencing will be erected to restrict access to the site or work zones described in Section II.G.

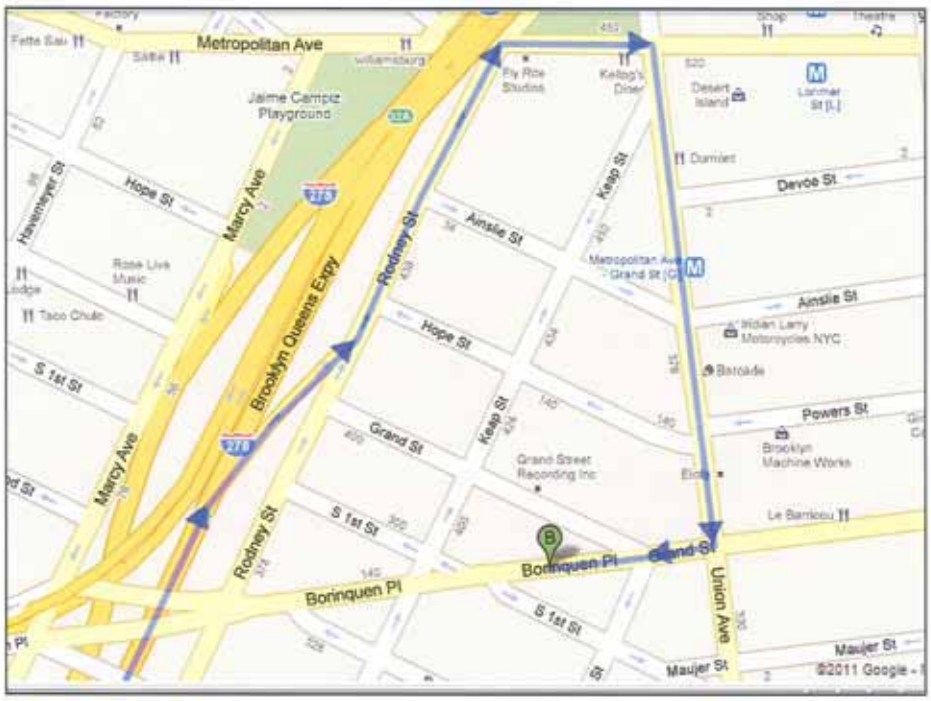
I. SITE MAP: Attach at end of completed Site Health and Safety Plan. Include highlight route to nearest hospital.

J. TRUCK ROUTE TO / FROM BROOKLYN-QUEENS EXPRESSWAY:

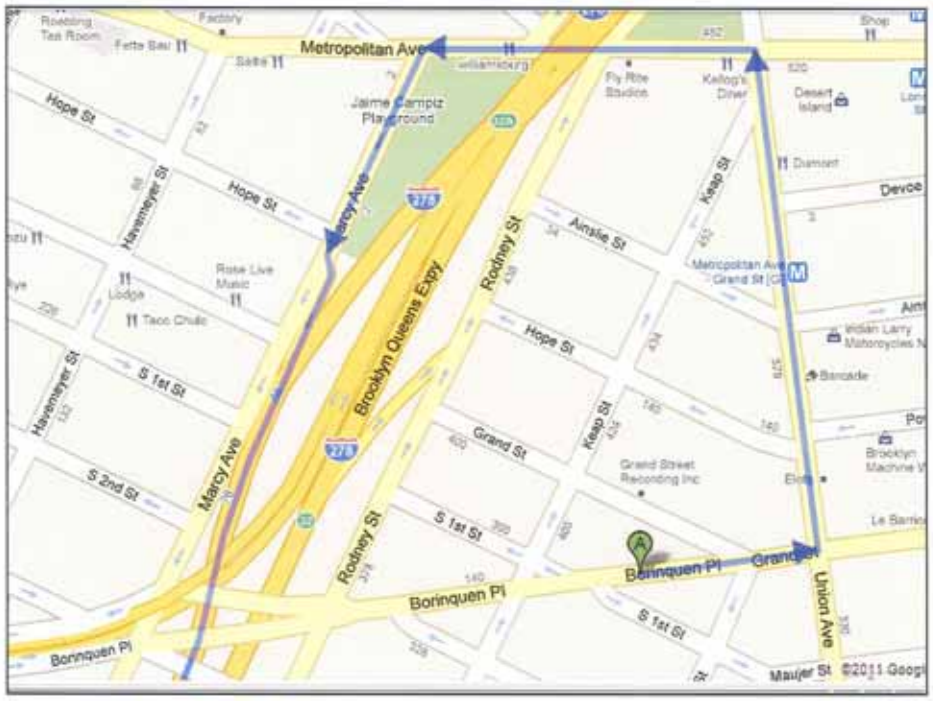
This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent

possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

Inbound: Inbound truck transport route is exit 32 off of the Brooklyn-Queens Expressway northbound, merge onto Rodney Street, turn right onto Metropolitan Avenue, turn right onto Union Avenue, turn right onto Grand Street – arrive at site.



Outbound: The outbound truck transport route is to turn left onto Grand Street, turn left onto Union Avenue, turn left onto Metropolitan Avenue, turn left onto Marcy Avenue, slight left onto Interstate 278 (Brooklyn-Queens Expressway).



III. SITE CHARACTERIZATION

A. Summary of Previous Site Investigation(s): Phase I ESA Rpt. (9/28/10), Phase II ESA Rpt. (Sept 2004), Heating Oil UST Closure Report (2/17/05), Soil Boring Investigation (3/14/08), Tank Excavation Assessment (7/8/08), Update/Monitoring Reports (2008-2009), EFR Update Reports (2010), and Antea Group Phase II Investigation Report of Findings (2/17/11)

B. Source of Previous Site Investigation Information:

Sing Environmental Group, ltd; Northeast Environmental Solutions, Inc; and Sovereign Consulting, Inc.

C. General Facility Description:

Gasoline Service Station [ ] Refinery [ ] Bulk Terminal [ ] Other:

Description: Active [ ] Years has the site been operating: [ ] Closed/Abandoned [X]

Site Activities (operations on-site, products, raw materials used, etc.): Site is currently vacant.

Was the site used by previous owners?: Yes [X] No [ ]

Describe previous site activity: Commercial stores/residences in 1905; stores and an open-air moving picture screen in 1916; Republic Theater (built in 1921) from at least 1942 to 1965; and a gasoline station from at least 1978 to 2007.

Surface cover on-site includes:

X	Soil/bare ground	[ ]	Clay caps	[ ]	Plastic cover
[ ]	Grass	[ ]	Paving/asphalt	[ ]	Water bodies
[ ]	Woods	[ ]	Swamp	[ ]	Brush/scrub
[ ]	Buildings	[ ]	Unpaved roads	[ ]	Other

Approximate site surface area: ____ sq. ft. or 0.41 acres

Percentage of surface area: paved ____ % bare soil 100 %

vegetated ____ % under water ____ %

Potential for dust generation on-site: High [ ] Medium [x] Low [ ]

Any site access restrictions: Yes [x] No [ ] Please list: Fence surrounds property

Fenced/locked [ ] Posting (signs) [ ] Security guards [ ]

Evidence of public access to the site? Yes [ ] No [x]

If "yes," describe:

D. Regulatory Contacts:

Are regulatory agencies involved with the site (Y/N)? Federal? [n] State? [n] Local? [y]

Name	Agency	Phone (incl. area code)
Breanna Gribble	NYC OER	(212) 442-7126
		( )
		( )
		( )

IV. WASTE CHARACTERIZATION

A. Waste/Contaminant Type(s)

Characteristic(s):

X	Liquid	X	Soil		Solid		Sludge		Gas
	Corrosive		Ignitable		Radioactive		Explosive		Flammable
X	Volatile		Toxic		Reactive		Unknown		Other

B. Major Spills/Releases:

Type	Date	Chemical	Quantity	Impacted Media*
Petroleum	2/21/08	Gasoline (Spill # 07-122272)	Unknown	Soil (Spill closed 7/19/10)
Petroleum	10/10/96	Heating Oil (Spill # 96-08624)	Unknown	Soil (Spill closed 7/11/02)

(*air, surface water, soil, or ground water)

Free Product: Yes [ ] No [x] Dissolved: Yes [x] No [ ]

Have removal actions occurred? Yes [x] No [ ]

If "yes," describe: 25 cubic yards of impacted soil was removed during 2004 heating oil UST closure activities; 315.33 tons of impacted soil was removed during 2008 gasoline UST closure activities; approx. 2,300 gal and 2,400 gal of ground water was extracted from site MWs during enhanced fluid recovery (EFR) events in Jan. and Apr. 2010, respectively.

Is there evidence that contaminants present could cause vapor problems in structures on-site?

Yes [ ] No [x] If "yes," is building mechanically ventilated? Yes [ ] No [ ]

Exhaust Ventilation: _____ General Building Ventilation: _____

C. Chemicals/Waste Stored On-site (including petroleum products):

		How Many?	Size?	Chemical?
[ ]	Drums			
[ ]	Tanks			
[ ]	Vats			
[ ]	Surface impoundments			
[ ]	Pits/landfills			
[ ]	Other			

Identify all chemical products Antea Group will use or store on site:

Material Safety Data Sheets (MSDSs) are **required** for site chemicals.
Please indicate where MSDSs can be found for this site:

[X] MSDS Log/Binder (In Field) [ ] Attached (Additional Info. Optional)

V. REMEDIATION SYSTEM INFORMATION (complete when applicable)

Has system been installed? Yes [ ] No [x]

Describe: _____

_____

_____

Enclosed per codes? Yes [ ] No [ ]

Ventilated? Yes [ ] No [ ]

If "Yes," Explosion-proof? Yes [ ] No [ ]

Blower systems on a timer? Yes [ ] No [ ]

Have sound level surveys been conducted on site? Yes [ ] No [ ]

If "Yes," record range of survey results and approximate distance from source:

dBA	Source	Distance from Source	Date

Check all energy sources on the remediation site:

[ ] Electrical [ ] Mechanical [ ] Other (describe) _____

[ ] Thermal [ ] Hydraulic

[ ] Chemical [ ] Pneumatic

NOTE: If there is more than **1 energy source** on site, ***written, equipment-specific Lockout/Tagout Procedures are required!***

Written Lockout/Tagout Procedure required? Yes [ ] No [ ] Where is it located? _____

VI. HAZARD EVALUATION

Identify all chemicals that are present or are suspected of being present on site and list their maximum concentrations in soil/water. Information on hazardous properties is listed in **Appendix A.** For chemicals not shown in **Appendix A**, enter the hazardous property information in the spaces provided and attach a Material Safety Data Sheet. See notes below.

Chemical Name	*TLV*/PEL *(2002)*	Maximum Concentration in Soil (*P*)	Maximum Concentration in Water (*P*)	Health Hazards/ Comments
Gasoline	*300 ppm*	mg/kg	ug/l (ppb)	Irritant (skin, eye, mucous membranes), CNS narcotic
Toluene	*50 ppm* 200 ppm	mg/kg	ug/l (ppb)	Severe irritant (skin, eye), reproductive toxin, CNS narcotic
Xylene	*100 ppm* 100 ppm	mg/kg	ug/l (ppb)	Irritant (skin, eye, nose, throat), reproductive toxin, CNS narcotic
Benzene	*0.5 ppm* 1 ppm	mg/kg	ug/l (ppb)	Severe irritant (skin, eye), reproductive toxin, CNS narcotic, carcinogen
Ethylbenzene	*100 ppm* 100 ppm	mg/kg	ug/l (ppb)	Irritant (eye, skin, mucous membranes), mutagenic, acute CNS effects
Total BTEX	None Estab.	mg/kg	ug/l (ppb)	
Total Lead (elemental)	*0.05 mg/m^3* 0.05 mg/m^3	mg/kg	ug/l (ppb)	Carcinogen, neurotoxic
MTBE	*50 ppm*	mg/kg	ug/l (ppb)	Irritant
Naphthalene	*10 ppm* 10 ppm	mg/kg	ug/l (ppb)	Irritant (eye, skin)
Kerosene	*15 ppm*	mg/kg	ug/l (ppb)	Irritant, CNS narcotic
Diesel Fuel	*15 ppm*	mg/kg	ug/l (ppb)	Possible carcinogen, possible mutagen

(*P*) = results pending; (NA) = not analyzed; **For "Free Product/LNAPL use the soluble limit at STP.**

Potential Hazards (check boxes that apply to the site):

	corroded containers		open lagoons		underground tanks		air stack emissions
	overhead electric lines		visible leachate		surface tanks		visible on-site releases
	visible soil contamination	x	Odors		observed tanks		visible off-site releases
	observed free product	x	Dust		confined spaces		visible on-site erosion
x	underground utilities	x	open pits		excess debris		on-site surface water contamination
	building contamination		no hazards	x	High Traffic issues		off-site surface water contamination

VII. PERSONAL PROTECTION & MONITORING EQUIPMENT GUIDELINES

A. PERSONAL PROTECTION:

Level of Protection: B [ ] C [ ] D [X] (with modifications) Modifications: _____

1. **All personnel working on Antea Group sites must wear hardhats, neon traffic safety vests, and safety shoes. Personnel working in the Exclusion Zone must also wear eye\face, and hand PPE appropriate to the task.**

2. (e.g. Nitrile, etc) gloves and tyvek/saranex suit should be worn if contact with contaminated water or soil is likely.

3. Hearing protection must be worn if noise levels prevent normal conversation at a distance of three feet.

4. No smoking, eating, or drinking is allowed in the exclusion or contamination reduction zones. **No Smoking anywhere on site.**

5. No Antea Group personnel shall conduct a confined space entry. In addition, No personnel shall approach any excavation area where there is danger of a wall collapse.

6. Respiratory protection is dependent on conditions listed below Section VII.B.3.

B. SURVEILLANCE EQUIPMENT AND MATERIALS:

1. Calibration: A qualified individual will calibrate before and after field activities the photoionization detector (PID) or flame ionization detector (FID).

2. Frequency: The breathing zone of Antea Group employees on-site will be monitored every hour (at a minimum) and recorded in the Antea Group field book. Monitoring should be conducted during tasks that may result in exposure to vapors.

3. Instrumentation

Instrument	Breathing Zone Reading	Action Taken
Photoionization detector (PID) or Flame ionization detector (FID)	Total Org.Vapors	
	Bkgrd - 2 ppm	**Level D.** Work may continue.
	2 - 50 ppm	**Level D.** Collect benzene detector tubes.
	50 - 500 ppm	**Level C.** Air-purifying respirator with organic vapor canisters. Collect benzene detector tubes.
	>500 ppm	**Leave area**. Contact Health & Safety Sr. Specialist.
	>5ppm above background down gradient of exclusion zone for more than 15 minutes	Work activities will be temp. halted and monitoring continued. If total organic vapor level readily decrease (per instantaneous reading) <5 ppm over background, work activities will resume.
	>5ppm but <25ppm above background down gradient of exclusion zone for more than 15 minutes	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.

Instrument	Breathing Zone Reading	Action Taken
	>25ppm	Work activities will be shut down.
Explosion Meter	< 10% of LEL 10 - 20% of LEL > 20% of LEL	**Work may continue. Evaluate inhalation potential.** **Work may continue. Eliminate all ignition sources, Reduce the concentration &increase monitoring** frequency, consider use of ventilation. **Work must stop until LEL is Below 10%!**
Oxygen Meter	< 19.5% O_2 19.5% to 23.5% O_2 >23.5% O_2	**Leave area.** Re-enter only with SCBA. **Work may continue.** Investigate causes of changes above/below 21%. **Work must stop.** Ventilate before returning and retest atmosphere. O_2-rich atmospheres pose explosion hazards.

Instrument	Breathing Zone Reading	Action Taken
Hydrogen Sulfide (H_2S) Colorimetric Tubes or Monitors-- Some states with high regional H_2S have special, local monitoring requirements.	0-5 ppm 5-10 ppm >10 ppm	**Continue working.** **Requires Level B** including supplied air respirator or SCBA. Increase monitoring frequency. Contact Health & Safety Sr. Specialist. Supplied air respirator required due to poor warning properties and toxicity.
Sound Level Meter	< 85 dBA 85 - 90 dBA > 90 dBA	Suggest wearing hearing protection when it is necessary to raise voice to be heard at distance of 3 feet. **Hearing protection required.** Install warning signs for fixed noise sources. **Hearing protection required.** Employer must have Hearing Conservation Program.
Particulate Monitoring	>100 mcg/m3 downwind as compared to upwind for 15 minute period	Dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration

C. FIRST AID EQUIPMENT AND EMERGENCY PROCEDURES: (compile information on the Incident/Near Miss form located in Appendix B. Call the office ASAP.

1. First Aid Equipment:

Standard first aid kit (sized for number of individuals on-site).
Portable eye wash (appropriate for number of individuals on-site).

2. First Aid Procedures:

Ingestion:	Follow instructions from Poison Control Center or the MSDS.
Inhalation:	Move victim to fresh air. Seek medical attention if needed.
Dermal Exposure:	Remove contaminated clothing. Wash thoroughly with soap and water.

A first aid kit will be provided on-site for use in case of minor injuries. A portable eye wash will also be provided, and if a worker suffers a chemical splash in the eye, the field team will be instructed to flush the eye for 15 minutes and arrange for off-site medical treatment immediately. Workers will also be instructed to thoroughly wash with soap and water any unprotected skin that comes in direct contact with contaminated soil or water.

Workers providing CPR or First Aid should use Universal Precautions to control possible exposure to bloodborne and infectious agents. Report all CPR or First Aid assistance to the Health and Safety Sr. Specialist immediately.

3. Site Emergencies:

In the event of a fire or explosion, evacuate the site immediately and call the appropriate emergency phone numbers listed in Section II.A, page 2.

In case of a spill, try to contain with clean dirt, if feasible, and call the local fire department or hazardous materials response (HAZMAT) unit. Phone numbers are listed in Section II.A, page 2.

Have procedures for remediation system shutdown or emergency procedures been provided to site owner or manager?

☐ Yes ☐ No (Applies to sites with remediation systems in place).

VIII. SAFETY STANDARD OPERATING PROCEDURES (Also See Appendix C for Site Safety Checklist)

A. CHEMICAL HAZARDS:

A photoionization detector (PID) or flame ionization detector (FID) will be used to measure the relative concentration of hydrocarbon vapors. Monitoring for exposure to benzene vapors may be done using activated charcoal tubes and vacuum pumps, vapor badges, or benzene colorimetric tubes in the breathing zone when working with heavily contaminated soil or water. Action limits for use of respiratory protective equipment are outlined in Section VI.B above. All respiratory protection equipment shall be NIOSH/MSHA-approved and use shall conform to OSHA 29 CFR 1910.134. A written Respiratory Protection Program detailing selection, use, cleaning, storage, medical monitoring, training and fit testing of respiratory protective equipment is maintained at the Antea Group office.

In addition to being inhalation hazards, hydrocarbon compounds can also be absorbed through the skin. Skin contact with liquid hydrocarbons or fuel hydrocarbon-bearing soil should be prevented. In situations where sampling would result in direct skin contact with hydrocarbon liquids, saturated soil or contaminated equipment, nitrile gloves will be worn.

Drilling or digging may also liberate pockets of hydrogen sulfide (H_2S). While the characteristic "rotten egg" odor of H_2S is detectable at levels as low as 0.0005 ppm, prolonged detection is unreliable due to its olfactory fatigue properties. In open air on a typical petroleum remediation site, risk from exposure to H_2S is minimal. However, should H_2S be encountered, workers shall be instructed to stop drilling/digging and move to an upwind location until the vapors have dissipated, as measured by H_2S colorimetric detector tubes or other direct-reading instruments. The bore hole or excavation will be immediately backfilled.

A combination explosimeter/oxygen (O_2) meter will be available on-site to monitor the levels of flammable gases, such as petroleum vapors and methane. An explosimeter should also be used by a subcontractor to verify that the atmosphere inside an underground storage tank has been inerter prior to allowing the tank to be removed.

B. PHYSICAL HAZARDS:

1. Mechanical hazards: cuts, abrasions, contusions; slips, trips, falls; being struck or entrapped by moving parts of heavy equipment or falling objects. Such hazards will be minimized by keeping the work area free of equipment and debris that could cause slips, trips or falls and maintaining a safe distance from heavy equipment and moving machinery parts.

2. Electrical hazards: Possible excavation of unanticipated electrical cables and potential contact by heavy equipment with overhead power lines during drilling and excavation. Maintain at least 20 feet clearance from overhead power lines. If unavoidably close to overhead or buried power lines, turn power off and lock out circuit breaker. All equipment will be properly locked/tagged out when required by the Energy Lockout/Tagout Program and Safe Electrical Work Policy and Procedure for Antea Group Project Work. Avoid standing in water when operating electrical equipment.

3. Traffic hazards: Petroleum site work frequently necessitates working in parking lots, streets or other areas with vehicular traffic. In such instances, the work team will be wearing neon traffic safety vests and will use a combination of traffic cones (each cone\flag configuration must be a minimum of 42-inches in height) and barricades as necessary to prevent contact between workers, pedestrians and motor vehicles. Please refer to the PM approved Site Specific Traffic Plan (sketch) attached in front of the Hospital Route Plan in the back of this SHSP.

4. Open excavations: When scheduling or work conditions necessitate leaving excavations open overnight, security fencing will be erected to restrict access to the site or work zones described in Section II.G, page 3.

C. UTILITIES:

A minimum of 72 working hours prior to excavating, Underground Service Alert or the state equivalent:

Name _____ Phone _____

will be contacted and informed of the scheduled field activities. The underground service locator company will identify which underground utilities (e.g. electrical, gas, sewer, water, telephone, cable TV) are present and will notify their respective owners. The utilities will be located by their owners. **Prior to drilling or direct push, hand or air excavate (120% the width of the hole) and to a depth of at least 5 feet will be performed at all times** to ensure no utilities, lines or tanks are in the way. See Excavation Section. **Look for overhead utilities** as well.

Utility service locator company has been notified? **If applicable attach contact sheet to back of document.**	Date(s) _____ _____	Confirmation #, if applicable: _____ _____

D. WORK LIMITATIONS (time of day, weather, heat/cold stress):

In the event of severe weather, such as high winds, heavy rain or snow, tornadoes, electrical storms, or extreme temperatures, the SSO and PM shall determine whether work can continue without compromising site worker health and safety.

In high ambient temperatures (especially with high humidity), ***follow heat-stress precautions***. Drink plenty of cool water and/or electrolyte-replacement beverages (e.g., Gatorade). Take frequent breaks out of direct sunlight removing protective clothing. Increase number of breaks if pulse does not return to normal resting pulse during breaks. Alter schedules so work is conducted during early morning or evening. Work shall progress only under conditions of adequate lighting.

Symptoms of heat exhaustion and heat stress include:

- Profuse sweating **or** complete cessation of sweating;
- Changes in skin color;
- Increased respiration;
- Vision problems, confusion;
- Body temperatures in excess of 100°F; and
- Increased heart rate.

Any member of the work team who exhibits these symptoms should immediately be removed from the area and observed while resting in a shaded area after removal of impervious or restrictive clothing and after consumption of cool water or electrolyte fluid. If symptoms persist, immediate medical attention shall be sought.

In cold temperatures, especially when combined with high wind, follow hypothermia precautions:

- Drink warm liquids and take frequent work breaks in a wind-sheltered area; Monitor co-workers for signs of shivering, in coordination, or confusion and remove workers exhibiting these signs from the work area to a heated warming shelter.
- Dress in removable layers of insulated clothing to prevent sweating and use protective waterproof gear;
- Frostbite (superficial or deep tissue) can occur on any exposed skin at temperatures of 30.2^{o}F or colder.
- If available clothing does not give adequate protection to prevent hypothermia or frostbite (which can occur on any exposed skin), work should be modified or suspended until adequate clothing is available or until conditions improve.

If extreme cold conditions are encountered, follow the ACGIH TLV booklet's "work-warming regime" recommendations, taking an appropriate number of breaks in a heated warming shelter.

E. FIRE AND EXPLOSION HAZARDS:

During the course of underground storage tank removal, drilling, or remediation of petroleum impacted soil or ground water, the potential for fire and explosion of flammable vapors exists. Extreme caution should be taken to monitor for the presence of flammable vapors or conditions that could create flammable conditions. Explosimeters are available for this monitoring and action levels are defined in Section VII.B page 10. Fire extinguishers must be available on all sites with the potential for flammable vapors or electrical fires (i.e., systems, control panels). Use of fire extinguishers by employees trained in their use is limited to employee rescue or extinguishing relatively small, controllable fires. Antea Group does not expect or require its employees to fight fires.

In the event of a fire or explosion, the following action plan should be followed:

Shut down equipment and shut off all supply lines immediately if this can be done safely.

Evacuate the immediate area. At this point you may not know if a soil vapor fire has started or if a supply line, natural gas line, etc. has been hit. Tank, supply line, or remediation system fires are extremely hazardous and precautions must be taken to evacuate the area immediately.

Call 911 to notify the fire department. Antea Group employees are not trained fire brigades. Every fire should be treated as an emergency. Even if site personnel extinguish the fire, professional fire departments should evaluate the situation to ensure that the danger is over and that a fire will not reoccur.

Evaluate the situation to identify the source of the flammable vapors and to assess the danger to employees, the public and property. From a safe distance, try to determine if the fire is due to a ruptured supply line, ignited soil vapors or methane, or is electrical. This information should be communicated to the fire department. Small fires from known sources (i.e., engine fires, electrical panel fires, etc.) may be extinguished if the employee can do it without high risk. A soil vapor fire may eventually burn itself out. Soil stockpiles must be placed away from nearby structures and property lines. Extinguishing fires

in fuel vapor-laden soils with clean soil may be possible. **Employees or subcontractors shall not enter an excavation to attempt to extinguish a fire.**

F. NOISE/HEARING PROTECTION:

Workers shall be instructed in the recognition of noise hazards and shall be provided, and trained in the use of, hearing protective devices. Hearing protective devices shall be worn when working around heavy equipment, particularly drill rigs, or when background noise is so high that a worker has to shout to be heard at a distance of 3 feet.

G. LEVELS OF PROTECTION:

Work on typical petroleum remediation sites can usually be performed in Level D protection: hard hat, steel-toed work shoes/boots, cotton coveralls or long-sleeved shirts and long pants, eye protection, hearing protection, and gloves if needed.

If monitoring equipment or site conditions indicate the need to upgrade the level of protection to Level C, air-purifying respirators with organic vapor canisters (or other appropriate cartridges), Tyvek coveralls with hoods, chemical resistant inner and outer gloves, and disposable boot covers will be donned. Upon HSE Senior Specialist approval, dermal protection may be modified.

At no time will an Antea Group employee conduct work on any site requiring Level A protection. On work sites requiring Level B protection, workers will be provided with additional training and equipment. Health & Safety Sr. Specialist must be on-site at all times while Level B work is being conducted.

H. DECONTAMINATION PROCEDURE:

Level: B. [ ] C. [ ] D. [X]

Contamination may result from walking through contaminated soils or liquids, splashing liquids during sampling, use of or contact with contaminated equipment, or contact with air contaminants. Due to the volatile nature of petroleum hydrocarbons that may be encountered during drilling, hand-augering and sample collection procedures, the need to decontaminate equipment and vehicles will be minimal. Field team workers will be instructed to observe the following precautions to assure contaminants will not remain in contact with their skin.

- Tools, equipment and personnel will be decontaminated using procedure appropriate for level of personal protection worn.
- All contaminated, disposable clothing will be properly bagged for disposal and left on site. All personnel will be instructed to wash hands, face, neck and forearms at the end of the work shift and to shower at the end of the workday.
- **No eating or drinking will be permitted in the immediate vicinity of heavy equipment and/or drilling and excavating activities. No smoking is permitted on any Antea Group site at any time.**

Special decontamination requirements: Decon of drilling / excavation equipment as needed with Alconox soap and water.

I. CONFINED SPACES:

If entry into a confined space is necessary, a trained Antea Group Subcontractor shall be used and a Confined Space Entry Permit must be completed and authorized, and confined space entry procedures followed. Detailed information on Antea Group's Confined Space Entry procedures can be found in the Antea Group Health & Safety Manual and contact a Senior HSE Specialist.

Does this site have any permit-required confined spaces? Yes [ ] No [x]

J. INVESTIGATION-DERIVED MATERIAL DISPOSAL:

Soil cuttings and well development or sampling water shall be placed in 55-gallon drums on-site. Disposal methods of drummed soil and water will be determined based on laboratory analytical data. Proper disposal is the responsibility of the responsible party.

K. EXCAVATIONS:

All soil excavation and utility trenching is to be undertaken in strict conformance with all applicable local, state, and federal regulations. Entry into excavated areas or trenches is allowed only when:

1. Shoring, sloping and spoil pile placement is in conformance with 29 CFR 1926 Subpart P, and
2. Personal protection and monitoring, as detailed in this Site Health and Safety Plan, has been implemented.

Drilling and Excavating Health and Safety Guidance Procedures

PREP:

- Prior to conducting any subsurface work, a markout must ALWAYS be called in (approximately three working days before field work is scheduled - depending on the area). In some areas, not all markouts are performed by the "Call Before You Dig System". A Markout tracking sheet should be used. This will need to get filled out whenever a markout is called in. There will be an area where you will need to fill in the utilities contacted and identify utilities that are not listed. When a utility is not listed, you will need to contact that utility directly and obtain maps and/or get them to markout the property.

- Always search the file and request the client search files for an as-built of the station/facility.

WHEN ON SITE:

- Subcontractors are required to perform an on-site inspection of their heavy machinery each day prior to the start of fieldwork. The Antea Group Site Safety Officer (SSO) will observe the inspection. Any safety concerns identified by the subcontractor must be addressed prior to the use of the equipment. During the inspection, the subcontractor must verify that all rig/vehicle kill switches are working properly. Antea Group employees on-site must be informed of the location of the kill switches and how to operate them.

- As part of your on-site health and safety meeting, walk the site with the drillers and identify possible boring locations (make sure the locations shown on the work plan/site plan are in areas free of utilities/subsurface structures). Make sure all utilities have been marked out properly. It is your responsibility for our client to ensure all boring locations are clear of utilities prior to drilling. Often “as-builts” are incorrect or not available.

- Attempt to determine how all utilities are running. For the most part, utilities can run anywhere and can bend and twist in any direction but, there are a few basic things to keep in mind. Usually water and sewer lines will run to a bathroom. Electrical will run in between on-site lights, the kiosk and SS building. Storm water drains usually tie into one another and you can get a general idea of how they run by looking into them and seeing what direction the line is going. Obviously any cut outs in the asphalt should be avoided, especially if observed around the USTs (often, leak detection is an afterthought and is added following the completion of the service station rebuild and its location is obvious due to a continuous cut out in the asphalt around the tank field).

- WE SHOULD NOT DRILL OR EXCAVATE WITHIN TEN FEET OF THE TANK FIELD, USTs OR PUMP ISLANDS. IN ADDITION, DO NOT DRILL IN BETWEEN THE PUMP ISLAND AND THE TANK FIELD. Should drilling be required within Ten feet of the above noted systems, an “air knife” should be utilized to a depth of at least ten feet below grade surface (bgs). Drilling within five feet of the above noted systems will require the station and tank systems to be shut down. It may be helpful to open up tank field manways and identify the general direction that the product lines are running.

- ALWAYS HAND or AIR EXCAVATE (110% the width of the proposed hole) TO AT LEAST FIVE FEET bgs. If you are going in the same location as a previously installed point and the diameter of the new boring/well is larger, you must hand auger. In addition, if you didn't advance the "old" boring yourself, you can't assume that it is a safe drilling location. Refusal may have been encountered in the "old" location. If refusal with the hand auger is encountered prior to five feet, move to a new location. If you make three attempts without success, call office to discuss alternatives. If you can't reach the PM contact your UM for further instruction.

- If you encounter pea-gravel while excavating STOP. Call the Antea Group PM for further instruction. Utilities or USTs may be present.

- If you hit/damage any utility/subsurface feature IMMEDIATELY contact the office for further instruction. If you can't reach the PM contact your UM for further instruction. Also contact your HSE Sr. Specialists.

L. SUBCONTRACTOR SHSPs

All subcontractors of Antea Group shall be responsible for the development and implementation of their own SHSP to cover duties and hazards specific to that subcontractor's area of expertise or on-site functions. Subcontractors are given the opportunity to review Antea Group's SHSP, and must sign the document, prior to the start of on-site work.

Any hazardous work situations or procedures should be reported to the Antea Group Site Safety Officer so that corrective measures may be taken.

IX. ACKNOWLEDGMENT AGREEMENT

ANTEA GROUP EMPLOYEE
SITE HEALTH AND SAFETY PLAN REVIEW RECORD

I acknowledge that I have read and understood the contents of this Site Health and Safety Plan and I agree to abide by all provisions as set forth. I have also checked in with the site client contact to alert them of our presence and for any daily safety issues. Please note: "no implements are to be brought on an Antea Group site, or while performing Antea Group business that are, or are intended to be used, as weapons (such as: guns, knives, etc.)". Firearms are expressly prohibited. By signing below you are certifying, that this policy is upheld. Antea Group retains the option to audit your personnel and equipment to assure your compliance.

Signature	Date

SUBCONTRACTOR & VISITOR
SITE HEALTH AND SAFETY PLAN REVIEW RECORD

SITE: _____

I have read the Site Health and Safety Plan for this site and have been briefed on the nature of the contaminants and the level and degree of exposure likely as a result of participation in this project. I agree to conform to all the requirements of this plan. This SHSP does not replace the requirement or liability for your company to have it's own safety program and SHSP. I also acknowledge that this plan is specific for this Antea Group. site and may not address unforeseen hazards not included in the Site Health and Safety Plan or your specific contracted task. Please note: "no implements are to be brought on a Antea Group site, or while performing Antea Group business that are, or are intended to be used, as weapons (such as: guns, knives, etc.)". Firearms are expressly prohibited. By signing below you are certifying, that this policy is upheld. Antea Group retains the option to audit your personnel and equipment to assure your compliance.

Name	Signature	Affiliation	Date

PETROLEUM CLASS III SHSP--HAZARDOUS PROPERTY INFORMATION (REV. 12-05-00)

Material	Water Solubility A & B	Specific Gravity[C]	Vapor Density[D]	Flash Point °F[E]	Vapor Pressure mm/Hg[F]	%LEL/ %UEL[G]	LD 50 mg/kg[H]	TLV-TWA *PEL*[I]	IDLH Level[J]	Recommended Respiratory Protection/Max. Use Concentration *Odor Threshold*[K]	Hazard Property[L]	Dermal Toxicity[M]	Acute Exposure Symptoms[N]
Benzene	0.18%	0.877	2.8	12	75 (20 °C)	1.2/7.8	930	*0.5 ppm* 1 ppm	500 ppm	½/OV/1ppm FF/OV/10 ppm *4.68 ppm*	BCDGI	CGI	BCDFHIKLM NOQR
Diesel Fuel	Insoluble	0.81-0.90	NA	130	NA	0.6-1.3 6-7.5	None Estab.	100 mg/m^3 (14 ppm)	None Estab.	*0.7 ppm*	BCD	CI	BCDFHIKLM NP
Ethylbenzene	0.014%	0.867	4.45	70	10 (26 °C)	0.8/6.7	3500	100 ppm *100 ppm*	800 ppm	½/OV/1000 ppm *140 ppm*	BCDI	CFI	ABFHIKLMNP QR
Gasoline	Insoluble	0.72-0.76	3-4	-50	Var.	1.4/7.6	None Estab.	300 ppm	None Estab.	½/OV/300 ppm *.25 ppm*	BCD	CI	BCEFHIKLMN P
Kerosene	Insoluble	0.83-1.0	4.5	100-165	5	0.7/5.0	None Estab.	100 mg/m^3	None Estab.	*1 ppm*	CD	CI	BCDFHIKLM NP
Lead (elemental)	Insoluble[B]	11.34	NA	NA	NA	NA	Varies by Cmpd.	0.05 mg/m^3 *0.05 mg/m^3*	100 mg/m^3	½/HEPA/0.05 mg/m^3 FF/HEPA/0.25 mg/m^3	C		ACDFGHOR
MTBE (methyl tertiary butyl ether)	Moderate	0.74	Unavlbl.	-16	245 (25 °C)	1.6/8.4	2.96 g/kg	40 ppm *None Estab.*	None Estab.	Unavailable	BD	A	BFK
Naphthalene	Insoluble	1.145	4.42	190	.23 (25 °C)	.9/5.9	490	10 ppm *10 ppm*	250 ppm	½/OV/10 ppm FF/OV/<50 ppm	C	CGI	BKLNQ
Tetraethyl lead	Insoluble[B]	1.653	8.6	199	0.2 mm (20 °C)	1.8/ Unkn	12.3	0.10 mg/m^3 (Skin) *0.075 mg/m^3 (Skin)*	40 mg/m^3	Supplied Air Warning Unknown	CG	CFI	N
Tetramethyl lead	Insoluble[B]	1.999	6.5	100	22.5 mm (20 °C)	Unkn/ Unkn	105	0.15 mg/m^3 (Skin) *0.075 mg/m^3 (Skin)*	40 mg/m^3	Supplied Air Poor Warning	CG	CFI	N
Toluene	0.05	0.866	3.2	39	21 (20 °C)	1.27/7	2000	50 ppm (Skin) *200 ppm*	2000 ppm	½/OV/200 ppm FF/OV/400 ppm *0.17-40 ppm (300-400 ppm)--Olfactory Fatigue*	BCI	BHE	BEFHIKLMN OPQ
Xylenes	Insoluble	0.868	3.68	63-81	9 mm (20 °C)	1.1/6.6-7.0	5000	100 ppm *100 ppm*	900 ppm	½/OV/<100 ppm	BCI	CFI	BEFHIKLMNP

APPENDIX A

PETROLEUM CLASS III SHSP--HAZARDOUS PROPERTY INFORMATION
Explanations and Footnotes

A	Water solubility expressed as 0.2 g means 0.2 grams per 100 grams of water at 20 °C. Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is nearly insoluble and will be found as a discrete layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene, will also be found in solution in the ground water at the part per million or part per billion level.
B	Solubility of metals depends on the compound in which they are present.
C	Specific gravity is the ratio of the density of a substance to the density of a reference substance. For solids and liquids, the reference substance is water; for gases, the reference substance is air. Specific gravity is expressed in units of g/cc (for solids and liquids) or g/l (at 0 °C and 760 mm Hg) for gases.
D	Vapor density is the weight/unit volume expressed as grams/cubic centimeter liquids.
E	Flash point is the temperature at which a liquid or volatile solid gives off sufficient vapor to form an ignitable mixture with the air. Flash points may be determined by the open cup method or closed cup method. Several chlorinated hydrocarbons exhibit no flash point in the conventional sense, but will burn in the presence of high energy ignition sources or will form explosive mixtures at temperatures above 200 °F.
F	Vapor pressure is the pressure at a given temperature of a vapor in equilibrium with its liquid or solid form. It is expressed as mm Hg at 1 atm. Temperatures vary...see chart.
G	Lower explosive limit (LEL) and Upper explosive limit (UEL) are the minimum and maximum concentrations of a gas or vapor in air that will support flame. LEL and UEL are expressed as % in air at ambient or room temperature.
H	LD_{50} is the quantity of a substance administered by ingestion that is necessary to kill 50% of the test animals exposed to it within a specified time.
I	Threshold limit value as a time-weighted average (TLV-TWA) is the concentration for a normal 8-hr workday and 40-hr work week to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. Values reported are the current ACGIH Threshold Limit Value-Time Weighted Average (TLV-TWA) and OSHA Permissible Exposure Limit (PEL). All PELs are based on pre-1989 values, per OSHA's 1993 decision to vacate the 1989 PELs.
J	Immediately Dangerous to Life and Health (IDLH) concentrations represent the maximum concentrations from which, in the event of a respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
K	Recommended Respiratory Protection/Max. Use Concentration is used to show the limits for respirator style and contaminant concentration. The codes in the table refer to the following: ½ = Half-face, air-purifying respirator FF = Full-face, air-purifying respirator OV = Organic vapor canisters HEPA = High Efficiency Particulate Air canisters PAPR = Powered Air-purifying Respirator The Odor Threshold is the lowest concentration at which one may detect an odor or experience a warning effect such as taste, eye irritation, etc., which varies with individual susceptibility.
L	Hazard Property: A - Corrosive / D - Volatile / G - Carcinogen B - Flammable / E - Reactive / H - Infectious C - Toxic / F - Radioactive / I - Reproductive Toxin *Note: A reproductive toxin is a compound (chemical) that affects the reproductive organs (generally the sperm and eggs, but sometimes the physical structure of the testes or ovaries, too). It can affect the reproductive organs of males, females, or both; it can affect the reproductive organs of an adult or child; it can affect the reproductive organs of a developing fetus with or without affecting the mother.*
M	Dermal toxicity data is summarized in the following three categories: 1. **Skin Penetration** A - negligible penetration (solid-polar) + B - slight penetration (solid-nonpolar) ++ C - moderate penetration (liquid/solid-nonpolar) +++ D - high penetration (gas/liquid-nonpolar) 2. **Systemic Potency** E - Slightly Toxic (LD50 = 5 - 15 g/kg) — Lethal dose for 70 kg adult = 1 pint to 1 quart F - Moderately Toxic (LD50 = 0.5 - 5 g/kg) — Lethal dose for 70 kg adult = 1 ounce to 1 pint G - Extremely toxic (LD50 = 5 - 50 mg/kg) — Lethal dose for 70 kg adult = 7 drops to 1 teaspoon 3. **Local Potency** H - slight - reddening of the skin I - moderate - irritation/inflammation of skin J - extreme - tissue destruction/necrosis
N	Acute Exposure Symptoms A - abdominal pains / G - diarrhea / M - respiratory irritation B - central nervous system depression / H - drowsiness / N - skin C - comatose / I - dyspnea / O - tremors D - convulsions / J - fever / P - unconsciousness E - confusion / K - headache / Q - vomiting F – dizziness / L - nausea / R - weakness

APPENDIX B

Insert Incident/ Near Miss Report (page 1 of 2)

5 Day Site Safety Checklist

SITE NAME: _____

SITE NUMBER: _____

Check if OK, NA if not applicable

DATE: _____

Pre-mobilization

Updated health and safety plan _____

Emergency phone numbers for utilities included _____

Proper personal protective equipment (PPE) selected & inspected-

- Hard hat _____
- Safety glasses (with side shields) _____
- Hearing protection _____
- Safety vest _____
- Work gloves _____
- Sampling gloves (PM specify type)_____ _____
- Protective coveralls (specify, Tyvek, Nomex, etc.) _____ _____
- Safety boots _____
- Respirator/cartridges (PM identify proper cartridges) _____

Other protective equipment-

- Eye wash (check expiration date) _____
- Fire extinguisher (visually inspected within last 30 days) _____
- First aid kit (inventory and check expiration dates) _____
- Safety cones (or flashing traffic light) _____

Underground utility hazards identified and addressed _____
(provide public utility one-call ticket or job number: _____.)

	DATE				
On-Site Pre-Work					
Review site hazards and HASP w/ site workers	_____	_____	_____	_____	_____
Review route to hospital	_____	_____	_____	_____	_____
Site workers sign HASP acknowledgement page	_____	_____	_____	_____	_____
Place HASP and emergency numbers in visible location	_____	_____	_____	_____	_____
Designate evacuation signal and meeting place	_____	_____	_____	_____	_____

	DATE				
Delineate exclusion zone	_____	_____	_____	_____	_____
Check subcontractor PPE-					
Hard hat	_____	_____	_____	_____	_____
Safety glasses (with side shields)	_____	_____	_____	_____	_____
Hearing protection	_____	_____	_____	_____	_____
Safety vest	_____	_____	_____	_____	_____
Work gloves	_____	_____	_____	_____	_____
Sampling gloves	_____	_____	_____	_____	_____
Protective coveralls (specify, Tyvek, Nomex, etc.) _____	_____	_____	_____	_____	_____
Safety boots	_____	_____	_____	_____	_____
Respirator	_____	_____	_____	_____	_____
Subcontractors-					
Subcontractor has own HASP or field SOPs on-site (when required)	_____	_____	_____	_____	_____
Confirm sub. equipment (e.g., drill rig, ext. cords) is in sound working condition	_____	_____	_____	_____	_____
Drilling subcontractor: drill rig kill switch identified, located and tested	_____	_____	_____	_____	_____
Overhead hazards identified and addressed	_____	_____	_____	_____	_____
On-Site Work					
Proper PPE worn by site workers	_____	_____	_____	_____	_____
Breathing zone monitoring performed and recorded	_____	_____	_____	_____	_____

(Specify any new hazards identified on-site not addressed by site HASP. If new hazard cannot be mitigated by the existing scope-of-work and/or available equipment on-site, stop work and immediately contact the site project manager.)

_____

_____

_____

_____

(Sign and date at the end of the field work.)

Name: _____

Signature: _____

Date: _____

REPORT ALL INCIDENTS AND NEAR MISSES IMMEDIATELY

Appendix A

APPENDIX A

PETROLEUM CLASS III SHSP--HAZARDOUS PROPERTY INFORMATION
Explanations and Footnotes

A	Water solubility expressed as 0.2 g means 0.2 grams per 100 grams of water at 20 °C. Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is nearly insoluble and will be found as a discrete layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene, will also be found in solution in the ground water at the part per million or part per billion level.
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F	Vapor pressure is the pressure at a given temperature of a vapor in equilibrium with its liquid or solid form. It is expressed as mm Hg at 1 atm. Temperatures vary...see chart.
G	Lower explosive limit (LEL) and Upper explosive limit (UEL) are the minimum and maximum concentrations of a gas or vapor in air that will support flame. LEL and UEL are expressed as % in air at ambient or room temperature.
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I	Threshold limit value as a time-weighted average (TLV-TWA) is the concentration for a normal 8-hr workday and 40-hr work week to which nearly all workers may be repeatedly exposed, day after day, without adverse effect. Values reported are the current ACGIH Threshold Limit Value-Time Weighted Average (TLV-TWA) and OSHA Permissible Exposure Limit (PEL). All PELs are based on pre-1989 values, per OSHA's 1993 decision to vacate the 1989 PELs.
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L	Hazard Property: A - Corrosive B - Flammable C - Toxic D - Volatile E - Reactive F - Radioactive G - Carcinogen H - Infectious I - Reproductive Toxin *Note: A reproductive toxin is a compound (chemical) that affects the reproductive organs (generally the sperm and eggs, but sometimes the physical structure of the testes or ovaries, too). It can affect the reproductive organs of males, females, or both; it can affect the reproductive organs of an adult or child; it can affect the reproductive organs of a developing fetus with or without affecting the mother.*
M	Dermal toxicity data is summarized in the following three categories: 1. **Skin Penetration** A - negligible penetration (solid-polar) + B - slight penetration (solid-nonpolar) ++ C - moderate penetration (liquid/solid-nonpolar) +++ D - high penetration (gas/liquid-nonpolar) 2. **Systemic Potency** E - Slightly Toxic (LD50 = 5 - 15 g/kg) — Lethal dose for 70 kg adult = 1 pint to 1 quart F - Moderately Toxic (LD50 = 0.5 - 5 g/kg) — Lethal dose for 70 kg adult = 1 ounce to 1 pint G - Extremely toxic (LD50 = 5 - 50 mg/kg) — Lethal dose for 70 kg adult = 7 drops to 1 teaspoon 3. **Local Potency** H - slight - reddening of the skin I - moderate - irritation/inflammation of skin J - extreme - tissue destruction/necrosis
N	Acute Exposure Symptoms A - abdominal pains B - central nervous system depression C - comatose D - convulsions E - confusion F – dizziness G - diarrhea H - drowsiness I - dyspnea J - fever K - headache L - nausea M - respiratory irritation N - skin O - tremors P - unconsciousness Q - vomiting R - weakness

MSDS Number: **T0767** * * * * * *Effective Date:* ***05/19/08*** * * * * * *Supercedes:* ***08/16/05***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TETRACHLOROETHYLENE

1. Product Identification

Synonyms: ethylene tetrachloride; tetrachloroethene; perchloroethylene; carbon bichloride; carbon dichloride
CAS No.: 127-18-4
Molecular Weight: 165.83
Chemical Formula: Cl2C:CCl2
Product Codes:
J.T. Baker: 9218, 9360, 9453, 9465, 9469
Mallinckrodt: 1933, 8058

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Tetrachloroethylene	127-18-4	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate (Life)
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Irritating to the upper respiratory tract. Giddiness, headache, intoxication, nausea and vomiting may follow the inhalation of large amounts while massive amounts can cause breathing arrest, liver and kidney damage, and death. Concentrations of 600 ppm and more can affect the central nervous system after a few minutes.
Ingestion:
Not highly toxic by this route because of low water solubility. Used as an oral dosage for hookworm (1 to 4 ml). Causes abdominal pain, nausea, diarrhea, headache, and dizziness.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin with possible systemic effects.
Eye Contact:
Causes irritation, redness, and pain.
Chronic Exposure:
May cause liver, kidney or central nervous system damage after repeated or prolonged exposures. Suspected cancer risk from animal studies.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance. The use of alcoholic beverages enhances the toxic effects.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard but becomes hazardous in a fire situation because of vapor generation and possible degradation to phosgene (highly toxic) and hydrogen chloride (corrosive). Vapors are heavier than air and collect in low-lying areas.
Explosion:
Not considered to be an explosion hazard. Containers may explode when involved in a fire.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Store in a cool, dry, ventilated area away from sources of heat or ignition. Isolate from flammable materials. Protect from direct sunlight. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA), 200 ppm (ceiling),
300 ppm/5min/3-hour (max)

-ACGIH Threshold Limit Value (TLV):
25 ppm (TWA), 100 ppm (STEL); listed as A3, animal carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.
Odor:
Ethereal odor.
Solubility:
0.015 g in 100 g of water.
Specific Gravity:
1.62 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
121C (250F)
Melting Point:
-19C (-2F)
Vapor Density (Air=1):
5.7
Vapor Pressure (mm Hg):
18 @ 25C (77F)
Evaporation Rate (BuAc=1):
0.33 (trichloroethylene = 1)

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Slowly decomposed by light. Deteriorates rapidly in warm, moist climates.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition. Hydrogen chloride gas and phosgene gas may be formed upon heating. Decomposes with moisture to yield trichloroacetic acid and hydrochloric acid.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong acids, strong oxidizers, strong alkalis, especially NaOH, KOH; finely divided metals, especially zinc, barium, lithium. Slowly corrodes aluminum, iron and zinc.
Conditions to Avoid:
Moisture, light, heat and incompatibles.

11. Toxicological Information

Oral rat LD50: 2629 mg/kg; inhalation rat LC50: 4100 ppm/6H; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Tetrachloroethylene (127-18-4)	No	Yes	2A

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into water, this material is not expected to biodegrade. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals.
Environmental Toxicity:
The LC50/96-hour values for fish are between 1 and 10 mg/l. The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TETRACHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1897
Packing Group: III

Information reported for product/size: 4L

International (Water, I.M.O.)

Proper Shipping Name: TETRACHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1897
Packing Group: III
Information reported for product/size: 4L

International (Air, I.C.A.O.)

Proper Shipping Name: TETRACHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1897
Packing Group: III
Information reported for product/size: 4L

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15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                      TSCA  EC   Japan  Australia
----------------------------------------------  ----  ---  -----  ---------
Tetrachloroethylene (127-18-4)                   Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                        --Canada--
Ingredient                                      Korea  DSL   NDSL  Phil.
----------------------------------------------  -----  ---   ----  -----
Tetrachloroethylene (127-18-4)                   Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Tetrachloroethylene (127-18-4)            No    No      Yes        No

--------\Federal, State & International Regulations - Part 2\----------------
                                                     -RCRA-    -TSCA-
Ingredient                                CERCLA     261.33     8(d)
----------------------------------------  ------     ------    ------
Tetrachloroethylene (127-18-4)            100        U210       No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2[Z]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Monsanto
Material Safety Data

POLYCHLORINATED BIPHENYLS (PCBs)

Emergency Phone No.
(Call Collect)
314-694-1000

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: POLYCHLORINATED BIPHENYLS (PCBs)
Aroclor® Series 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268
Therminol® FR Series

MSDS Number: M00018515 Date: 12/95

Chemical Family: Chlorinated Hydrocarbons
Chemical Name: Polychlorinated biphenyls
Synonyms: PCBs, Chlorodiphenyls, Chlorinated biphenyls

Trade Names/Common Names:

PYRANOL® and INERTEEN® are trade names for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL is the generic name for a broad class of fire resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30 - 70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

PYDRAUL® is the trade name for hydraulic fluids that, prior to 1972, may have contained varying amounts of PCBs and other components including phosphate esters.

The product names/trade names are representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

In 1972, Monsanto restricted sales of PCBs to applications involving only closed electrical systems, (transformers and capacitors). In 1977, all manufacturing and sales were voluntarily terminated. In 1979, EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

MONSANTO COMPANY, 800 N. LINDBERGH BLVD., ST. LOUIS, MO 63167

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT
Call CHEMTREC - Day or Night - 1-800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska, or Virgin Islands. For calls originating elsewhere: 202-483-7616 (collect calls accepted)

For additional nonemergency information, call: 314-694-3344.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile, oily liquids to white crystalline solids and hard noncrystalline resins. Technical products vary in composition, in the degree of chlorination, and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per module (54% chlorine). They were used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic, and other industrial fluids, plasticizers, carbonless copy paper, paints, inks, and adhesives.

Component	CAS No.
chlorinated biphenyl	1336-36-3
Aroclor 1016	12674-11-2
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1242	53469-21-9
Aroclor 1248	12672-29-6
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4

There are also CAS Numbers for individual PCB congeners and for mixtures of Aroclor® products.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Seventh).

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance and Odor: PCB mixtures range in form and color from clear to amber liquids to white crystalline solids. They have a mild, distinctive odor and are not volatile at room temperature. Refer to Section 9 for details.

WARNING!
CAUSES EYE IRRITATION
MAY CAUSE SKIN IRRITATION

PROCESSING AT ELEVATED TEMPERATURES MAY RELEASE VAPORS OR FUMES WHICH MAY CAUSE RESPIRATORY TRACT IRRITATION

POTENTIAL HEALTH EFFECTS

Likely Routes of Exposure: Skin contact and inhalation of heated vapors

Eye Contact: Causes moderate irritation based on worker experience.

Skin Contact: Prolonged or repeated contact may result in redness, dry skin and defatting based on human experience. A potential exists for developing chloracne. PCBs can be absorbed through intact skin.

Inhalation: Due to the low volatility of PCBs, exposure to this material in ambient conditions is not expected to produce adverse health effects. However, at elevated processing temperatures, PCBs may produce a vapor that may cause respiratory tract irritation if inhaled based on human experience.

Ingestion: No more than slightly toxic based on acute animal toxicity studies. Coughing, choking and shortness of breath may occur if liquid material is accidentally drawn into the lungs during swallowing or vomiting.

Other: Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

Refer to Section 11 for toxicological information.

4. FIRST AID MEASURES

IF IN EYES, immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. Remove material from skin and clothing.

IF ON SKIN, immediately flush the area with plenty of water. Wash skin gently with soap as soon as it is available. Get medical attention if irritation persists.

IF INHALED, remove person to fresh air. If breathing is difficult, get medical attention.

IF SWALLOWED, do NOT induce vomiting. Rinse mouth with water. Get medical attention. Contact a Poison Control Center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

NOTE TO PHYSICIANS: Hot PCBs may cause thermal burn. If electrical equipment arcs between conductors, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce hydrochloric acid (HCl), a respiratory irritant. If large amounts are swallowed, gastric lavage may be considered.

5. FIRE FIGHTING MEASURES

Flash Point: 284 degrees F (140 degrees C) or higher depending on the chlorination level of the Aroclor product

Fire Point: 349 degrees F (176 degrees C) or higher depending on the chlorination level of the Aroclor product

NOTE: Refer to Section 9 for individual flash points and fire points.

Extinguishing Media: Extinguish fire using agent suitable for surrounding fire. Use dry chemical, foam, carbon dioxide or water spray. Water may be ineffective. Use water spray to keep fire-exposed containers or transformer cool.

PCBs are fire-resistant compounds. They may decompose to form CO, CO2, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

Dielectric fluids having PCBs and chlorinated benzenes as components have been reported to produce polychlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) during fire situations involving electrical equipment. At temperatures in the range of 600-650 degrees C in the presence of excess oxygen, PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state and local regulations.

Fire Fighting Equipment: Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

6. ACCIDENTAL RELEASE MEASURES

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any cleanup or disposal of PCBs, PCB items, or PCB contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All nonessential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways, and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. Refer to Section 8 for personal protection equipment and clothing.

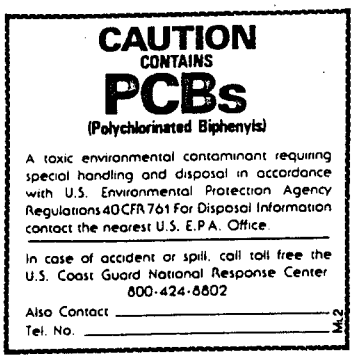
Personnel trained in emergency procedures and protected against attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks, and fight fires in PCB areas.

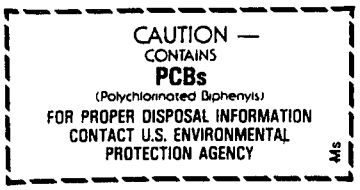
Refer to Section 13 for disposal information and Sections 14 and 15 for information regarding reportable quantity, and Section 7 for marking information.

7. HANDLING AND STORAGE

Care should be taken to prevent entry into the environment through spills, leakage, use vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked (check regulations, 40 CFR 761, for details).





Storage: The storage of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB waste is strictly regulated by 40 CFR Part 761. The storage time is limited, the storage area must meet physical requirements, and the area must be labeled.

Avoid contact with eyes.
Wash thoroughly after handling.
Avoid breathing processing fumes or vapors.
Process using adequate ventilation.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection: Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

Skin Protection: Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine the appropriate type glove for a given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contacted. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

ATTENTION! Repeated or prolonged skin contact may cause chloracne in some people.

Respiratory Protection: Avoid breathing vapor, mist, or dust. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended when airborne exposure limits are exceeded and, if used, replaces the need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

ATTENTION! Repeated or prolonged inhalation may cause chloracne in some people.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of vapor or mist, such as open process equipment.

Airborne Exposure Limits:

Product: Chlorodiphenyl (42% chlorine)

OSHA PEL: 1 mg/m^3 8-hour time-weighted average - Skin*
ACGIH TLV: 1 mg/m^3 8-hour time-weighted average - Skin*

Product: Chlorodiphenyl (54% chlorine)

OSHA PEL: 0.5 mg/m^3 8-hour time-weighted average - Skin*
ACGIH TLV: 0.5 mg/m^3 8-hour time-weighted average - Skin*

*For Skin notation see Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Government Industrial Hygienists, 1995-1996.

9. PHYSICAL AND CHEMICAL PROPERTIES

PROPERTIES OF SELECTED AROCLORS®							
PROPERTY	**1016**	**1221**	**1232**	**1242**	**1248**	**1254**	**1260**
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—*Not Available*

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Stability: PCBs are very stable, fire-resistant compounds.
Materials to Avoid: None
Hazardous Decomposition
Products: PCBs may decompose to form CO, CO_2, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surface.
Hazardous Polymerization: Does not occur.

11. TOXICOLOGICAL INFORMATION

Data from laboratory studies conducted by Monsanto and from the available scientific literature are summarized below.
Single exposure (acute) studies indicate:
Oral - Slightly Toxic (Rat LD50 - 8.65 g/kg for 42% chlorinated; 11.9 g/kg for 54% chlorinated)

The liquid products and their vapors are moderately irritating to eye tissues. Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute (NCI) performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed population, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Seventh Annual Report on Carcinogens.

12. ECOLOGICAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquid or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

13. DISPOSAL CONSIDERATIONS

The disposal of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB wastes is strictly regulated by 40 CFR Part 761. For example, all wastes and residues containing PCBs (wiping cloths, absorbent material, used disposable protective gloves and clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

14. TRANSPORT INFORMATION

The data provided in this section are for information only. Please apply the appropriate regulations to properly classify a shipment for transportation.

DOT Classification:	IF WEIGHT OF PCBs TO BE SHIPPED IS OVER ONE POUND, THE FOLLOWING CLASSIFICATION AND LABEL APPLY.	
DOT Label:	LIQUID:	Environmentally Hazardous Substance, liquid, n.o.s. (Contains PCB), 9, UN 3082, III
	SOLID:	Environmentally Hazardous Substance, solid, n.o.s. (Contains PCB), 9, UN 3077, III
DOT Label:	Class: 9	
DOT Reportable Quantity:	One Pound	
IMO Classification:	Polychlorinated Biphenyls, IMO Class 9, UN 2315, II IMO Page 9034, EMS 6.1-02	
IATA/ICAO Classification:	Polychlorinated Biphenyls, 9, UN2315, II	

15. REGULATORY INFORMATION

For regulatory purposes, under the Toxic Substances Control Act, the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such a substance (40 CFR Part 761).

TSCA Inventory: not listed.

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370): Immediate, Delayed.
SARA Section 313 Toxic Chemical(s): Listed-1993 (De Minimis concentration 0.1%.)

Reportable Quantity (RQ) under DOT (49 CFR) and CERCLA Regulations: 1 lb. (polychlorinated biphenyls) PCBs.

Release of more than 1 (one) pound of PCBs to the environment requires notification to the National Response Center (800-424-8802 or 202-426-2675).

Various state and local regulations may require immediate reporting of PCB spills and may also define spill cleanup levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill cleanup.

16. OTHER INFORMATION

Reason for revision: Conversion to the 16 section format. Supersedes MSDS dated 10/88.

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Pyranol® is a registered trademark of General Electric Company
Inerteen® is a registered trademark of Westinghouse Electric Corporation

FOR ADDITIONAL NONEMERGENCY INFORMATION, CONTACT:

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AVIMA

MATERIAL SAFETY DATA SHEET
LINDANE / THIRAM
200 g /kg / *270* g /kg

COMPANY DETAILS:

Name:	Avima (Pty) Ltd
Address:	Nu 18 Aschenberg Street Chamdor Krugersdorp
Tel. Nr.:	(011) 769 1300
Fax Nr.:	*(011)* **762** *5712*
Emergency Tel Nr.:	083 326 3581 / 082 823 4473 0800 – 172 –743

1. PRODUCT IDENTIFICATION:

Trade Name:	Lindane /Thiram: 200 g /kg & 270 g /kg
Chemical Family:	Organo Chlorine & Fungicide mixture
Chemical Name:	LINDANE Gamma –1,2,3,4,5,6 –Hexachlorocyclohexane Gamma –BHC Gamma –HCH THIRAM Tetramethylthiuram disulfide
Molecular Formula:	$C_6 H_6 C\ell_3$ (Lindane) $C_6H_{12}N_2S_4$ (Thiram)
UN Nr.	2761
C.A.S. Nr.:	58-89-9 (Lindane Tech) 137-26-8 (Thiram Tech)
Description **of Product:**	**A** wettable powder formulation ready to –use combination product *of* fungicide and insecticide for seed dressing on maize, peas, beans, groundnuts, sorghum, millet and most vegetables seeds to control seed and soil –borne diseases and early soil- bourne

2. COMPOSITION:

Hazardous Components:	Gamma – BHC	200 g /kg
	Thiram	270 g /kg

3. PHYSICAL AND CHEMICAL CHARACTERISTICS:

Appearance: Blue Powder
Density @ 20 °C (kg/ℓℓ): Not available

4. FIRE AND EXPLOSION HAZARD:

Flash **Point:**	Not available
Flammability:	Not available
Auto ignition Temperature:	Not available
Decomposition **Temperature:**	Not available
Acute Hazards:	Thermal decomposition products may be hazardous. These may include chlorine, hydrogen chloride, phosgene, carbon monoxide and carbon dioxide.
Special fire fighting **procedures:**	Keep fire exposed containers cool. with water spray. If a leak or spill has not ignited. use water spray to disperse the vapors and to protect personnel attempting to stop leak. No unprotected persons should be allowed the vicinity. Water spray may be used to flush spills away from exposures. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Contain run-off with temporary earth barriers
Extinguishing **Media:**	Water spray or fog, foam, dry chemical or carbon dioxide. (water may be ineffective for putting out fires, unless used by experienced fire fighters)
Special protective equipment:	Do not breath fumes. For fires in close *areas,* fire fighters must use self-contained breathing apparatus, as well as full protective nitrile rubber gloves, close fitting safety goggles or face shield, effective respiratory protection. Full-length protective clothing and boots must be worn when handling gear, this material in an emergency.
Hazardous decomposition **products:**	These may include chlorine, hydrogen chloride, phosgene, carbon monoxide and carbon dioxide.

5. REACTIVITY DATA:

Stability:	Stable
Conditions **to avoid:**	Excessive heat.
Materials to avoid:	Strong alkaline or oxidizing agents.
Hazardous **decomposition** products:	These may include chlorine, hydrogen chloride, phosgene; carbon monoxide and carbon dioxide.

6. WARNINGS:

Store under **lock** and key
Store in a cool, dry place, away from source of heat & naked flames
Keep away from oxidizers and alkaline agents.
Keep containers closed when not in use.
Minimize skin and eye contact
Decontaminate all equipment before repairing
Keep out of reach of children, uninformed persons and animals.
Store away from farm feeds: foodstuffs, eating utensils and drinking water.
Flammable liquid

7. HEALTH HAZARD DATA: (Acute Hazards & Symptoms)

Effects of overexposure:

Acute (Short term exposure): Harmful if swallowed, absorbed through skin, or inhaled. May cause irritation of nose, throat, or skin. Consumption of alcohol after exposure to Thiram may cause flushing, breathing difficulty, nausea, vomiting and low blood pressure. If ingested, this product may produce kidney and liver damage. Acute exposure *to* Lindane can cause dizziness, headache, vomiting, diarrhea, tremors, weakness, and convulsions.

Chronic (**Long term exposure**): Lindane may produce liver and kidney toxicity.

General precautions: Always practice good industrial hygiene; handle with *care;* avoid personal contact. Do not *get* into eyes or on skin, do not breathe product dust. Do not swallow Wash hands with soap and water and rinse after handling product. Shower after each *shift* Wash all work clothing and completely clean all personal protective equipment after each shift.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Inhalation: Respirator with an organic –vapor removing cartridge with a prefilter approved for pesticides *or* canister approved for pesticides.

Skin: Wear protective clothing (long sleeve shirt & pants) as well as protective gloves (solvent resistant gloves:). Launder contaminated clothing before re-use. Avoid **skin** contact. Keep working clothes separately and do not take home. Good personal hygiene practices should always be followed. Provide local emergency shower.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION: (continue)

Eyes: Avoid contact with eyes. Wear eye & face protection (safety glasses & face shields). When handling this product: wear goggles giving completely eye protection. Normal industrial eye protection practices should be employed. Provide emergency eye wash stations.

Ingestion: Store away from food & feedstuffs Do not tat, drink or smoke whilst handling this product. Wash hands & face after handling the product, before eating and drinking.

Work practices: Wear appropriate personal protective equipment when handling material. Users should Wash hands before eating: drinking, chewing gum, using tobacco, or using toilet. Remove clothing immediately if pesticides get inside. Then wash thoroughly and put on clean clothing.

9. FIRST AID MEASURES:

Inhalation: Remove patient from source of poisoning to well ventilated area and **keep** him quiet and reassured. If necessary administer artificial respiration and oxygen or closed chest cardiac message. **Seek** medical attention immediately

Remove contaminated clothing & shoes. Immediately rinse the affected skin area with plenty of soap & cool water or shower, for **15** –20 minutes. Do not rub skin Launder contaminated clothing before re-use. If irritation occurs & persists, seeks medical attention

Eyes: Flush contamination of eyes with copious amounts of clean water for at least 15 min. Cover with a sterile **pad** and **seek** medical attention.

Ingestion: Keep patient quiet & reassured, rinse mouth with water Do not induce vomiting Never give anything by mouth to an unconscious person. DO NOT apply direct mouth-to-mouth respiration: use a disposable protective mouthpiece. Contact a doctor or hospital.

NOTE TO PHYSICIAN:

Thiram: Treat symptomatically. Avoid alcohol. In the presence of consumed alcohol Thiram responds similarly to disulfiram.

Lindane: **Symptoms:** Conjunctivitis, headache, staggering, fever, nausea, vomiting, mental confusion, irritation to respiratory system These symptoms result in pulmonary edema, dilation to the heart, extensive necrosis to blood vessels in lungs, liver, fatty degeneration to liver and kidney, and some cases of hypoplasmic anemia have been reported. In case of ingestion Gastric lavage followed by saline catharsis Give Phenobarbital for normal sedation and potassium gluconate for muscular cramps. Prescribe high calcium, high carbohydrates, and high vitamin intake

10. ACCIDENTAL RELEASE MEASURES:

Notification **procedures:**	Report spills as required *to* appropriate authorities.
Procedures if **material is released *or* spilled:**	Evacuate unprotected personnel, dike / contain spill with dry sand, inert material and sweep **up** and place into proper container as for toxic waste in accordance with local/national regulations. ***DO*** NOT BURN. Protective clothing to be worn when clearing spillage If safe **disposal is** not possible contact manufacturer, dealer or local representative.
Environmental Precautions:	Prevent spills from entering storm sewers or drains. waterways and contact with soil.

11. HANDLING & STORAGE:

Handling /storage precaution:	Do not inhale spray mist Avoid contact with **skin,** eyes and clothing. Avoid inhalation of fog and vapors, wash with soap and water after use/accidental **skin** contact Do not eat, drink or smoke while working. Exposed operating positions must have an efficient local exhaust source; working areas must be well ventilated In addition to the measures taken usually in the chemical works like splash proof filling and measuring equipment (including vapor stripping). Further personnel protection measures may have to be implemented to avoid possible contact with the product.
Cleaning of equipment after use:	During application and when cleaning equipment and protective clothing, contamination of all sources of drinking H_2O, rivers, dams, other crops **or** grazing shall be prevented. Clean protective clothing, used protective clothing and the workers personal clothing shall be **kept apart.** At the end of each day, all protective clothing and respirators, shall be decontaminated, washed. rinsed and dried. Extra care must be.taken when cleaning equipment after use

12. DISPOSAL CONSIDERATION:

Waste disposal:	Product should be utilized completely to avoid disposal.
Disposal **of residue:**	Pesticide wastes are toxic Residue *to* be disposed of **as** toxic waste in accordance with local/national regulations **DO** NOT BURN.

Disposal of used packing material:
Destroy empty containers by perforation or flattening, and DO NOT re-use for any other purpose Dispose unwanted product or spillage only at approved waste disposal sites away from water sources

13, TRANSPORTATION DATA:

Hazardous **Description Label:**		Organo chlorine pesticide, powder, toxic, n.o s contains Gamma -BHC & Thiram Keep away from foodstuff. Toxic
UN Hazard Class:		6 1
UN Packing Group:		II
ICAO/IATA:	Shipping Name:	Toxic powder.
	Label(s):	Keep away from foodstuffs. Poison
	Packing group:	II
	Class:	6.1

14. ENVIRONMENTAL DATA:

Toxic to fish, birds, and wildlife. Do not apply directly to water, or to areas where surface water is present Avoid release into environment in circumstances different to normal use. Exposed treated seeds may he hazardous to birds or other wildlife. Dispcse of all excess treated seed by burial away from bodies of water. Do not contaminate disposing of equipment wash waters

Is'. NOTE:

THE INFORMATION CONTAINED HEREIN IS BASED ON THE **PRESENT** STATE OF OUR KNOWLEDGE ON THE PRODUCT, ALL INFORMATION IS GIVEN IN GOOD FAITH BUT WITHOUT GUARANTEE IN RESPECT OF ACCURACY, **AND** NO **RESPONSIBILITY** IS ACCEPTED FOR ERRORS OR EMISSION OR THE CONSEQUENCES THEREOF

Material Safety Data Sheet

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

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

Section I Product Identification

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

Solvent : methylene chloride (dichloromethane)

Section II Composition / Information on Ingredients

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

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

Section III Hazards Identification

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

Irritant

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

Section IV First Aid Measures

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.

Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.

Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.

Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V Fire Fighting Measures

Fire and Explosion Hazard Data for Solvent

Fire Hazard: non-combustible

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

Section VI Accidental Release Measures

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

Section VII Handling and Storage

Store at Room Temperature (18-25°C)

Keep in a tightly closed container, and store in a corrosion proof area.

This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Solvent

Melting Pt.: -96.7°C	Boiling Pt.: 39.8°C	Density: 1.326
Vapor Pressure: 350 mmHg @ 20°C	Vapor Density: 2.9	Water Solubility: insoluble
Appearance: colorless liquid	Odor: chloroform-like odor	Flash Point: none
Auto-Ignition Temperature: 1139°F	LEL: 15.5	UEL: 66.4

Section X Stability and Reactivity

Reactivity Data for Solvent

Stability: stable

Incompatibilities:
- strong oxidizers
- caustics
- active metal powder

Hazardous Decomposition Products: phosgene, HCl, CO

Hazardous Effects of Polymerization: none

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Toxic, liquids, organic, n.o.s. (dichloromethane)

UN Number: UN2810 Shipping Class: 6.1 Packing Group: III

Section XV Regulatory Information

Warning: This product contains chemicals known to the state of California to cause cancer.

EU Directives Classification

R: 40

Risk Statements: Limited evidence of a carcinogenic effect.

S: 23-24/25-36/37

Safety Statements: Do not breathe gas/fumes/vapour/spray. Avoid contact with skin and eyes. Wear suitable protective clothing and gloves.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-160R: fluoranthene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-160R: fluoranthene

CAS number	206-44-0
EINECS number	205-912-4
RTECS number	LL4025000
Molecular mass	202.26 g/mol
Formula	C16H10

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-0(*)

DSD/DPD

Classified dangerous in accordance with Directives 67/548/EEC and 1999/45/EC

Harmful if swallowed

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

Other hazards

Combustible

Its dust is explosive with air

Dust cloud can be ignited by a spark

Highly bioaccumulative

CLP

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

Acute Tox. 4	Harmful if swallowed. (H302)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Combustible

Its dust is explosive with air

Dust cloud can be ignited by a spark

Highly bioaccumulative

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
fluoranthene	206-44-0 205-912-4		Xn; R22 N; R50-53	Acute Tox. 4; H302 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Do not apply (chemical) neutralizing agents

Consult a doctor/medical service

4.3 Eye contact:

Rinse with water

Do not apply neutralizing agents

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

No unsuitable extinguishing media known

5.3 Special exposure hazards:

Temperature above flashpoint: higher fire/explosion hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of environmentally hazardous firefighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers

Carefully collect the spill/leftovers

Clean contaminated surfaces with an excess of water

Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Observe normal hygiene standards
Keep away from naked flames/heat
Keep container tightly closed
Do not discharge the waste into the drain
Finely divided: spark- and explosionproof appliances
Finely divided: keep away from ignition sources/sparks

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements
Storage temperature: < 4 °C

Keep away from:

oxidizing agents

Suitable packaging material:

glass

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Fluoranthene	OSHA	CSI		
Fluoranthene (Polynuclear aromatic hydrocarbon)	NIOSH	5515	adsorption tubes	
Fluoranthene (Polynuclear aromatic hydrocarbon)	NIOSH	5506	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Carry operations in the open/under local exhaust/ventilation or with respiratory protection

Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P2

b) Hand protection:

Gloves

- rubber

c) Eye protection:

Safety glasses

In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Needles
Colour	Colourless to light yellow

9.2 Important health, safety and environmental information:

Boiling point	384 °C

Flashpoint	198 °C
Relative density	(0 °C) 1.25
Solubility in water	0.000026 g/100 ml
Solubility in solvents	Soluble in ethanol
	Soluble in ether
	Soluble in acetic acid
	Soluble in carbondisulfide
	Soluble in chloroform
Log Pow	5.33

9.3 Other information:

Melting point	110 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources
ignition sources

Stability

Stable under normal conditions

10.2 Materials to avoid:

oxidizing agents

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

BCR-160R: fluoranthene

LD50 oral (rat)	2000 mg/kg
LD50 dermal (rabbit)	3180 mg/kg

11.2 Chronic toxicity:

Not classifiable as a human carcinogen
Not listed in mutagenicity class (EC,MAK)
Not classified as toxic to reproduction (EC)

BCR-160R: fluoranthene

IARC - classification	3

11.3 Acute effects/symptoms:

Inhalation:

No data available

Skin contact:

No data available

Eye contact:

No data available

Ingestion:

No data available

11.4 Chronic effects:

No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Tingling/irritation of the skin
Nausea
Accelerated heart action
Disturbances of heart rate
Enlargement/affection of the liver

Risk of lung oedema

12. Ecological information

12.1 Ecotoxicity:

BCR-160R: fluoranthene

LC50 fishes

species	value	duration (h)	remarks
SALMO GAIRDNERI/ ONCORHYNCHUS MYKISS	0.0077 mg/l	96 h	

EC50 Daphnia

species	value	duration (h)	remarks
DAPHNIA MAGNA	<0.1 mg/l	72 h	LOCOMOTOR EFFECT

EC50 other aquatic organisms

species	value	duration (h)	remarks
SELENASTRUM CAPRICORNUTUM	54 mg/l	96 h	

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
	Substance sinks in water
Water physicochemical processes	Forming sediments in water

12.3 Persistence and degradability:

12.4 Bioaccumulative potential:

Log Pow	5.33

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)

16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals

Depending on branch of industry and production process, also other EURAL codes may be applicable

Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery

Remove waste in accordance with local and/or national regulations

Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)

15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	fluoranthene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Not listed in Annex I of directive 67/548/EEC et sequens. Labelling established on the basis of the available data.

Harmful

Dangerous for the environment

R-phrases

22	Harmful if swallowed

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

S-phrases

(02)	(Keep out of the reach of children)
(46)	(If swallowed, seek medical advice immediately and show this container or label)
60	This material and its container must be disposed of as hazardous waste
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

CLP

Classification and labelling according to the criteria of Regulation (EC) No 1272/2008 and after evaluation of available test data

Signal word

Wng	Warning

H-statements

H302	Harmful if swallowed.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P264	Wash hands thoroughly after handling.
P273	Avoid release to the environment.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P330	Rinse mouth.
P391	Collect spillage.
P501	Dispose of contents/container to manufacturer/competent authority.

15.2 National provisions:

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R22	Harmful if swallowed
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H302	Harmful if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Acute Tox.	Acute toxicity
Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-337: dibenzofuran

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-337: dibenzofuran

CAS number	132-64-9
EINECS number	205-071-3
RTECS number	HP4430000
Molecular mass	168.19 g/mol
Formula	C12H80

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

DSD/DPD

Classified dangerous in accordance with Directives 67/548/EEC and 1999/45/EC
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Other hazards

Combustible
Its dust is explosive with air
Dust cloud can be ignited by a spark
Highly bioaccumulative
Not readily biodegradable in water

CLP

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008
Aquatic Chronic 2 Toxic to aquatic life with long lasting effects. (H411)

Other hazards

Combustible
Its dust is explosive with air
Dust cloud can be ignited by a spark
Highly bioaccumulative
Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
dibenzofuran	132-64-9 205-071-3		N; R51-53	Aquatic Chronic 2; H411	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air
Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water
Soap may be used
Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water
Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water
Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray
Polyvalent foam
Polymer foam
ABC powder
Carbon dioxide

5.2 Unsuitable extinguishing media:

No unsuitable extinguishing media known

5.3 Special exposure hazards:

Temperature above flashpoint: higher fire/explosion hazard
Dust cloud can be ignited by a spark
Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of environmentally hazardous firefighting water
Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves
Protective clothing
Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill
Prevent soil and water pollution
Prevent spreading in sewers
See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Clean contaminated surfaces with an excess of water
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Avoid prolonged and repeated contact with skin
Keep away from naked flames/heat
Keep container tightly closed

Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Store in a dark area
Keep container in a well-ventilated place
Fireproof storeroom
Meet the legal requirements

Keep away from:

oxidizing agents

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
No data available				

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Carry operations in the open/under local exhaust/ventilation or with respiratory protection

Personal protective equipment:

a) Respiratory protection:

Dust formation: dust mask

b) Hand protection:

Gloves

- PVC

c) Eye protection:

Safety glasses

In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Crystalline powder
	Needles
Odour	Characteristic odour
Colour	White

9.2 Important health, safety and environmental information:

Boiling point	287 °C
Flashpoint	130 °C
Relative density	1.1
Solubility in water	0.00031 g/100 ml
Solubility in solvents	Soluble in ethanol
	Soluble in ether
	Soluble in acetone
	Soluble in acetic acid
	Soluble in chloroform
Relative vapour density	5.8
Dynamic viscosity	(0 °C) 0.099 Pa.s
Log Pow	4.12 - 5.16

9.3 Other information:

Melting point	86 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources
ignition sources

Stability

No data available

10.2 Materials to avoid:

oxidizing agents

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Not listed in carcinogenicity class (IARC,EC,TLV,MAK)
Mutagenicity: AMES test negative
Mutagenicity tests: negative
Not listed in mutagenicity class (EC,MAK)
Not classified as toxic to reproduction (EC)

11.3 Acute effects/symptoms:

Inhalation:

No data available

Skin contact:

No data available

Eye contact:

No data available

Ingestion:

No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
Skin rash/inflammation
May stain the skin

12. Ecological information

12.1 Ecotoxicity:

BCR-337: dibenzofuran

LC50 fishes

species	value	duration (h)	remarks
PIMEPHALES PROMELAS	1.78 - 1.85 mg/l	96 h	

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
Water physicochemical processes	Forming sediments in water

12.3 Persistence and degradability:

Half-life soil > 48 days

Not readily biodegradable in water

test: 0%, 28d, OECD 301C mitil

12.4 Bioaccumulative potential:

Log Pow 4.12 - 5.16

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)

16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals

Depending on branch of industry and production process, also other EURAL codes may be applicable

Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery

Remove waste in accordance with local and/or national regulations

Obtain the consent of pollution control authorities before discharging to wastewater treatment plants

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)

15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	dibenzofuran
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	dibenzofuran
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	dibenzofuran
UN number	3077
Class	9
Packing group	III

Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	dibenzofuran
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	dibenzofuran
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Not listed in Annex I of directive 67/548/EEC et sequens. Labelling established on the basis of the available data.

Dangerous for the environment

R-phrases

51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

(29)	(Do not empty into drains)
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

CLP

Classification and labelling according to the criteria of Regulation (EC) No 1272/2008 and after evaluation of available test data

Signal word

	No signal word

H-statements

H411	Toxic to aquatic life with long lasting effects.

P-statements

P273	Avoid release to the environment.
P391	Collect spillage.
P501	Dispose of contents/container to manufacturer/competent authority.

15.2 National provisions:

16. Other information

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(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H411	Toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Chronic	Hazardous to the aquatic environment - chronic

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-269: chrysene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-269: chrysene

CAS number	218-01-9
EC index number	601-048-00-0
EINECS number	205-923-4
RTECS number	GC0700000
Molecular mass	228.30 g/mol
Formula	C18H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

DSD/DPD

May cause cancer
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
Possible risk of irreversible effects

Other hazards

Its dust is explosive with air
Dust cloud can be ignited by a spark
No certainty about human mutagenic properties
Highly bioaccumulative
Literature reports: not readily degradable in water

CLP

Muta. 2	Suspected of causing genetic defects. (H341)
Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air
Dust cloud can be ignited by a spark
No certainty about human mutagenic properties
Highly bioaccumulative
Literature reports: not readily degradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note

chrysene	218-01-9 205-923-4		Carc. Cat. 2; R45 Muta. Cat. 3; R68 N; R50-53	Carc. 1B; H350 Muta. 2; H341 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Wash with water and soap

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

Polymer foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers

Carefully collect the spill/leftovers

Clean contaminated surfaces with an excess of water

Take collected spill to manufacturer/competent authority

Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Finely divided: spark- and explosionproof appliances
Keep container tightly closed
Finely divided: keep away from ignition sources/sparks
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Store in a dark area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Store only in a limited quantity
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

TLV (USA)

Chrysene	Short time value	- ppm
	Time-weighted average exposure limit	- ppm

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
1,2-benzophenanthrene	NIOSH	OSHA-58		
Chrysene	OSHA	CSI		
Chrysene	OSHA	58	filter	
Chrysene (Polynuclear aromatic Hydrocarbons)	NIOSH	5515	adsorption tubes	
Chrysene (Polynuclear aromatic Hydrocarbons)	NIOSH	5506	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:

Protective clothing

In case of dust production: head/neck protection

In case of dust production: dustproof clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Flakes
Odour	Odourless
Colour	White
	On exposure to light: fluorescent blue

9.2 Important health, safety and environmental information:

Boiling point	448 °C
Relative density	1.27
Solubility in water	0.00000020 g/100 ml
Log Pow	(experimental) 5.81-5.86

9.3 Other information:

Melting point	256 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources

ignition sources

Stability

Stable under normal conditions

Reactions

Reacts violently with (strong) oxidizers

Decomposes on exposure to (strong) acids

10.2 Materials to avoid:

oxidizing agents

(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic

No certainty about human mutagenic properties

Not classified as toxic to reproduction (EC)

BCR-269: chrysene

EC carc cat	2
EC muta cat	3
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	3
TLV - Carcinogen	A3
MAK - Krebserzeugend Kategorie	2
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

CLP muta cat	category 2

11.3 Acute effects/symptoms:

Inhalation:
No data available

Skin contact:
No data available

Eye contact:
No data available

Ingestion:
No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Photoallergy
Cracking of the skin
Skin rash/inflammation
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

BCR-269: chrysene

TLM fishes

species	value	duration (h)	remarks
NEANTHES ARENACEODENTATA	>1 ppm	96 h	STATIC SYSTEM

Threshold limit algae

species	value	duration (h)	remarks
CYANOPHYTA	0.001 mg/l		GROWTH

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
	Substance sinks in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Half-life soil	> 77 days

Literature reports: not readily degradable in water

12.4 Bioaccumulative potential:

Log Pow	(experimental) 5.81-5.86

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	chrysene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	chrysene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	chrysene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	chrysene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	chrysene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Labelling in accordance with 29th adaptation of EC directive 67/548/EEC

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
68	Possible risk of irreversible effects

S-phrases

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

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

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

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. d)

16. Other information

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Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R68	Possible risk of irreversible effects

Full text of any H-statements referred to under headings 2 and 3:

H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity
Muta.	Germ cell mutagenicity

APG

Analytical Products Group, Inc.

2730 Washington Blvd., Belpre, OH 45714
740-423-4200 800-272-4442 Fax 740-423-5588

Material Safety Data Sheet

Date prepared on: 12/5/95

Last revised on: 1/20/08

Page **1**

Section I: Product Identification

CATALOG NUMBER: 5370/5372	PRODUCT NAME: Chlordane (Total)

Section II - Hazardous Ingredients/Identity Information

Chemical Name	CAS Reg. No.	OSHA PEL (TWA)	% Composition*
Acetone	67-64-1	750 ppm750 ppm	99.995%
Technical Chlordane	57-74-9	0.5 mg/m3	0.005%

* Components are calculated on a weight/weight basis.

Section III - Physical/Chemical Characteristics

BOILING POINT: 56°C (132°F) @ 760 mm Hg	SPECIFIC GRAVITY: 0.79 (water = 1)	
VAPOR PRESSURE: 181 mm Hg @ 20°C	SOLUBILITY IN WATER: Complete	APPEARANCE/ODOR: Clear, colorless liquid, sweet odor (acetone)

Section IV - Fire and Explosion Hazard Data

FLASH POINT (Method used): -18°C (-2°F) closed cup	AUTO IGNITION TEMPERATURE: 464°C (869°F)	FLAMMABLE LIMITS	LEL 2.5%	UEL 13%

EXTINGUISHING MEDIA: Use alcohol foam, dry chemical or carbon dioxide (water may be ineffective). Use extinguisher media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire exposed containers cool.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause a fire.

Section V - Reactivity Data

STABILITY:	Unstable ☐	Stable ☒	Conditions to Avoid: Heat, sparks, and contact with ignition source.

INCOMPATIBILITY (Materials to avoid):
Strong oxidizing agents, strong bases, halogen acids and halogen compounds, caustics, amines and ammonia, chlorine and chlorine compounds, strong acids, esp. sulfuric and nitric.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, toxic fumes of chlorine.

HAZARDOUS POLYMERIZATION:	May Occur ☐	Will Not Occur ☒	Conditions to Avoid: N/A

Section VI - Health Hazard Data

ROUTES OF ENTRY	Inhalation? YES	Skin? YES	Ingestion? YES
HEALTH HAZARDS (Acute and Chronic): Acute: Irritation of the nose and throat. Chronic: Kidney and liver damage. CANCER HAZARD			
COMPONENTS LISTED AS CARCINOGENS OR POTENTIAL CARCINOGENS: Technical Chlordane 57-74-9 (IARC) RTECS #PB9800000 Consult RTECS for complete information on the effects of this compound.			
SIGNS AND SYMPTOMS OF EXPOSURE: Irritation of skin, eyes, nose and throat. Headache, dizziness, vomiting, nausea, central nervous system depression, low blood pressure and respiratory failure. Prolonged contact may cause dermatitis.			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Skin disorders, eye disorders, and chronic respiratory disease.			
EMERGENCY AND FIRST AID PROCEDURES: EYES: Remove contact lenses if present. Hold eyelids open and irrigate with large volumes of water for 15 min. Seek medical treatment. SKIN: Immediately wash with soap and water. Continue rinsing with large volumes of water for 15 min. Remove contaminated clothing. Seek medical treatment. INHALATION: If inhaled, remove to fresh air. Have a trained person administer oxygen and CPR if needed. Contact a physician immediately. INGESTION: If conscious, give large amounts of water and induce vomiting. Contact a physician immediately.			

Section VII - Precautions for Safe Handling and Use

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Diluted standard can be absorbed with sand or other non-combustible absorbent material and placed into a container for later disposal. Sample solutions should be absorbed with charcoal or other organic absorbent and incinerated. Flush are with water.
WASTE DISPOSAL METHOD: Dispose in accordance with all applicable federal, state, and local regulations.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Contains a CARCINOGEN or SUSPECTED CARCINOGEN. Avoid all inhalation and contact. Keep in a tightly closed container at all times. Protect from temperature extremes and direct sunlight. Handle with the utmost care. Store in an explosion proof refrigerator at 4C.
OTHER PRECAUTIONS* This product contains a chemical(s) known to the State of California to cause cancer.

Section VIII - Control Measures

RESPIRATORY PROTECTION (Please specify): Respiratory protection required if airborne concentration exceeds PEL 750 ppm. At concentrations up to 5000 ppm a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended. (20,000 ppm is immediately dangerous to life or health).	
VENTILATION: Use in an area provided with general and local exhaust ventilation meeting OSHA requirements	
PROTECTIVE GLOVES: Solvent resistant: neoprene, nitrile, or rubber.	EYE PROTECTION: Safety glasses or goggles.
OTHER PROTECTIVE EQUIPMENT: Protective clothing meeting laboratory safety requirements.	
EMERGENCY WASH FACILITIES: Maintain eye wash and quick drench showers in work area.	

The information stated in this Material Safety Data Sheet (MSDS) is believed to be correct on the date of publication and must not be considered all conclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. Persons not specifically and properly trained should not handle this chemical or its container. This MSDS is provided without any warranty expressed or implied, including merchantability or fitness for any particular purpose.

This product is furnished for laboratory use ONLY! Our standards may not be used as drugs, cosmetics, agricultural or pesticidal products, food additives or as house hold chemicals.

* Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Environmental Protection Agency, and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

Material Safety Data Sheet

SO-Flex **MSDS No. 625**

Date of Preparation: November 2, 2010 Revision: 0011

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: SO-Flex
General Use: Polyurethane Plasticizer
Manufacturer: Smooth-On Inc., 2000 St. John St., Easton PA 18042
Phone (610) 252-5800, FAX (610) 252-6200
Emergency Contact: Chem-Tel
Domestic: 800-255-3924 International: 813-248-0585

Section 2- Hazards Identification

Hazard Designation: Classified according to Articles 6 & 7of Directive 1999/45/EC

Europe **Canada**

HMIS	
H	2
F	1
R	0

+T:Toxic Xn: Harmful N: Dangerous for the environment

Risk Phrases pertaining to particular dangers
R20: Harmful by inhalation.
R36/37/38: Irritating to eyes, respiratory system and skin.
R40: Limited evidence of a carcinogenic effect.
R48/20: Harmful; danger of serious damage to health by prolonged exposure through inhalation.
R50/53: Very toxic to aquatic organisms may cause long term adverse effects in the aquatic environment.
R61: May cause harm to the unborn child.
R62: Possible risk of impaired fertility.

Section 3 - Composition / Information on Ingredients

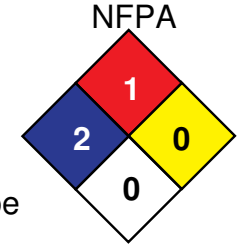
Component	ACGIH TWA	OSHA PEL	Hazard Designation	Weight Percent (%)
Butyl benzyl phthalate CAS Number: 85-68-7 EINECS Number: 201-622-7	None Established	None Established	+T N	**99.7**
Phenylmercuric neodecanoate CAS Number: 26545-49-3 EINECS Number: 247-783-7	None Established	None Established	Xn	**0.3**

Section 4 - First Aid Measures

Inhalation: Remove source(s) of contamination and move victim to fresh air. If breathing has stopped, give artificial respiration, then oxygen if needed. Contact physician immediately.
Eye Contact: Flush eyes with plenty of water. If irritation persists, seek medical attention.
Skin Contact: In case of skin contact, wash thoroughly with soap and water; remove contaminated clothing and launder before reuse; seek medical attention if rash develops.
Ingestion: Do not induce vomiting unless instructed by a physician. Contact physician immediately
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 5 - Fire-Fighting Measures

NFPA



Flash Point: >300 °F (150°C)
Flash Point Method: COC
LEL: Not Established **UEL:** Not Established
Flammability Classification: Non-Flammable
Extinguishing Media: Water Fog, Dry Chemical, and Carbon Dioxide Foam
Unusual Fire or Explosion Hazards: Hazardous decomposition products may be formed. Avoid water contamination in closed containers or confined areas as exothermic heat and carbon dioxide can evolve.
Fire-Fighting Instructions: Fire fighters should wear self-contained breathing apparatus. Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Only properly protected personnel should remain in the spill area; dike and contain spill; absorb or scrape up excess into suitable container for disposal; wash area with dilute ammonia solution. Stop or reduce discharge if it can be done safely**.**

Section 7 - Handling and Storage

Handling Precautions: Minimize breathing of vapors and avoid prolonged or repeated contact with skin. Wear proper protective equipment. If ventilation is not sufficient, wear proper respiratory equipment. Avoid moisture contamination. Reseal partial containers. Use good general housekeeping procedures.
Storage Requirements: Store in cool dry, well-ventilated area.

Section 8 - Exposure Controls / Personal Protection

Respiratory Protection: Follow OSHA respirator regulations 29 CFR 1910.134 and European Standard EN 149; wear an MSHA/NIOSH or European Standard EN149 approved respirator. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas

Protective Clothing/Equipment: Wear chemically protective gloves to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations 29 CFR 1910.133 and European Standard EN166. Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance : Clear oily liquid
Odor : mild odor
Vapor Pressure (mm of Hg): 8.6 x 10^{-6} @ 20℃
Vapor Density (Air=1): 10.8
Specific Gravity (H_2O=1, at 4 ℃): 1.12
Water Solubility: Negligible:
Boiling Point: 370℃
% Volatile: Nil
Freezing/Melting Point: None Determined
Viscosity: 1 poise
Evaporation Rate: None Determined

Section 10 - Stability and Reactivity

Stability: This product is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization can occur.
Chemical Incompatibilities: Strong bases, water, amines, alcohols.
Conditions to Avoid: Avoid contamination with water and other materials that react with Isocyanates.
Hazardous Decomposition Products: carbon monoxide and carbon dioxide.

Section 11- Toxicological Information

Butyl Benzyl Phthalate	Rat: 20,400 mg/kg	Rat: >6.7 g/l for 4 hours.

Section 12 - Ecological Information

Butyl Benzyl Phthalate: Biodegradable according to OECD.
Ecotoxicity in water: 1.1-1.7 mg/l (Fish)

Section 13 - Disposal Considerations

Disposal: Must be disposed of in accordance with local regulations.

Section 14 - Transport Information

DOT	IATA	IMDG
55 Gallon Quantities or Greater **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. Butyl Benzyl Phthalate Mixture **UN #:** 3082 **Hazard Class:** 9 **Label:** Miscellaneous	All Quantities **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. Butyl Benzyl Phthalate Mixture **UN #:** 3082 **Hazard Class:** 9 **Label:** Miscellaneous	All Quantities **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. Butyl Benzyl Phthalate Mixture **UN #:** 3082 **Hazard Class:** 9 **Label:** Marine Pollutant

Section 15 - Regulatory Information

TSCA Inventory Status (40 CFR710): All components of this formulation are listed in the TSCA Inventory.

California Proposition 65**:** This product contains Butyl Benzyl Phthalate and a mercury compound, which have been identified by the state of California to cause birth defects or other reproductive harm.

Section 15 - Regulatory Information (continued)

Canadian Regulations;

WHMIS Identification: **D2A, D2B**
CDSL/NDL (Canadian Domestic Substance List/Non Domestic Substance List): **Listed on CDSL**

Labeling according to EEC Directive

Risk Phrases	Symbol(s) Required for EU Label	Safety Phrases
R20: Harmful by inhalation. **R36/37/38**: Irritating to eyes, respiratory system and skin. **R40**: Limited evidence of a carcinogenic effect. **R48/20**: Harmful; danger of serious damage to health by prolonged exposure through inhalation **R50/53**: Very toxic to aquatic organisms may cause long term adverse effects in the aquatic environment. **R61:** May cause harm to the unborn child. **R62:** Possible risk of impaired fertility.	 **+T: Toxic** **Xn: Harmful** **N: Dangerous for the environment**	**S1/2:** Keep locked up and out of reach of children. **S26:** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. **S28:** After contact with skin, wash immediately with plenty of soap-suds. **S36/37/39:** Wear suitable protective clothing, gloves and eye and face protection. **S45:** In case of accident or if you feel ill, seek medical advice immediately. **S53**: Avoid exposure. **S60**: This material and container must be disposed as hazardous waste. **S61:** Avoid release to the environment. (See MSDS).

16 - Other Information

Disclaimer: The information contained in this MSDS is considered accurate as of the version date. However, no warranty is expressed or implied regarding the accuracy of the data. Since the use of this product is not within the control of Smooth-On Inc., it is the user's obligation to determine the suitability of the product for its intended application and assumes all risk and liability for its safe use.

This Material Safety Data Sheet is prepared to comply with the United States Occupational Safety and Health Administration (OSHA)Hazard Communication Standard (29 CFR 1910.1200), the Canadian Workplace Hazardous Materials Information System (WHMIS), and European Union Directive 1907/2006/EEC (REACH). Hazard symbols and risk phrases are based on maximum listed concentration of each hazardous ingredient. Unlisted ingredients are not "hazardous" per the OSHA Hazard Communication Standard (29 CFR 1910.1200), the Canadian Workplace Hazardous Materials Information System (WHMIS) or the European Union (EU/EEC) directive 1907/2006/EEC and are considered trade secrets under US Federal Law (29CFR and 40CFR), Canadian Law (Health Canada Legislation), and European Union Directives.

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-048R: benzo[k]fluoranthene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-048R: benzo[k]fluoranthene

CAS number	207-08-9
EC index number	601-036-00-5
EINECS number	205-916-6
RTECS number	DF6350000
Molecular mass	252.32 g/mol
Formula	C20H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-2(*)

DSD/DPD

May cause cancer

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

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

CLP

Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benzo[k]fluoranthene	207-08-9 205-916-6		Carc. Cat. 2; R45 N; R50-53	Carc. 1B; H350 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Do not apply (chemical) neutralizing agents

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Do not apply neutralizing agents

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Do not induce vomiting

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Polyvalent foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

No unsuitable extinguishing media known

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Clean contaminated surfaces with an excess of water
Take collected spill to manufacturer/competent authority
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Keep container tightly closed
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benz(a)Anthracene	OSHA	CSI		
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Needles
Colour	Light yellow

9.2 Important health, safety and environmental information:

Boiling point	480 °C
Vapour pressure (20°C)	< 0.00001 hPa
Solubility in water	< 0.00001 g/100 ml
Solubility in solvents	Soluble in ethanol
	Soluble in acetic acid
	Soluble in oils/fats
Log Pow	6.84

9.3 Other information:

Melting point	217 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources
ignition sources

Stability

No data available

Reactions

Reacts violently with (strong) oxidizers

10.2 Materials to avoid:

oxidizing agents
(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic
No certainty about human mutagenic properties
Not classified as toxic to reproduction (EC)

BCR-048R: benzo[k]fluoranthene

EC carc cat	2
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	2B
MAK - Krebserzeugend Kategorie	2
MAK - Keimzellmutagen Kategorie	3B
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

11.3 Acute effects/symptoms:

Inhalation:

No data available

Skin contact:

Slight irritation

Eye contact:

Slight irritation

Ingestion:

No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Cracking of the skin
Skin rash/inflammation
Photoallergy
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

No (test)data available.

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Water abiotic degradation processes	Ozonation in water
Half-life soil	65 - 1400 days

Not readily biodegradable in water

12.4 Bioaccumulative potential:

Log Pow	6.84

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

{13.4 Entsorgung verschmutzter Gebinde:}

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

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

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. g)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-052: benzo[ghi]perylene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-052: benzo[ghi]perylene

CAS number	191-24-2
EINECS number	205-883-8
RTECS number	DI6200500
Molecular mass	276.34 g/mol
Formula	C22H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

DSD/DPD

Classified dangerous in accordance with Directives 67/548/EEC and 1999/45/EC
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Other hazards

According to literature, highly bioaccumulative
Not readily biodegradable in water

CLP

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

According to literature, highly bioaccumulative
Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benzo[ghi]perylene	191-24-2 205-883-8		N; R50-53	Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air
Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Wash with water and soap

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Do not induce vomiting

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

Polymer foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of environmentally hazardous firefighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers

Carefully collect the spill/leftovers

Clean contaminated surfaces with an excess of water

Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust

Reduce/avoid exposure and/or contact

Keep away from naked flames/heat

Keep container tightly closed

Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area

Store in a dry area

Store in a dark area

Keep container in a well-ventilated place

Meet the legal requirements

Keep away from:

oxidizing agents

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benzo(g,h,i)perylene	OSHA	CSI		
Benzo(g,h,i)perylene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	
Benzo(g,h,i)perylene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Carry operations in the open/under local exhaust/ventilation or with respiratory protection

Personal protective equipment:

a) Respiratory protection:

Dust formation: dust mask

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses

In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
Colour	Light yellow-green

9.2 Important health, safety and environmental information:

Boiling point	> 500 °C
Solubility in water	0.000000026 g/100 ml
Solubility in solvents	Soluble in acetone
	Soluble in 1,4-dioxane
	Soluble in dichloromethane
Log Pow	(calc.) 6.51 - 7.23

9.3 Other information:

Melting point	272 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources

Stability

Stable under normal conditions

10.2 Materials to avoid:

oxidizing agents

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Not classifiable as a human carcinogen
Mutagenicity tests: positive
Not listed in mutagenicity class (EC,MAK)
Not classified as toxic to reproduction (EC)

BCR-052: benzo[ghi]perylene

IARC - classification	3

11.3 Acute effects/symptoms:

Inhalation:
No data available

Skin contact:
No data available

Eye contact:
No data available

Ingestion:
No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Cracking of the skin
Skin rash/inflammation
Photoallergy
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Half-life soil	> 173 days

Not readily biodegradable in water
test: 18%, 5we.; 24%, 240d.

12.4 Bioaccumulative potential:

Log Pow	(calc.) 6.51 - 7.23

According to literature, highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[ghi]perylene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[ghi]perylene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[ghi]perylene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[ghi]perylene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[ghi]perylene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Not listed in Annex I of directive 67/548/EEC et sequens. Labelling established on the basis of the available data.

Dangerous for the environment

R-phrases

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

S-phrases

60	This material and its container must be disposed of as hazardous waste
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

CLP

Classification and labelling according to the criteria of Regulation (EC) No 1272/2008 and after evaluation of available test data

Signal word

Wng	Warning

H-statements

H410	Very toxic to aquatic life with long lasting effects.

P-statements

P273	Avoid release to the environment.
P391	Collect spillage.
P501	Dispose of contents/container to manufacturer/competent authority.

15.2 National provisions:

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

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(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

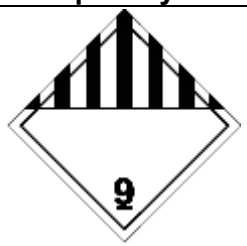
Full text of any H-statements referred to under headings 2 and 3:

H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic

Material Safety Data Sheet

NFPA	WHMIS	PPE	Transport Symbol
			

Preparation Date No data available **Revision Date** 16-Apr-2007 **Revision Number** 2

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name Black-Knight™ CTP
Product Code 8344
UN-No UN3077
Contact Manufacturer

The Garland Company, Inc.
3800 East 91st. Street
Cleveland, Ohio 44105-2197
Ph: (800) 762-8225 Fax: (216) 641-0633

Garland Canda, Inc.
1296 Martin Grove Rd.
Toronto, Ontario M9W 4X3
Ph: (416)747-7995 Fax: (416)747-1980

Emergency Telephone Number 1-800-762-8225 (24 Hrs.)

2. HAZARDS IDENTIFICATION

Emergency Overview

Harmful by inhalation, in contact with skin and if swallowed
Harmful in contact with skin
Harmful if swallowed
Harmful by inhalation
Irritating to respiratory system
Irritating to skin
May be harmful if swallowed
May cause irritation of respiratory tract

Appearance Black. **Physical State** Solid. Liquid. **Odor** Aromatic.

OSHA Regulatory Status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Mexico - Grade Serious risk, Grade 3

Potential Health Effects

Principle Routes of Exposure Skin contact, Inhalation, Ingestion.

Acute Effects

Eyes Avoid contact with eyes. Irritating to eyes.

Skin Avoid contact with skin. Irritating to skin. May cause sensitization by skin contact.

Inhalation Avoid breathing vapors or mists. Irritating to mucous membranes. Inhalation of vapours in high concentration may cause irritation of respiratory system.

Ingestion May be harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Chronic Effects Prolonged exposure may cause chronic effects.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions Skin disorders. Central nervous system.

Interactions with Other Chemicals Not available

Potential Environmental Effects See Section 12 for additional Ecological information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components

Chemical Name	CAS-No	Weight %	North American Hazard Indicator
High Temperature Coal Tar Pitch	65996-93-2	60 - 100	1
Fluoranthene	206-44-0	1 - 5	1
Phenanthrene	85-01-8	1 - 5	1
Pyrene	129-00-0	1 - 5	1
1,2-Benzanthracene	56-55-3	1 - 5	1
1,2-Benzphenanthrene	218-01-9	1 - 5	1
Benzo(a)pyrene	50-32-8	1 - 5	1
Benzo(G,H,I)Perylene	191-24-2	1 - 5	1
Indeno(1,2,3-CD)Pyrene	193-39-5	0.1 - 1	1
Benzo(B)fluoranthene	205-99-2	0.1 - 1	1
Dibenzo(A,H)pyrene	189-64-0	0.1 - 1	1
Benzo(J)fluoranthene	205-82-3	0.1 - 1	1
Benzo(K)fluoranthene	207-08-9	0.1 - 1	1
Dibenzo(A,E)pyrene	192-65-4	0.1 - 1	1
Dibenzo(A,I)pyrene	189-55-9	0.1 - 1	1
Dibenz(A,H)anthracene	53-70-3	0.1 - 1	1
Naphthalene	91-20-3	0.1 - 1	1
5-Methylchrysene	3697-24-3	0.1 - 1	1

4. FIRST AID MEASURES

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Skin Contact Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. If skin irritation persists, call a physician. Remove and wash contaminated clothing before re-use.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a physician immediately.

Ingestion Never give anything by mouth to an unconscious person. Drink 1 or 2 glasses of water. Do not induce vomiting. Call a physician or Poison Control Centre immediately.

Notes to Physician Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media Carbon dioxide (CO_2). Foam. Dry powder. Dry chemical.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire.

Hazardous Combustion Products Carbon monoxide, Carbon dioxide (CO_2), Hydrocarbons.

Explosion Data

Sensitivity to mechanical impact No
Sensitivity to static discharge Yes

Specific Hazards Arising from the Chemical
Combustible material. Thermal decomposition can lead to release of irritating gases and vapours.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA **Health** 3 **Flammability** 1 **Instability** 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Avoid contact with skin, eyes and clothing. Evacuate personnel to safe areas. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Ensure adequate ventilation.

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. Keep out of waterways.

Methods for Containment Dam up

Methods for Cleaning Up Soak up with inert absorbent material. Pick up and transfer to properly labelled containers. Keep in suitable and closed containers for disposal.

Other Information Not applicable

7. HANDLING AND STORAGE

Handling Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Remove and wash contaminated clothing before re-use. Ensure adequate ventilation.

Storage Keep container tightly closed in a dry and well-ventilated place. Keep out of the reach of children. Keep at temperatures below 100°C.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	Ontario TWAEV	Mexico
High Temperature Coal Tar Pitch	TWA: 0.2 mg/m^3	TWA: 0.2 mg/m^3	TWA: 0.2 mg/m^3	STEL: 0.03 mg/m^3 STEL: 0.015 ppm TWA: 0.02 mg/m^3 TWA: 0.002 mg/m^3
Naphthalene	TWA: 10 ppm STEL: 15 ppm Skin	TWA: 50 mg/m^3 TWA: 10 ppm	STEL: 78 mg/m^3 STEL: 15 ppm TWA: 10 ppm TWA: 52 mg/m^3	STEL: 75 mg/m^3 STEL: 15 ppm TWA: 50 mg/m^3 TWA: 10 ppm

Chemical Name	NIOSH IDLH
High Temperature Coal Tar Pitch	80 mg/m^3
Naphthalene	250 ppm

Engineering Measures Ensure adequate ventilation, especially in confined areas. Do not allow ventilation equipment to draw material odors indoors..

Personal Protective Equipment

Eye/face Protection Tightly fitting safety goggles.
Skin Protection Long sleeved clothing. Boots. Lightweight protective clothing.
Respiratory Protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

Hygiene Measures
When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product. Remove and wash contaminated clothing before re-use. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance Black
Odor Aromatic
Physical State Solid Liquid
pH Not available
Flash Point > 374°F / > 190°C
Method Tag closed cup
Autoignition Temperature 750°F / 399°C
Boiling Point/Range >464°F / 240°C
Freezing Point Not available
Flammability Limits in Air **Lower** Not available **Upper** Not available
Explosive Properties Not available
Oxidizing Properties Not available
Evaporation Rate 0.37 for solvent (ether = 1)
Vapor Pressure <1 mmHg @ 68 °F
Vapor Density <1 @ Air = 1
Specific Gravity 1.3
Solubility Slightly soluble

9. PHYSICAL AND CHEMICAL PROPERTIES

Water Solubility slightly soluble
Volatiles Not available
VOC Content 0 g/l

10. STABILITY AND REACTIVITY

Stability Stable under normal conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents.

Hazardous Decomposition Products Carbon monoxide. Carbon dioxide (CO2). Hydrocarbons.

Possibility of Hazardous Reactions Hazardous polymerisation does not occur

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fluoranthene	2 g/kg Rat	3180 mg/kg Rabbit	
Phenanthrene	700 mg/kg Mouse		
Pyrene	2700 mg/kg Rat		
Naphthalene	490 mg/kg Rat	2500 mg/kg Rat 20 g/kg Rabbit	340 mg/m^3 Rat 1 h

Chronic Toxicity

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA	Mexico
High Temperature Coal Tar Pitch	A1	Group 1	Known	X	A1

Chemical Name	ACGIH	IARC	NTP	OSHA	Mexico
1,2-Benzanthracene	A2	Group 2A	Reasonably Anticipated	X	
1,2-Benzphenanthrene	A3				
Benzo(a)pyrene	A2	Group 2A	Reasonably Anticipated	X	
Indeno(1,2,3-CD)Pyrene		Group 2B	Reasonably Anticipated	X	
Benzo(B)fluoranthene	A2	Group 2B	Reasonably Anticipated	X	
Dibenzo(A,H)pyrene		Group 2B	Reasonably Anticipated	X	
Benzo(J)fluoranthene		Group 2B	Reasonably Anticipated	X	
Benzo(K)fluoranthene		Group 2B	Reasonably Anticipated	X	
Dibenzo(A,E)pyrene		Group 2B	Reasonably Anticipated	X	
Dibenzo(A,I)pyrene		Group 2B	Reasonably Anticipated	X	
Dibenz(A,H)anthracene		Group 2A	Reasonably Anticipated	X	
Naphthalene		Group 2B	Reasonably Anticipated	X	
5-Methylchrysene		Group 2B	Reasonably Anticipated	X	

12. ECOLOGICAL INFORMATION

Ecotoxicity

No information available.

Pyrene

Water Flea Data
water flea EC50=1.8 mg/L (48 h)

1,2-Benzanthracene

Microtox Data
Photobacterium phosphoreum EC50=0.26 mg/L (15 min)
Water Flea Data
water flea EC50=0.01 mg/L (96 h)

1,2-Benzphenanthrene

Water Flea Data
water flea EC50=1.9 mg/L (2 h)

Naphthalene

Freshwater Algae Data
Skeletonema costatum EC50=0.4 mg/L (96 h)
Microtox Data
Photobacterium phosphoreum EC50=0.93 mg/L (30 min)
Pseudomonas putida EC50>20 mg/L (18 h)
Water Flea Data
water flea EC50=2.16 mg/L (48 h)

Persistence/Degradability	Not available
Bioaccumulation/ Accumulation	Not available
Mobility in Environmental Media	Not available

High Temperature Coal Tar Pitch
log Pow = 6.04

Fluoranthene
log Pow = 5.33

Phenanthrene
log Pow = 4.46

Pyrene
log Pow = 4.88

1,2-Benzanthracene
log Pow = 5.61

1,2-Benzphenanthrene
log Pow = 5.61 - 5.91

Benzo(a)pyrene
log Pow = 6.06

Benzo(G,H,I)Perylene
log Pow = 7.23

Indeno(1,2,3-CD)Pyrene
log Pow = 6.584

Benzo(B)fluoranthene
log Pow = 6.57

Benzo(K)fluoranthene
log Pow = 6.84

Dibenz(A,H)anthracene
log Pow = 6.50

Naphthalene
log Pow = 3.3

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method Dispose of in accordance with local regulations.

Contaminated Packaging Empty containers should be taken for local recycling, recovery or waste disposal.

US EPA Waste Number D001

Chemical Name	RCRA
Fluoranthene - 206-44-0	waste number U120

Chemical Name	RCRA
1,2-Benzanthracene - 56-55-3	waste number U018
1,2-Benzphenanthrene - 218-01-9	waste number U050
Benzo(a)pyrene - 50-32-8	waste number U022
Indeno(1,2,3-CD)Pyrene - 193-39-5	waste number U137
Benzo(B)fluoranthene - 205-99-2	(hazardous constituent - no waste number)
Dibenzo(A,H)pyrene - 189-64-0	(hazardous constituent - no waste number)
Benzo(J)fluoranthene - 205-82-3	(hazardous constituent - no waste number)
Benzo(K)fluoranthene - 207-08-9	(hazardous constituent - no waste number)
Dibenzo(A,E)pyrene - 192-65-4	(hazardous constituent - no waste number)
Dibenzo(A,I)pyrene - 189-55-9	waste number U064
Dibenz(A,H)anthracene - 53-70-3	waste number U063
Naphthalene - 91-20-3	waste number U165

14. TRANSPORT INFORMATION

DOT Not Regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
Reportable Quantity (RQ) Dibenz[a,i]pyrene, RQ kg = 1816 Indeno1,2,3-cdpyrene, RQ kg = 4585.858 Fluoranthene, RQ kg = 1297.143 Chrysene, RQ kg = 3242.857 Benz[a]anthracene, RQ kg = 324.2857 Acenaphthene, RQ kg = 9659.574 Naphthalene, RQ kg = 18916.67
Description Environmentally hazardous substances, solid, n.o.s.(Dibenz[a,i]pyrene,Indeno(1,2,3-cd)pyrene,Fluoranthene,Chrysene,Benz[a]anthracene,Acenaphthene,Naphthalene),9,UN3077,PG III,RQ

TDG Not regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
Description ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., Class 9,UN3077,PG III

MEX Not regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
Description UN3077 Environmentally hazardous substance, solid, n.o.s.,9,III

ICAO Not regulated

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
Packing Group III

14. TRANSPORT INFORMATION

Description Environmentally hazardous substance, solid, n.o.s.*,UN3077,PG III

IATA Not regulated

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
Packing Group III
ERG Code 9L
Description Environmentally hazardous substance, solid, n.o.s.*,UN3077,PG III

IMDG/IMO Not regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
EmS No. F-A, S-F
Description Environmentally hazardous substance, solid, n.o.s.,UN3077,PG III

15. REGULATORY INFORMATION

International Inventories

Chemical Name	TSCA	DSL	NDSL	EINECS	ELINCS	ENCS	CHINA	KECL	PICCS	AICS
High Temperature Coal Tar Pitch	X	X	-	X	-	X	X	X	X	X
Fluoranthene	X	-	X	X	-	X	X	-	-	X
Phenanthrene	X	X	-	X	-	X	X	X	X	X
Pyrene	X	X	-	X	-	X	X	-	X	X
1,2-Benzanthracene	X	-	X	X	-	-	X	-	-	-
1,2-Benzphenanthrene	X	X	-	X	-	-	-	X	-	X
Benzo(a)pyrene	X	X	-	X	-	-	X	X	X	-
Benzo(G,H,I)Perylene	-	-	-	X	-	-	-	-	-	-
Indeno(1,2,3-CD)Pyrene	X	-	X	X	-	-	-	-	-	-
Benzo(B)fluoranthene	-	-	-	X	-	-	-	-	-	-
Dibenzo(A,H)pyrene	-	-	-	X	-	-	-	-	-	-
Benzo(J)fluoranthene	-	-	-	X	-	-	-	-	-	-
Benzo(K)fluoranthene	-	-	-	X	-	-	-	-	-	-
Dibenzo(A,E)pyrene	-	-	-	X	-	-	-	-	-	-
Dibenzo(A,I)pyrene	-	-	-	X	-	-	-	-	-	-
Dibenz(A,H)anthracene	X	-	X	X	-	-	X	-	-	-
Naphthalene	X	X	-	X	-	X	X	X	X	X
5-Methylchrysene	-	-	-	-	-	-	-	-	-	-

TSCA Does not Comply
DSL Does not Comply
NDSL Does not Comply
EINECS Does not Comply
ELINCS Does not Comply
ENCS Does not Comply
CHINA Does not Comply
KECL Does not Comply

PICCS Does not Comply
AICS Does not Comply

USA

Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and and Title 40n of the Code of Federal Regulations, Part 372:

Chemical Name	SARA 313 - Threshold Values
Fluoranthene (CAS #: 206-44-0)	1.0%
Phenanthrene (CAS #: 85-01-8)	1.0%
1,2-Benzanthracene (CAS #: 56-55-3)	0.1%
1,2-Benzphenanthrene (CAS #: 218-01-9)	0.1%
Benzo(a)pyrene (CAS #: 50-32-8)	0.1%
Benzo(G,H,I)Perylene (CAS #: 191-24-2)	1.0%
Indeno(1,2,3-CD)Pyrene (CAS #: 193-39-5)	0.1%
Benzo(B)fluoranthene (CAS #: 205-99-2)	0.1%
Dibenzo(A,H)pyrene (CAS #: 189-64-0)	0.1%
Benzo(J)fluoranthene (CAS #: 205-82-3)	0.1%
Benzo(K)fluoranthene (CAS #: 207-08-9)	0.1%
Dibenzo(A,E)pyrene (CAS #: 192-65-4)	0.1%
Dibenzo(A,I)pyrene (CAS #: 189-55-9)	0.1%
Dibenz(A,H)anthracene (CAS #: 53-70-3)	0.1%
Naphthalene (CAS #: 91-20-3)	0.1%
5-Methylchrysene (CAS #: 3697-24-3)	0.1%

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contain any HAPs.

Chemical Name
Naphthalene (CAS #: 91-20-3)

State Regulations

California Proposition 65
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Chemical Name	CAS-No	Category	Type
1,2-Benzanthracene	56-55-3	Carcinogen	
1,2-Benzphenanthrene	218-01-9	Carcinogen	
Benzo(a)pyrene	50-32-8	Carcinogen	
Indeno(1,2,3-CD)Pyrene	193-39-5	Carcinogen	
Benzo(B)fluoranthene	205-99-2	Carcinogen	
Dibenzo(A,H)pyrene	189-64-0	Carcinogen	
Benzo(J)fluoranthene	205-82-3	Carcinogen	
Benzo(K)fluoranthene	207-08-9	Carcinogen	
Dibenzo(A,E)pyrene	192-65-4	Carcinogen	
Dibenzo(A,I)pyrene	189-55-9	Carcinogen	
Dibenz(A,H)anthracene	53-70-3	Carcinogen	
Naphthalene	91-20-3	Carcinogen	

Chemical Name	CAS-No	Category	Type
5-Methylchrysene	3697-24-3	Carcinogen	

State Right-to-Know

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
High Temperature Coal Tar Pitch	X	X	X	X	
Fluoranthene	X	X	X		
Phenanthrene	X	X	X		
Pyrene	X	X	X	X	
1,2-Benzanthracene	X	X	X	X	X
1,2-Benzphenanthrene	X	X	X	X	X
Benzo(a)pyrene	X	X	X	X	X
Benzo(G,H,I)Perylene	X	X	X	X	
Indeno(1,2,3-CD)Pyrene	X	X	X	X	
Benzo(B)fluoranthene	X	X	X	X	X
Dibenzo(A,H)pyrene	X	X	X	X	X
Benzo(J)fluoranthene	X	X	X	X	X
Benzo(K)fluoranthene	X	X	X	X	
Dibenzo(A,E)pyrene	X	X	X	X	X
Dibenzo(A,I)pyrene	X	X	X	X	X
Dibenz(A,H)anthracene	X	X	X	X	X
Naphthalene	X	X	X	X	X
5-Methylchrysene	X		X	X	

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
D2A Very toxic materials

16. OTHER INFORMATION

Revision Date 16-Apr-2007

Revision Summary Not available

Disclaimer
The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of MSDS

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-050: benzo[e]pyrene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-050: benzo[e]pyrene

CAS number	192-97-2
EC index number	601-049-00-6
EINECS number	205-892-7
RTECS number	DJ4200000
Molecular mass	252.32 g/mol
Formula	C20H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-2(*)

DSD/DPD

May cause cancer

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

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

Highly bioaccumulative

Not readily biodegradable in water

CLP

Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

Highly bioaccumulative

Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benzo[e]pyrene	192-97-2 205-892-7		Carc. Cat. 2; R45 N; R50-53	Carc. 1B; H350 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Soap may be used

Do not apply (chemical) neutralizing agents

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Do not apply neutralizing agents

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Do not induce vomiting

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

Polymer foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Spill must not return in its original container
Clean contaminated surfaces with an excess of water
Take collected spill to manufacturer/competent authority
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Keep container tightly closed
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a dry area
Store in a dark area
Store at room temperature
Keep out of direct sunlight
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benzo(e)pyrene	OSHA	CSI		
Benzo(e)pyrene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	
Benzo(e)pyrene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
Odour	Odourless
Colour	Light yellow

9.2 Important health, safety and environmental information:

Boiling point	(13) 311 °C
Solubility in water	< 0.00001 g/100 ml
Solubility in solvents	Soluble in ether
	Soluble in acetone
Log Pow	6.30

9.3 Other information:

Melting point	179 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources

ignition sources

Stability

Unstable on exposure to light

Unstable on exposure to air

Reactions

Decomposes slowly on exposure to air and on exposure to UV light

Reacts violently with (strong) oxidizers

Decomposes on exposure to (strong) acids

10.2 Materials to avoid:

oxidizing agents

(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic

Not listed in mutagenicity class (EC,MAK)

Not classified as toxic to reproduction (EC)

BCR-050: benzo[e]pyrene

EC carc cat	2
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	3
MAK - Krebserzeugend Kategorie	2
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

11.3 Acute effects/symptoms:

Inhalation:

No data available

Skin contact:

Slight irritation

Photoallergy

Eye contact:

Slight irritation

Ingestion:

No data available

11.4 Chronic effects:

No effects known

12. Ecological information

12.1 Ecotoxicity:

No (test)data available.

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
Water physicochemical processes	Forming sediments in water

12.3 Persistence and degradability:

Half-life soil	> 292 days

Not readily biodegradable in water

12.4 Bioaccumulative potential:

Log Pow	6.30

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)

16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals

Depending on branch of industry and production process, also other EURAL codes may be applicable

Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Specific preliminary treatment

Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery

Remove waste in accordance with local and/or national regulations

Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)

15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[e]pyrene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90

Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[e]pyrene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[e]pyrene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[e]pyrene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[e]pyrene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

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

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. b)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-271: benzo[a]anthracene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-271: benzo[a]anthracene

CAS number	56-55-3
EC index number	601-033-00-9
EINECS number	200-280-6
RTECS number	CV9275000
Molecular mass	228.30 g/mol
Formula	C18H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-2(*)

DSD/DPD

May cause cancer

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

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

CLP

Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benz[a]anthracene	56-55-3 200-280-6		Carc. Cat. 2; R45 N; R50-53	Carc. 1B; H350 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

Polymer foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Clean contaminated surfaces with an excess of water
Take collected spill to manufacturer/competent authority
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Keep container tightly closed
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Store in a dark area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

TLV (USA)

Benz(a)anthracene	Short time value	- ppm
	Time-weighted average exposure limit	- ppm

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benz(a)Anthracene	OSHA	CSI		
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles
d) Skin protection:
Protective clothing
8.2.2 Environmental exposure controls:
See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Scales
Odour	Odourless
Colour	Fluorescent yellow-green to colourless

9.2 Important health, safety and environmental information:

Boiling point	Not applicable
Vapour pressure (20°C)	0.00007 hPa
Relative density	1.3
Solubility in water	0.00001 g/100 ml
Solubility in solvents	Soluble in ether
	Soluble in acetone
	Soluble in oils/fats
Log Pow	5.61 - 5.79

9.3 Other information:

Melting point	160 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard
heat sources
ignition sources

Stability
Unstable on exposure to light
Unstable on exposure to air

Reactions
Reacts violently with (strong) oxidizers
Decomposes on exposure to (strong) acids

10.2 Materials to avoid:

oxidizing agents
(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic
Mutagenicity: AMES test positive
No certainty about human mutagenic properties
Not classified as toxic to reproduction (EC)

BCR-271: benzo[a]anthracene

EC carc cat	2
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	2A

TLV - Carcinogen	A2
MAK - Krebserzeugend Kategorie	2
MAK - Keimzellmutagen Kategorie	3A
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

11.3 Acute effects/symptoms:

Inhalation:
No data available

Skin contact:
Slight irritation

Eye contact:
Slight irritation

Ingestion:
No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Photoallergy
Skin rash/inflammation
Cracking of the skin
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

BCR-271: benzo[a]anthracene

LC50 fishes

species	value	duration (h)	remarks
PIMEPHALES PROMELAS	0.0018 mg/l	65 h	LETHAL

EC50 Daphnia

species	value	duration (h)	remarks
DAPHNIA PULEX	0.01 mg/l	96 h	STATIC SYSTEM

EC50 other aquatic organisms

species	value	duration (h)	remarks
CYANOPHYTA	0.018 mg/l	336 h	

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
	Substance sinks in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Water abiotic degradation processes	Photolysis in water
	Ozonation in water
Half-life soil	> 100 days
Not readily biodegradable in water	

12.4 Bioaccumulative potential:

Log Pow	5.61 - 5.79
Highly bioaccumulative	

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Labelling according to Directive 2008/58/EC (30th adaptation of Directive 67/548/EEC)

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

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

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 790/2009, 1st adaptation of Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. b)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

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(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity

EN

**** MATERIAL SAFETY DATA SHEET ****

Acenaphthylene, tech. 80%

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Acenaphthylene, tech. 80%
Catalog Numbers:
33888-0000, 33888-0010, 33888-0050
Synonyms:
Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#	Haz Symbols	Risk Phrases
208-96-8	Acenaphthylene	80%	205-917-1	|||

Hazard Symbols: XI
Risk Phrases: 36/37/38

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Irritating to eyes, respiratory system and skin.
Potential Health Effects

Eye:
Causes eye irritation.

Skin:
Causes skin irritation. May be harmful if absorbed through the skin.

Ingestion:
May cause irritation of the digestive tract. May be harmful if swallowed.

Inhalation:
Causes respiratory tract irritation. May be harmful if inhaled.

Chronic:
Not available.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
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.

Ingestion:
Get medical aid. Wash mouth out with 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.

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

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

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

Spills/Leaks:
Vacuum or sweep up material and place into a suitable disposal container.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes.

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

**** 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.

Personal Protective Equipment

Eyes:
Wear chemical 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. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Flakes
Color:	yellow
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Viscosity:	Not available.
Boiling Point:	280 deg C
Freezing/Melting Point:	88 - 91 deg C
Autoignition Temperature:	Not available.
Flash Point:	Not available.
Explosion Limits, lower:	Not available.
Explosion Limits, upper:	Not available.
Decomposition Temperature:	
Solubility in water:	
Specific Gravity/Density:	
Molecular Formula:	C12H8
Molecular Weight:	152.20

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials.

Incompatibilities with Other Materials:
Strong oxidizing agents.

Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide.

Hazardous Polymerization: May occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 208-96-8: AB1254000 AB1254200

LD50/LC50:
CAS# 208-96-8: Oral, mouse: LD50 = 1760 mg/kg.

Carcinogenicity:
Acenaphthylene -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

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

**** SECTION 14 - TRANSPORT INFORMATION ****

IATA

No information available.

IMO

No information available.

RID/ADR

No information available.

USA RQ:CAS# 208-96-8: 5000 lb final RQ; 2270 kg final RQ

**** SECTION 15 - REGULATORY INFORMATION ****

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XI

Risk Phrases:

R 36/37/38 Irritating to eyes, respiratory system and skin.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 37/39 Wear suitable gloves and eye/face protection.

WGK (Water Danger/Protection)

CAS# 208-96-8: No information available.

United Kingdom Occupational Exposure Limits

United Kingdom Maximum Exposure Limits

Canada

CAS# 208-96-8 is listed on Canada's NDSL List.

CAS# 208-96-8 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 208-96-8: Not available.

US FEDERAL

TSCA

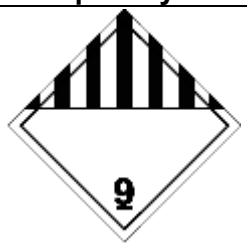
CAS# 208-96-8 is listed on the TSCA inventory.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/03/2000 Revision #0 Date: Original.

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 way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

Material Safety Data Sheet

NFPA	WHMIS	PPE	Transport Symbol
			

Preparation Date No data available **Revision Date** 16-Apr-2007 **Revision Number** 2

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name Black-Knight™ CTP
Product Code 8344
UN-No UN3077
Contact Manufacturer

The Garland Company, Inc.
3800 East 91st. Street
Cleveland, Ohio 44105-2197
Ph: (800) 762-8225 Fax: (216) 641-0633

Garland Canda, Inc.
1296 Martin Grove Rd.
Toronto, Ontario M9W 4X3
Ph: (416)747-7995 Fax: (416)747-1980

Emergency Telephone Number 1-800-762-8225 (24 Hrs.)

2. HAZARDS IDENTIFICATION

Emergency Overview

Harmful by inhalation, in contact with skin and if swallowed
Harmful in contact with skin
Harmful if swallowed
Harmful by inhalation
Irritating to respiratory system
Irritating to skin
May be harmful if swallowed
May cause irritation of respiratory tract

Appearance Black. **Physical State** Solid. Liquid. **Odor** Aromatic.

OSHA Regulatory Status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Mexico - Grade Serious risk, Grade 3

Potential Health Effects

Principle Routes of Exposure Skin contact, Inhalation, Ingestion.

Acute Effects

Eyes Avoid contact with eyes. Irritating to eyes.

Skin Avoid contact with skin. Irritating to skin. May cause sensitization by skin contact.

Inhalation Avoid breathing vapors or mists. Irritating to mucous membranes. Inhalation of vapours in high concentration may cause irritation of respiratory system.

Ingestion May be harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Chronic Effects Prolonged exposure may cause chronic effects.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions Skin disorders. Central nervous system.

Interactions with Other Chemicals Not available

Potential Environmental Effects See Section 12 for additional Ecological information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components

Chemical Name	CAS-No	Weight %	North American Hazard Indicator
High Temperature Coal Tar Pitch	65996-93-2	60 - 100	1
Fluoranthene	206-44-0	1 - 5	1
Phenanthrene	85-01-8	1 - 5	1
Pyrene	129-00-0	1 - 5	1
1,2-Benzanthracene	56-55-3	1 - 5	1
1,2-Benzphenanthrene	218-01-9	1 - 5	1
Benzo(a)pyrene	50-32-8	1 - 5	1
Benzo(G,H,I)Perylene	191-24-2	1 - 5	1
Indeno(1,2,3-CD)Pyrene	193-39-5	0.1 - 1	1
Benzo(B)fluoranthene	205-99-2	0.1 - 1	1
Dibenzo(A,H)pyrene	189-64-0	0.1 - 1	1
Benzo(J)fluoranthene	205-82-3	0.1 - 1	1
Benzo(K)fluoranthene	207-08-9	0.1 - 1	1
Dibenzo(A,E)pyrene	192-65-4	0.1 - 1	1
Dibenzo(A,I)pyrene	189-55-9	0.1 - 1	1
Dibenz(A,H)anthracene	53-70-3	0.1 - 1	1
Naphthalene	91-20-3	0.1 - 1	1
5-Methylchrysene	3697-24-3	0.1 - 1	1

4. FIRST AID MEASURES

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Skin Contact Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. If skin irritation persists, call a physician. Remove and wash contaminated clothing before re-use.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a physician immediately.

Ingestion Never give anything by mouth to an unconscious person. Drink 1 or 2 glasses of water. Do not induce vomiting. Call a physician or Poison Control Centre immediately.

Notes to Physician Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media Carbon dioxide (CO_2). Foam. Dry powder. Dry chemical.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire.

Hazardous Combustion Products Carbon monoxide, Carbon dioxide (CO_2), Hydrocarbons.

Explosion Data

Sensitivity to mechanical impact No
Sensitivity to static discharge Yes

Specific Hazards Arising from the Chemical
Combustible material. Thermal decomposition can lead to release of irritating gases and vapours.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA **Health** 3 **Flammability** 1 **Instability** 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Avoid contact with skin, eyes and clothing. Evacuate personnel to safe areas. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Ensure adequate ventilation.

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. Keep out of waterways.

Methods for Containment Dam up

Methods for Cleaning Up Soak up with inert absorbent material. Pick up and transfer to properly labelled containers. Keep in suitable and closed containers for disposal.

Other Information Not applicable

7. HANDLING AND STORAGE

Handling Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Remove and wash contaminated clothing before re-use. Ensure adequate ventilation.

Storage Keep container tightly closed in a dry and well-ventilated place. Keep out of the reach of children. Keep at temperatures below 100°C.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	Ontario TWAEV	Mexico
High Temperature Coal Tar Pitch	TWA: 0.2 mg/m^3	TWA: 0.2 mg/m^3	TWA: 0.2 mg/m^3	STEL: 0.03 mg/m^3 STEL: 0.015 ppm TWA: 0.02 mg/m^3 TWA: 0.002 mg/m^3
Naphthalene	TWA: 10 ppm STEL: 15 ppm Skin	TWA: 50 mg/m^3 TWA: 10 ppm	STEL: 78 mg/m^3 STEL: 15 ppm TWA: 10 ppm TWA: 52 mg/m^3	STEL: 75 mg/m^3 STEL: 15 ppm TWA: 50 mg/m^3 TWA: 10 ppm

Chemical Name	NIOSH IDLH
High Temperature Coal Tar Pitch	80 mg/m^3
Naphthalene	250 ppm

Engineering Measures Ensure adequate ventilation, especially in confined areas. Do not allow ventilation equipment to draw material odors indoors..

Personal Protective Equipment

Eye/face Protection Tightly fitting safety goggles.
Skin Protection Long sleeved clothing. Boots. Lightweight protective clothing.
Respiratory Protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

Hygiene Measures
When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product. Remove and wash contaminated clothing before re-use. Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance Black
Odor Aromatic
Physical State Solid Liquid
pH Not available
Flash Point > 374°F / > 190°C
Method Tag closed cup
Autoignition Temperature 750°F / 399°C
Boiling Point/Range >464°F / 240°C
Freezing Point Not available
Flammability Limits in Air **Lower** Not available **Upper** Not available
Explosive Properties Not available
Oxidizing Properties Not available
Evaporation Rate 0.37 for solvent (ether = 1)
Vapor Pressure <1 mmHg @ 68 °F
Vapor Density <1 @ Air = 1
Specific Gravity 1.3
Solubility Slightly soluble

9. PHYSICAL AND CHEMICAL PROPERTIES

Water Solubility slightly soluble
Volatiles Not available
VOC Content 0 g/l

10. STABILITY AND REACTIVITY

Stability Stable under normal conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents.

Hazardous Decomposition Products Carbon monoxide. Carbon dioxide (CO2). Hydrocarbons.

Possibility of Hazardous Reactions Hazardous polymerisation does not occur

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fluoranthene	2 g/kg Rat	3180 mg/kg Rabbit	
Phenanthrene	700 mg/kg Mouse		
Pyrene	2700 mg/kg Rat		
Naphthalene	490 mg/kg Rat	2500 mg/kg Rat 20 g/kg Rabbit	340 mg/m^3 Rat 1 h

Chronic Toxicity

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA	Mexico
High Temperature Coal Tar Pitch	A1	Group 1	Known	X	A1

Chemical Name	ACGIH	IARC	NTP	OSHA	Mexico
1,2-Benzanthracene	A2	Group 2A	Reasonably Anticipated	X	
1,2-Benzphenanthrene	A3				
Benzo(a)pyrene	A2	Group 2A	Reasonably Anticipated	X	
Indeno(1,2,3-CD)Pyrene		Group 2B	Reasonably Anticipated	X	
Benzo(B)fluoranthene	A2	Group 2B	Reasonably Anticipated	X	
Dibenzo(A,H)pyrene		Group 2B	Reasonably Anticipated	X	
Benzo(J)fluoranthene		Group 2B	Reasonably Anticipated	X	
Benzo(K)fluoranthene		Group 2B	Reasonably Anticipated	X	
Dibenzo(A,E)pyrene		Group 2B	Reasonably Anticipated	X	
Dibenzo(A,I)pyrene		Group 2B	Reasonably Anticipated	X	
Dibenz(A,H)anthracene		Group 2A	Reasonably Anticipated	X	
Naphthalene		Group 2B	Reasonably Anticipated	X	
5-Methylchrysene		Group 2B	Reasonably Anticipated	X	

12. ECOLOGICAL INFORMATION

Ecotoxicity

No information available.

Pyrene

Water Flea Data
water flea EC50=1.8 mg/L (48 h)

1,2-Benzanthracene

Microtox Data
Photobacterium phosphoreum EC50=0.26 mg/L (15 min)
Water Flea Data
water flea EC50=0.01 mg/L (96 h)

1,2-Benzphenanthrene

Water Flea Data
water flea EC50=1.9 mg/L (2 h)

Naphthalene

Freshwater Algae Data
Skeletonema costatum EC50=0.4 mg/L (96 h)
Microtox Data
Photobacterium phosphoreum EC50=0.93 mg/L (30 min)
Pseudomonas putida EC50>20 mg/L (18 h)
Water Flea Data
water flea EC50=2.16 mg/L (48 h)

Persistence/Degradability	Not available
Bioaccumulation/ Accumulation	Not available
Mobility in Environmental Media	Not available

High Temperature Coal Tar Pitch
log Pow = 6.04

Fluoranthene
log Pow = 5.33

Phenanthrene
log Pow = 4.46

Pyrene
log Pow = 4.88

1,2-Benzanthracene
log Pow = 5.61

1,2-Benzphenanthrene
log Pow = 5.61 - 5.91

Benzo(a)pyrene
log Pow = 6.06

Benzo(G,H,I)Perylene
log Pow = 7.23

Indeno(1,2,3-CD)Pyrene
log Pow = 6.584

Benzo(B)fluoranthene
log Pow = 6.57

Benzo(K)fluoranthene
log Pow = 6.84

Dibenz(A,H)anthracene
log Pow = 6.50

Naphthalene
log Pow = 3.3

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method Dispose of in accordance with local regulations.

Contaminated Packaging Empty containers should be taken for local recycling, recovery or waste disposal.

US EPA Waste Number D001

Chemical Name	RCRA
Fluoranthene - 206-44-0	waste number U120

Chemical Name	RCRA
1,2-Benzanthracene - 56-55-3	waste number U018
1,2-Benzphenanthrene - 218-01-9	waste number U050
Benzo(a)pyrene - 50-32-8	waste number U022
Indeno(1,2,3-CD)Pyrene - 193-39-5	waste number U137
Benzo(B)fluoranthene - 205-99-2	(hazardous constituent - no waste number)
Dibenzo(A,H)pyrene - 189-64-0	(hazardous constituent - no waste number)
Benzo(J)fluoranthene - 205-82-3	(hazardous constituent - no waste number)
Benzo(K)fluoranthene - 207-08-9	(hazardous constituent - no waste number)
Dibenzo(A,E)pyrene - 192-65-4	(hazardous constituent - no waste number)
Dibenzo(A,I)pyrene - 189-55-9	waste number U064
Dibenz(A,H)anthracene - 53-70-3	waste number U063
Naphthalene - 91-20-3	waste number U165

14. TRANSPORT INFORMATION

DOT Not Regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
Reportable Quantity (RQ) Dibenz[a,i]pyrene, RQ kg = 1816 Indeno1,2,3-cdpyrene, RQ kg = 4585.858 Fluoranthene, RQ kg = 1297.143 Chrysene, RQ kg = 3242.857 Benz[a]anthracene, RQ kg = 324.2857 Acenaphthene, RQ kg = 9659.574 Naphthalene, RQ kg = 18916.67
Description Environmentally hazardous substances, solid, n.o.s.(Dibenz[a,i]pyrene,Indeno(1,2,3-cd)pyrene,Fluoranthene,Chrysene,Benz[a]anthracene,Acenaphthene,Naphthalene),9,UN3077,PG III,RQ

TDG Not regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
Description ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., Class 9,UN3077,PG III

MEX Not regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
Description UN3077 Environmentally hazardous substance, solid, n.o.s.,9,III

ICAO Not regulated

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
Packing Group III

14. TRANSPORT INFORMATION

Description Environmentally hazardous substance, solid, n.o.s.*,UN3077,PG III

IATA Not regulated

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
Packing Group III
ERG Code 9L
Description Environmentally hazardous substance, solid, n.o.s.*,UN3077,PG III

IMDG/IMO Not regulated

Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Subsidiary Class
UN-No UN3077
Packing Group III
EmS No. F-A, S-F
Description Environmentally hazardous substance, solid, n.o.s.,UN3077,PG III

15. REGULATORY INFORMATION

International Inventories

Chemical Name	TSCA	DSL	NDSL	EINECS	ELINCS	ENCS	CHINA	KECL	PICCS	AICS
High Temperature Coal Tar Pitch	X	X	-	X	-	X	X	X	X	X
Fluoranthene	X	-	X	X	-	X	X	-	-	X
Phenanthrene	X	X	-	X	-	X	X	X	X	X
Pyrene	X	X	-	X	-	X	X	-	X	X
1,2-Benzanthracene	X	-	X	X	-	-	X	-	-	-
1,2-Benzphenanthrene	X	X	-	X	-	-	-	X	-	X
Benzo(a)pyrene	X	X	-	X	-	-	X	X	X	-
Benzo(G,H,I)Perylene	-	-	-	X	-	-	-	-	-	-
Indeno(1,2,3-CD)Pyrene	X	-	X	X	-	-	-	-	-	-
Benzo(B)fluoranthene	-	-	-	X	-	-	-	-	-	-
Dibenzo(A,H)pyrene	-	-	-	X	-	-	-	-	-	-
Benzo(J)fluoranthene	-	-	-	X	-	-	-	-	-	-
Benzo(K)fluoranthene	-	-	-	X	-	-	-	-	-	-
Dibenzo(A,E)pyrene	-	-	-	X	-	-	-	-	-	-
Dibenzo(A,I)pyrene	-	-	-	X	-	-	-	-	-	-
Dibenz(A,H)anthracene	X	-	X	X	-	-	X	-	-	-
Naphthalene	X	X	-	X	-	X	X	X	X	X
5-Methylchrysene	-	-	-	-	-	-	-	-	-	-

TSCA Does not Comply
DSL Does not Comply
NDSL Does not Comply
EINECS Does not Comply
ELINCS Does not Comply
ENCS Does not Comply
CHINA Does not Comply
KECL Does not Comply

PICCS Does not Comply
AICS Does not Comply

USA

Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and and Title 40n of the Code of Federal Regulations, Part 372:

Chemical Name	SARA 313 - Threshold Values
Fluoranthene (CAS #: 206-44-0)	1.0%
Phenanthrene (CAS #: 85-01-8)	1.0%
1,2-Benzanthracene (CAS #: 56-55-3)	0.1%
1,2-Benzphenanthrene (CAS #: 218-01-9)	0.1%
Benzo(a)pyrene (CAS #: 50-32-8)	0.1%
Benzo(G,H,I)Perylene (CAS #: 191-24-2)	1.0%
Indeno(1,2,3-CD)Pyrene (CAS #: 193-39-5)	0.1%
Benzo(B)fluoranthene (CAS #: 205-99-2)	0.1%
Dibenzo(A,H)pyrene (CAS #: 189-64-0)	0.1%
Benzo(J)fluoranthene (CAS #: 205-82-3)	0.1%
Benzo(K)fluoranthene (CAS #: 207-08-9)	0.1%
Dibenzo(A,E)pyrene (CAS #: 192-65-4)	0.1%
Dibenzo(A,I)pyrene (CAS #: 189-55-9)	0.1%
Dibenz(A,H)anthracene (CAS #: 53-70-3)	0.1%
Naphthalene (CAS #: 91-20-3)	0.1%
5-Methylchrysene (CAS #: 3697-24-3)	0.1%

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contain any HAPs.

Chemical Name
Naphthalene (CAS #: 91-20-3)

State Regulations

California Proposition 65
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Chemical Name	CAS-No	Category	Type
1,2-Benzanthracene	56-55-3	Carcinogen	
1,2-Benzphenanthrene	218-01-9	Carcinogen	
Benzo(a)pyrene	50-32-8	Carcinogen	
Indeno(1,2,3-CD)Pyrene	193-39-5	Carcinogen	
Benzo(B)fluoranthene	205-99-2	Carcinogen	
Dibenzo(A,H)pyrene	189-64-0	Carcinogen	
Benzo(J)fluoranthene	205-82-3	Carcinogen	
Benzo(K)fluoranthene	207-08-9	Carcinogen	
Dibenzo(A,E)pyrene	192-65-4	Carcinogen	
Dibenzo(A,I)pyrene	189-55-9	Carcinogen	
Dibenz(A,H)anthracene	53-70-3	Carcinogen	
Naphthalene	91-20-3	Carcinogen	

Chemical Name	CAS-No	Category	Type
5-Methylchrysene	3697-24-3	Carcinogen	

State Right-to-Know

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
High Temperature Coal Tar Pitch	X	X	X	X	
Fluoranthene	X	X	X		
Phenanthrene	X	X	X		
Pyrene	X	X	X	X	
1,2-Benzanthracene	X	X	X	X	X
1,2-Benzphenanthrene	X	X	X	X	X
Benzo(a)pyrene	X	X	X	X	X
Benzo(G,H,I)Perylene	X	X	X	X	
Indeno(1,2,3-CD)Pyrene	X	X	X	X	
Benzo(B)fluoranthene	X	X	X	X	X
Dibenzo(A,H)pyrene	X	X	X	X	X
Benzo(J)fluoranthene	X	X	X	X	X
Benzo(K)fluoranthene	X	X	X	X	
Dibenzo(A,E)pyrene	X	X	X	X	X
Dibenzo(A,I)pyrene	X	X	X	X	X
Dibenz(A,H)anthracene	X	X	X	X	X
Naphthalene	X	X	X	X	X
5-Methylchrysene	X		X	X	

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
D2A Very toxic materials

16. OTHER INFORMATION

Revision Date 16-Apr-2007

Revision Summary Not available

Disclaimer
The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of MSDS

4,4'-DDT

sc-238975

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
4,4'-DDT

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

NFPA

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

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

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

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW
RISK
Limited evidence of a carcinogenic effect.

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

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

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

EYE

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

SKIN

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

INHALED

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

CHRONIC HEALTH EFFECTS

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

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max
Flammability:	1		

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

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

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

Section 4 - FIRST AID MEASURES

SWALLOWED

■

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

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

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

(ICSC20305/20307).

EYE

■ If this product comes in contact with the eyes:

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

SKIN

■ If skin or hair contact occurs:

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

INHALED

■

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

NOTES TO PHYSICIAN

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

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

[Ellenhorn and Barceloux: Medical Toxicology].

Section 5 - FIRE FIGHTING MEASURES

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

EXTINGUISHING MEDIA

■

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

FIRE FIGHTING

■

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

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

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

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

FIRE INCOMPATIBILITY

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

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

■

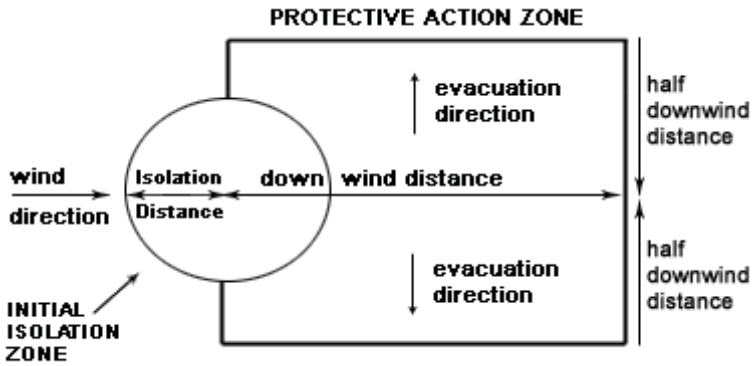
- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted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

MAJOR SPILLS

■

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

PROTECTIVE ACTIONS FOR SPILL



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

FOOTNOTES

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

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

■

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

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

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

RECOMMENDED STORAGE METHODS

■

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

For low viscosity materials

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

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

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

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

STORAGE REQUIREMENTS

■

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

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X + X X +

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

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

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

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

EMERGENCY EXPOSURE LIMITS

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

MATERIAL DATA

DDT:

■ for DDT:

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

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

PERSONAL PROTECTION

Consult your EHS staff for recommendations

EYE

■

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

HANDS/FEET

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

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

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

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

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

OTHER

■

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

■

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

RESPIRATOR

■

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

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

ENGINEERING CONTROLS

■

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

(a): particle dust respirators, if necessary, combined with an absorption cartridge;
(b): filter respirators with absorption cartridge or canister of the right type;
(c): fresh-air hoods or masks

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.

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

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

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

Within each range the appropriate value depends on:

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

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

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Does not mix with water.

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

APPEARANCE

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

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■

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

STORAGE INCOMPATIBILITY

■

- Avoid strong bases.

Avoid reaction with oxidizing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

DDT

TOXICITY AND IRRITATION

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

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

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

■ **For DDT:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CARCINOGEN

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

SKIN

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

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
DDT:

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

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

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

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

Ecotoxicity

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

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

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

Disposal Instructions

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

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

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

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

Section 14 - TRANSPORTATION INFORMATION

DOT:

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

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

Air Transport IATA:

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

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

Maritime Transport IMDG:

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

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

Section 15 - REGULATORY INFORMATION

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

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

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

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

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

REPRODUCTIVE HEALTH GUIDELINES

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

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

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

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

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

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

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4,4'-DDT

sc-238975

Material Safety Data Sheet

Hazard Alert Code Key:	EXTREME	HIGH	MODERATE	LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
4,4'-DDT

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

NFPA

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

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

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

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

EMERGENCY OVERVIEW
RISK
Limited evidence of a carcinogenic effect.

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

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

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

EYE

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

SKIN

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

INHALED

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

CHRONIC HEALTH EFFECTS

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

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

		Min	Max
Flammability:	1		

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

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

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

Section 4 - FIRST AID MEASURES

SWALLOWED

■

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

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

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

(ICSC20305/20307).

EYE

■ If this product comes in contact with the eyes:

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

SKIN

■ If skin or hair contact occurs:

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

INHALED

■

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

NOTES TO PHYSICIAN

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

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

[Ellenhorn and Barceloux: Medical Toxicology].

Section 5 - FIRE FIGHTING MEASURES

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

EXTINGUISHING MEDIA

■

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

FIRE FIGHTING

■

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

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■

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

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

FIRE INCOMPATIBILITY

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

PERSONAL PROTECTION

Glasses:
Chemical goggles.
Gloves:
Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

■

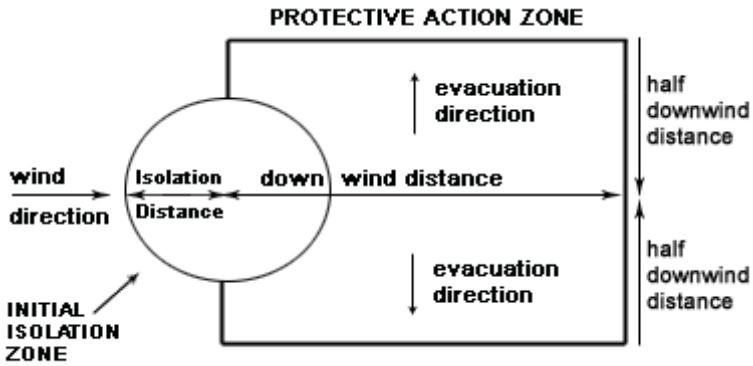
- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted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

MAJOR SPILLS

■

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

PROTECTIVE ACTIONS FOR SPILL



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

FOOTNOTES

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

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

■

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

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

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

RECOMMENDED STORAGE METHODS

■

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

For low viscosity materials

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

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

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

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

STORAGE REQUIREMENTS

■

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

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X X + X X +

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

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

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

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

EMERGENCY EXPOSURE LIMITS

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

MATERIAL DATA

DDT:

■ for DDT:

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

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

PERSONAL PROTECTION

Consult your EHS staff for recommendations

EYE

■

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

HANDS/FEET

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

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

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

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

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

OTHER

■

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

■

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

RESPIRATOR

■

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

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

ENGINEERING CONTROLS

■

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

(a): particle dust respirators, if necessary, combined with an absorption cartridge;
(b): filter respirators with absorption cartridge or canister of the right type;
(c): fresh-air hoods or masks

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.

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

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

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

Within each range the appropriate value depends on:

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

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

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.
Does not mix with water.

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

APPEARANCE

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

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■

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

STORAGE INCOMPATIBILITY

■

- Avoid strong bases.

Avoid reaction with oxidizing agents.

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

Section 11 - TOXICOLOGICAL INFORMATION

DDT

TOXICITY AND IRRITATION

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

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

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

■ **For DDT:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CARCINOGEN

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

SKIN

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

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:
DDT:

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

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

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

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

Ecotoxicity

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

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

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

Disposal Instructions

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

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

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

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

Section 14 - TRANSPORTATION INFORMATION

DOT:

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

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

Air Transport IATA:

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

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

Maritime Transport IMDG:

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

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

Section 15 - REGULATORY INFORMATION

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

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

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

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

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

REPRODUCTIVE HEALTH GUIDELINES

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

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

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

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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.

■ 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

Print Date:Apr-22-2010

Material Safety Data Sheet

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

Product # US-112B **Last Updated: 4/23/2004**

Section I *Product Identification*

Name: Organochlorine Pesticides Mixture

Solvent: acetone

Section II *Composition / Information on Ingredients*

Component	*CAS #*	*% by Wt.*	*LD50*	*OSHA PEL*	*ACGIH TLV*	*RTECS #*	*Codes*
acetone	000067-64-1	95.70164	9750 mg/kg oral rat	1000 ppm	750 ppm	AL3150000	G
aldrin	000309-00-2	0.25284	39 mg/kg oral rat	0.25 mg/m3	0.25 mg/m3	IO2100000	GH
alpha-BHC (alpha-HCH)	000319-84-6	0.25284	500 mg/kg oral rat	N/A	N/A	GV3500000	F
beta-BHC (beta-HCH)	000319-85-7	0.25284	6000 mg/kg oral rat	N/A	N/A	GV4375000	F
delta-BHC (delta-HCH)	000319-86-8	0.25284	1000 mg/kg oral rat	N/A	N/A	GV4550000	
gamma-BHC (lindane)	000058-89-9	0.25284	76 mg/kg oral rat	0.5 mg/m3	0.5 mg/m3	GV4900000	FG
4,4'-DDD	000072-54-8	0.25284	113 mg/kg oral rat	N/A	N/A	KI0700000	DH
4,4'-DDE	000072-55-9	0.25284	880 mg/kg oral rat	N/A	N/A	KV9450000	DH
4,4'-DDT	000050-29-3	0.25284	113 mg/kg oral rat	1 mg/m3	1 mg/m3	KJ3325000	DFH
dieldrin	000060-57-1	0.25284	46 mg/kg oral rat	0.25 mg/m3	0.25 mg/m3	IO1750000	H
endosulfan I	000959-98-8	0.25284	43 mg/kg oral rat	N/A	N/A	RB9275000	
endosulfan II	033213-65-9	0.25284	18 mg/kg oral rat	N/A	N/A	RB9875200	
endosulfan sulfate	001031-07-8	0.25284	N/A	N/A	N/A	N/A	
endrin	000072-20-8	0.25284	7.5 mg/kg oral rat	0.1 mg/m3	0.1 mg/m3	N/A	
endrin aldehyde	007421-93-4	0.25284	500 mg/kg oral rat	N/A	N/A	N/A	
heptachlor	000076-44-8	0.25284	90 mg/kg oral rat	0.5 mg/m3	0.05 mg/m3	PC0700000	DGH
heptachlor epoxide - isomer B	001024-57-3	0.25284	47 mg/kg oral rat	N/A	0.5 mg/m3	PB9450000	DH
methoxychlor	000072-43-5	0.25284	6000 mg/kg oral rat	15 mg/m3	10 mg/m3	N/A	G

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

Section III *Hazards Identification*

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

Toxic; irritant

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

Section IV *First Aid Measures*

Inhalation: If inhaled, remove to fresh air. Give oxygen, if necessary. Contact a physician.

Skin Contact: In case of skin contact, flush with copious amounts of water. Remove contaminated clothing. Contact a physician.

Eye Contact: In case of eye contact, flush with copious amounts of water, lifting eyelids occasionally. Contact a physician.

Ingestion: If ingested, contact poison center immediately for recommended procedure. Contact a physician.

Section V *Fire Fighting Measures*

Fire and Explosion Hazard Data for Solvent

Fire Hazard: flammable

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

Section VI Accidental Release Measures

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

Section VII Handling and Storage

Do Not Refrigerate

Keep in a tightly closed container, and store in a corrosion proof area.

This product should only be used by persons trained in the safe handling of hazardous chemicals.

Section VIII Exposure Controls / Personal Protection

Ensure that there is adequate ventilation to prevent airborne levels from exceeding recommended exposure limits (see Section II). Use appropriate MSHA/NIOSH approved safety equipment. Wear chemical goggles, face shield, gloves, and chemical resistant clothing, such as a laboratory coat and/or a rubber apron, to prevent contact with eyes, skin, and clothing.

Section IX Physical and Chemical Properties

Physical Data for Solvent

Melting Pt.: -94.9°C	***Boiling Pt.:*** 56.5°C	***Density:*** 0.791
Vapor Pressure: 400 mmHg @ 39.5°C	***Vapor Density:*** 2	***Water Solubility:*** soluble
Appearance: colorless liquid	***Odor:*** mint-like odor	***Flash Point:*** 0°F
Auto-Ignition Temperature: 869°F	***LEL:*** 2.6	***UEL:*** 12.8

Section X Stability and Reactivity

Reactivity Data for Solvent

Stability: stable ***Incompatibilities:*** strong oxidizers

Hazardous Decomposition Products: N/A

Hazardous Effects of Polymerization: none

Section XI Toxicological Information

See Section II for specific toxicological information for the ingredients of this product.

Section XII Ecological Information

No information is available.

Section XIII Disposal Considerations

Recycle, if possible. Any material which cannot be saved for recovery or recycling should be disposed of at an appropriate and approved waste disposal facility. Processing, use, and/or contamination of this product may change waste management requirements. Observe all applicable federal, state, and local environmental regulations concerning disposal.

Section XIV Transport Information

Shipment Type: Dangerous Goods in Excepted Quantity (US DOT Small Quantity Exemption)

UN Number: UN3316 ***Shipping Class:*** 9 ***Packing Group:*** N/A

Section XV Regulatory Information

Warning: This product contains chemicals known to the state of California to cause cancer.

EU Directives Classification

R: 11-36-66-67

Risk Statements: Highly flammable. Irritating to eyes. Repeated exposure may cause skin dryness or cracking. Vapours may cause drowsiness and dizziness.

S: 9-16-26

Safety Statements: Keep container in a well-ventilated place. Keep away from sources of ignition -- No smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Section XVI Other Information

The above information is believed to be correct, but does not purport to be all-inclusive. This data should be used only as a guide in handling this material. ULTRA Scientific, Inc., shall not be held liable for any damage resulting from handling or from contact with the above product.

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Material Safety Data Sheet

Version 4.0
Revision Date 03/14/2010
Print Date 10/14/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	2-Methylnaphthalene
Product Number	:	45796
Brand	:	Fluka
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion.

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : β-Methylnaphthalene

Formula : $C_{11}H_{10}$
Molecular Weight : 142.2 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
2-Methylnaphthalene			
91-57-6	202-078-3	-	-

4. FIRST AID MEASURES

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

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

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

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

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

5. FIRE-FIGHTING MEASURES

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

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

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation.

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

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

7. HANDLING AND STORAGE

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

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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. For prolonged or repeated contact use protective gloves.

Eye protection
Safety glasses with side-shields conforming to EN166

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

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	34.0 - 36.0 °C (93.2 - 96.8 °F)
Boiling point	241.0 - 242.0 °C (465.8 - 467.6 °F)
Flash point	98.0 °C (208.4 °F) - closed cup
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1.00 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 3.80

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 1,630 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

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

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (GHS)
Inhalation - May cause respiratory irritation.

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

Aspiration hazard
no data available

Potential health effects

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

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

Additional Information
RTECS: QJ9635000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 2.5 mg/l
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 1.5 mg/l - 48 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 28 d Bioconcentration factor (BCF): 23,500

Mobility in soil

no data available

PBT and vPvB assessment
no data available

Other adverse effects

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

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

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

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

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

15. REGULATORY INFORMATION

OSHA Hazards
Harmful by ingestion.

DSL Status
All components of this product are on the Canadian DSL list.

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

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

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Methylnaphthalene	91-57-6	

New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Methylnaphthalene	91-57-6	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

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

APG

Analytical Products Group, Inc.

2730 Washington Blvd., Belpre, OH 45714
740-423-4200 800-272-4442 Fax 740-423-5588

Material Safety Data Sheet

Date prepared on: 9/15/95

Last revised on: 1/20/08

Page 1

Section I: Product Identification

CATALOG NUMBER: 4460,4462,4470,4472,4480,9690,9190	PRODUCT NAME: Pesticides

Section II - Hazardous Ingredients/Identity Information

Chemical Name	CAS Reg. No.	OSHA PEL (TWA)	% Composition*
Acetone	67-64-1	750ppm	>99%
A table of the compounds possible in this pesticide standard is attached. Data included in the table are CAS numbers, oral ld50 values for rats and PEL/TWA values if available. Total concentration of all pesticides in the standard is less than .1%.			

Section III - Physical/Chemical Characteristics of Hazardous Ingredients

Acetone

BOILING POINT: 56 C (132 F) @ 760 mm Hg	SPECIFIC GRAVITY: 0.79 (water=1)	
VAPOR PRESSURE: 181 (20 C)	SOLUBILITY IN WATER: Complete	APPEARANCE/ODOR: Clear, colorless liquid, sweet odor (acetone).

Section IV - Fire and Explosion Hazard Data

FLASH POINT (Method used): -18 C (-2 F) Closed Cup	AUTO IGNITION TEMPERATURE: 464 C (869 F)	FLAMMABLE LIMITS	LEL 2.5%	UEL 13%
EXTINGUISHING MEDIA: Use alcohol foam, dry chemical or carbon dioxide (water may be ineffective). Use extinguisher media appropriate for surrounding fire.				
SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire exposed containers cool.				
UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors may flow along surfaces to distant ignition sources and flash back. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause a fire.				

Section V - Reactivity Data

STABILITY:	Unstable ☐	Stable ☒	Conditions to Avoid: Heat, flame, other sources of ignition.
INCOMPATIBILITY (Materials to avoid): Strong oxidizing agents, strong bases, halogen acids and halogen compounds, caustics, amines and ammonia, chlorine and chlorine compounds, strong acids, esp. sulfuric, and nitric.			
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, toxic fumes of chlorine.			
HAZARDOUS POLYMERIZATION:	May Occur ☐	Will Not Occur ☒	Conditions to Avoid: None Known.

Section VI - Health Hazard Data

ROUTES OF ENTRY	Inhalation? YES	Skin? YES	Ingestion? YES
HEALTH HAZARDS (Acute and Chronic): ACUTE: Irritation of the nose and throat. CHRONIC: Kidney and liver damage.			
COMPONENTS LISTED AS CARCINOGENS OR POTENTIAL CARCINOGENS: Total of pesticides is less than 1%. Some are on the IARC list.			
SIGNS AND SYMPTOMS OF EXPOSURE: Irritation of skin, eyes, nose and throat. Headache, dizziness, vomiting, nausea, central nervous system depression, low blood pressure and respiratory failure. Prolonged contact may cause dermatitis.			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Skin disorders, eye disorders, and chronic respiratory disease.			
EMERGENCY AND FIRST AID PROCEDURES: Seek medical assistance for treatment, observation and support if necessary. EYE CONTACT: Flush with water, seek medical attention. SKIN CONTACT: Wash with soap and water, use protective creams. INHALATION: Remove to fresh air. If not breathing, give artificial			

respiration. If breathing is difficult, give oxygen and obtain medical assistance. INGESTION: Obtain medical assistance if swallowed. If conscious, give large amounts of water and induce vomiting.

Section VII - Precautions for Safe Handling and Use

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Diluted standard can be absorbed with sand or other non-combustible absorbent material and placed into a container for later disposal. Sample solutions should be absorbed with charcoal or other organic absorbent and incinerated. Flush area with water.
WASTE DISPOSAL METHOD: Dispose in accordance with all applicable federal, state, and local regulations.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep container tightly closed. Store in a cool, dry, well ventilated, flammable liquid storage area. Isolate from incompatible materials.
OTHER PRECAUTIONS* Do not heat or evaporate analytical standards to dryness.

Section VIII - Control Measures

RESPIRATORY PROTECTION (Please specify): Respiratory protection required if airborne concentration exceeds PEL 750 ppm. At concentrations up to 5000 ppm a chemical cartridge respirator with organic vapor cartridge is recommended. Above this level, a self-contained breathing apparatus is recommended. (20,000 ppm is immediately dangerous to life or health).	
VENTILATION: Local exhaust	
PROTECTIVE GLOVES: Butyl, neoprene, or latex rubber gloves.	EYE PROTECTION: Safety glasses, or goggles.
OTHER PROTECTIVE EQUIPMENT: Impervious Clothing.	
EMERGENCY WASH FACILITIES: Maintain eye wash and quick drench showers in work area.	

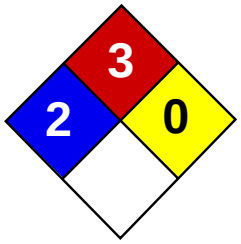
The information stated in this Material Safety Data Sheet (MSDS) is believed to be correct on the date of publication and must not be considered all conclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. Persons not specifically and properly trained should not handle this chemical or its container. This MSDS is provided without any warranty expressed or implied, including merchantability or fitness for any particular purpose.

This product is furnished for laboratory use ONLY! Our standards may not be used as drugs, cosmetics, agricultural or pesticidal products, food additives or as house hold chemicals.

* Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Environmental Protection Agency, and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.

Hazardous components of the Pesticide Standard

CHEMICAL	CAS#	% by WEIGHT	LD50
Alachlor	15972-60-8	<0.1%	Not Available
Atrazine	1912-24-9	<0.1%	Not Available
DDE	72-55-9	<0.1%	Not Available
DDD	72-54-8	<0.1%	Not Available
DDT	50-29-3	<0.1%	87 mg/kg
Dieldrin	60-57-1	<0.1%	38 mg/kg
Endrin	72-20-8	<0.1%	3 mg/kg
Heptachlor	76-44-8	<0.1%	Not Available
Heptachlor Epoxide	1024-57-3	<0.1%	40 mg/kg
Lindane	58-89-9	<0.1%	76 mg/kg
Aldrin	309-00-2	<0.1%	39 mg/kg
Endosulfan (a)	959-98-9	<0.1%	Not Available
Endosulfan (b)	33213-65-9	<0.1%	Not Available
Endosulfan Sulfate	1031-07-8	<0.1%	Not Available
Endrin Aldehyde	7421-93-4	<0.1%	Not Available
Benzene Hexachloride alpha	319-84-6	<0.1%	Not Available
Benzene Hexachloride beta	319-85-7	<0.1%	Not Available
Benzene Hexachloride delta	319-86-8	<0.1%	Not Available
Methoxychlor	72-43-5	<0.1%	6430 mg/kg
Alpha-chlordane	5103-71-9	<0.1%	500 mg/kg
Gamma-chlordane	5566-34-7	<0.1%	500 mg/kg



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Xylenes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Xylenes

Catalog Codes: SLX1075, SLX1129, SLX1042, SLX1096

CAS#: 1330-20-7

RTECS: ZE2100000

TSCA: TSCA 8(b) inventory: Xylenes

CI#: Not available.

Synonym: Xylenes; Dimethylbenzene; xylol; methyltoluene

Chemical Name: Xylenes (o-, m-, p- isomers)

Chemical Formula: C6H4(CH3)2

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

Toxicological Data on Ingredients: Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 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: 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, mucous membranes, bone marrow, 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.

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 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 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: Flammable.

Auto-Ignition Temperature: 464°C (867.2°F)

Flash Points: CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

Flammable Limits: LOWER: 1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

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

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

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Vapors may travel to source of ignition and flash back.

Special Remarks on Explosion Hazards:
Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

Section 6: Accidental Release Measures

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

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/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. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

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: 100 (ppm) [Canada] TWA: 435 (mg/m3) [Canada] TWA: 434 STEL: 651 (mg/m3) from ACGIH (TLV) [United States] TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless. Clear

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

Boiling Point: 138.5°C (281.3°F)

Melting Point: -47.4°C (-53.3°F)

Critical Temperature: Not available.

Specific Gravity: 0.864 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 1 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and femael fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/ kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may alsocause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

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 3: Flammable liquid.

Identification: : Xylenes UNNA: 1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 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 B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

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.

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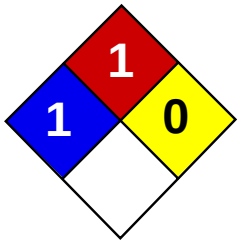

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Vanadium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Vanadium

Catalog Codes: SLV1306

CAS#: 7440-62-2

RTECS: YW1355000

TSCA: TSCA 8(b) inventory: Vanadium

CI#: Not applicable.

Synonym:

Chemical Name: Vanadium

Chemical Formula: V

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Vanadium	7440-62-2	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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: Not available.

Special Remarks on Explosion Hazards: Powdered Vanadium explodes with chlorine, even at 0 deg. C.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents.

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States] Inhalation (Fume or Dust)Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 50.94 g/mole

Color: Grey. Grayish white. (Light.)

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

Boiling Point: 3380°C (6116°F)

Melting Point: 1917°C (3482.6°F)

Critical Temperature: Not available.

Specific Gravity: 6.11 (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: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Violent reaction with bromine trifluoride, chlorine, lithium, oxidants

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Not available.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause cancer based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: It can cause skin irritation. Eyes: Dust can cause eye irritation. Inhalation: It can irritate the nose, throat, and lungs causing coughing, wheezing and/or shortness of breath. Ingestion: Low hazard. Low toxicity. It may nausea, vomiting abdominal pain, and greenish discoloration of the tongue. It may also affect behavior/central nervous system and cause headache, dizziness, tremors. Chronic Potential health Effects: Ingestion: Prolonged or repeated ingestion may cause weight loss, and may cause kidney damage. It may also affect the blood and cause anemia. Inhalation: Prolonged or repeated inhalation may irritate the lungs. It may also cause bronchitis to develop with cough, phlegm, and/or shortness of breath. It may also cause an asthma-like allergy. Future exposure may cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Vanadium Massachusetts RTK: Vanadium New Jersey: Vanadium New Jersey spill list: Vanadium California Director's List of Hazardous Materials: Vanadium TSCA 8(b) inventory: Vanadium SARA 313 toxic chemical notification and release reporting: Vanadium

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

Other Classifications:

WHMIS (Canada):
The classification of this product has not been validated yet by the Service du repertoire toxicologique.

DSCL (EEC):
This product is not classified according to the EU regulations. Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 12:14 AM

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

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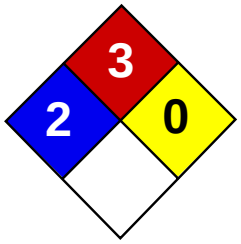

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) 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, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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 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.

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 medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

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

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

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N2O4; AgClO4; BrF3; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

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

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. 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. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/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. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

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: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m3) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

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

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

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

Solubility:
Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. 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): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Cauess mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abraisons. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophostatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

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 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

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: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 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: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

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

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

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.

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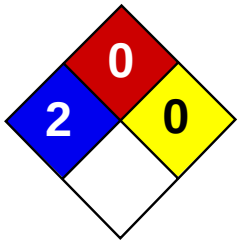

Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Thallium AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Thallium AA Standard

Catalog Codes: SLT3676

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Thallium; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Thallium	7440-28-0	0.1
Water	7732-18-5	98.5
Nitric acid, fuming	7697-37-2	1.4

Toxicological Data on Ingredients: Thallium LD50: Not available. LC50: Not available. Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

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 (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC

EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. 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 an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. 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:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. 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 immediate 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

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:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive 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. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. 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/ vapour/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

Storage: Corrosive materials should be stored in a separate 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:
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:
Thallium TWA: 0.1 (mg/m3) from ACGIH Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) 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: Not applicable.

Color: Not available.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 99.76°C (211.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1 (Water = 1)

Vapor Pressure:
The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 17.92 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily 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: Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 4786 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans: The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes.

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: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric Acid Solution (Nitric acid, fuming) : UN2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Thallium; Nitric acid, 70% Massachusetts RTK: Thallium; Nitric acid, 70% TSCA 8(b) inventory: Thallium; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Thallium; Nitric acid, 70% CERCLA: Hazardous substances.: Thallium; Nitric acid, 70%;

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

Other Classifications:

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

DSCL (EEC):
R23- Toxic by inhalation. R35- Causes severe burns.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 2

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.

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

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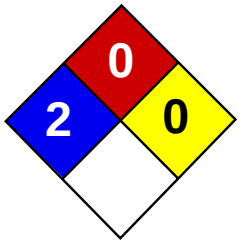

Health	2
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Sodium AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium AA Standard

Catalog Codes: SLS1627

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Sodium; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium	7440-23-5	0.1
Water	7732-18-5	98.5
Nitric acid, fuming	7697-37-2	1.4

Toxicological Data on Ingredients: Sodium LD50: Not available. LC50: Not available. Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes.

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 an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. 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 immediate 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

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. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive 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. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. 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/ vapour/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 alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate 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:
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:
Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) 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: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 99.76°C (211.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1 (Water = 1)

Vapor Pressure:
The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 17.92 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Reactive with alkalis. Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids. Non-reactive with oxidizing agents.

Corrosivity:
Highly corrosive in presence of aluminum, of zinc, of copper. Corrosive in presence of steel. Slightly corrosive to corrosive in presence of stainless steel(304), of stainless steel(316). 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:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 4786 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Material is destructive to tissue of the mucous membranes and upper respiratory tract. (Sodium)

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:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric acid, solution (Nitric acid, fuming) : UN2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Sodium; Nitric acid, 70% Massachusetts RTK: Sodium; Nitric acid, 70% TSCA 8(b) inventory: Sodium; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Nitric acid, 70% CERCLA: Hazardous substances.: Sodium; Nitric acid, 70%;

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

Other Classifications:

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

DSCL (EEC):
R23- Toxic by inhalation. R35- Causes severe burns.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 2

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.

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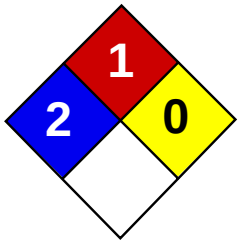

Health	2
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Silver MSDS

Section 1: Chemical Product and Company Identification

Product Name: Silver

Catalog Codes: SLS4222, SLS2005, SLS3427, SLS1210, SLS2632, SLS4054, SLS1837

CAS#: 7440-22-4

RTECS: VW3500000

TSCA: TSCA 8(b) inventory: Silver

CI#: Not applicable.

Synonym:

Chemical Formula: Ag

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Silver	7440-22-4	100

Toxicological Data on Ingredients: Silver: ORAL (LD50): Acute: 100 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion, of inhalation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching.

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

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

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

Serious Skin Contact: Not available.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

Personal Protection: Splash goggles. Lab coat.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (mg/m3) from OSHA (PEL) TWA: 0.01 (mg/m3) from OSHA NIOSH Australia: TWA: 0.1 (mg/m3)Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 107.87 g/mole

Color: Not available.

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

Boiling Point: 2212°C (4013.6°F)

Melting Point: 961°C (1761.8°F)

Critical Temperature: Not available.

Specific Gravity: 10.4 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals: Acute oral toxicity (LD50): 100 mg/kg [Mouse].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Very hazardous in case of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Silver Pennsylvania RTK: Silver Minnesota: Silver Massachusetts RTK: Silver New Jersey: Silver TSCA 8(b) inventory: Silver TSCA 8(a) PAIR: Silver TSCA 8(d) H and S data reporting: Silver SARA 313 toxic chemical notification and release reporting: Silver: 1% CERCLA: Hazardous substances.: Silver: 1000 lbs. (453.6 kg)

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

Other Classifications:

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

DSCL (EEC): R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Not applicable. Lab coat. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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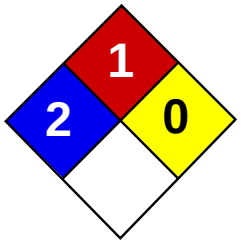

Health	2
Fire	1
Reactivity	0
Personal Protection	C

Material Safety Data Sheet
Pyrene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Pyrene

Catalog Codes: SLP3868

CAS#: 129-00-00

RTECS: UR2450000

TSCA: TSCA 8(b) inventory: Pyrene

CI#: Not available.

Synonym: Benzo(D,E,F)phenanthrene

Chemical Name: Pyrene

Chemical Formula: C16-H10

Contact Information:

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pyrene	129-00-00	100

Toxicological Data on Ingredients: Pyrene: ORAL (LD50): Acute: 2700 mg/kg [Rat]. 800 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

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

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: 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: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat, of combustible materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of heat. Non-explosive in presence of open flames and sparks.

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested,

seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F). Preferably refrigerate.

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. Synthetic apron. Gloves (impervious).

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid. Powdered solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 202.26 g/mole

Color: Yellow.

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

Boiling Point: 404°C (759.2°F)

Melting Point: 151.2°C (304.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.271 @ 23 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 4.9

Ionicity (in Water): Not available.

Dispersion Properties:
Is not dispersed in cold water, hot water. See solubility in diethyl ether.

Solubility:
Soluble in diethyl ether. Insoluble in cold water, hot water. Pyrene is fairly soluble in organic solvents. It is soluble in alcohol, benzene, carbon disulfide, ether, petroleum ether, and toluene

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 800 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause cancer (tumorigenic) according to animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be absorbed through skin. Eyes: May cause eye irritation. Conjunctival irritation may be noted. Inhalation: May cause respiratory tract irritaiton. Ingestion: May cause gastrointestinal tract irritation. May affect behavior/Central Nervous System (excitation and muscel spasicity), liver and urinary system, and immune system, and blood.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 1.8 mg/l 48 hours [Water flea].

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:
Connecticut carcinogen reporting list.: Pyrene Illinois chemical safety act: Pyrene New York release reporting list: Pyrene Pennsylvania RTK: Pyrene Massachusetts RTK: Pyrene Massachusetts spill list: Pyrene New Jersey: Pyrene New Jersey spill list: Pyrene Louisiana RTK reporting list: Pyrene Louisiana spill reporting: Pyrene California Director's list of Hazardous Substances: Pyrene TSCA 8(b) inventory: Pyrene TSCA 8(a) CAIR: Pyrene TSCA 8(d) H and S data reporting: Pyrene: June 1, 1987-June1, 1997 SARA 302/304/311/312 extremely hazardous substances: Pyrene CERCLA: Hazardous substances.: Pyrene: 5000 lbs. (2268 kg)

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R20/21/22- Harmful by inhalation, in contact with skin and if swallowed. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: C

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves (impervious). Synthetic apron. Not applicable. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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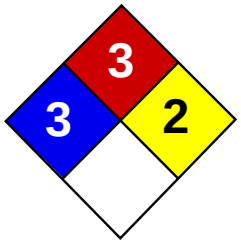

Health	3
Fire	3
Reactivity	3
Personal Protection	J

Material Safety Data Sheet
Potassium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Potassium

Catalog Codes: SLP3316

CAS#: 7440-09-7

RTECS: TS6460000

TSCA: TSCA 8(b) inventory: Potassium

CI#: Not available.

Synonym: Kalium

Chemical Name: Potassium

Chemical Formula: K

Contact Information:

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14025 Smith Rd.
Houston, Texas 77396

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Potassium	7440-09-7	100

Toxicological Data on Ingredients: Potassium 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), of eye contact (corrosive). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or 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:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung 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 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 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: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of moisture.

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

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Produces flammable gases on contact with water. May ignite on contact with water or moist air. May ignite spontaneously in air or oxygen. May be ignited by heat, sparks, or flame. Fire will produce irritating, corrosive and/or toxic gases. Burns violently, accompanied by explosions which cause spattering.

Special Remarks on Explosion Hazards:
Can react vigorously or explosively on contact with water. Mixture of solid forms of potassium & carbon dioxide (as dry ice) explodes when subjected to shock. ... Potassium & its alloys form explosive mixtures with carbon tetrachloride / and/...chlorinated hydrocarbons.

Section 6: Accidental Release Measures

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

Large Spill:
Corrosive solid. Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, acids, moisture.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Keep from any possible contact with water. Do not allow water to get into container because of violent reaction. Moisture sensitive. Air Sensitive

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Splash goggles. Synthetic apron. Vapor and 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. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 39.102 g/mole

Color: Silvery.-White.

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

Boiling Point: 765.5°C (1409.9°F)

Melting Point: 63.2°C (145.8°F)

Critical Temperature: Not available.

Specific Gravity: 0.856 (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:
Soluble in liquid ammonia, ethylenediamine, aniline, several metals, forming alloys. Soluble in acid, mercury.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Water, moisture, moist air, incompatible materials, heat, ignition sources

Incompatibility with various substances:
Highly reactive with moisture. Reactive with oxidizing agents, organic materials, metals, acids. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Air sensitive. Moisture sensitive. Oxidizes (tarnishes) when exposed to air. Peroxide formation may occur in containers that have been opened and remain in storage. May produce corrosive solutions on contact with water. Extremely dangerous in contact with water or moisture, releasing hydrogen with sufficient heat to cause ignition or explosion. Reacts violently with water, carbon dioxide, carbon tetrachloride. Also incompatible with acids, metal and non-metal halides, halogens, halocarbons, hydrogen iodide, silicates, sulfates, nitrates, carbonates, phosphates, oxides and hydroxides of heavy metals, organics, and Telfon.

Special Remarks on Corrosivity: Corrosive

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, upper respiratory tract.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

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:
Potential Health Effects: Skin: Causes severe skin irritation and burns. Eyes: Causes severe eye irritation and burns. Inhalation: Exposure to Potassium fumes can irritate the nose, and throat with sneezing, coughing and sore throat. Potassium

fumes can irritate the lungs. Repeated inhalation of Potassium fumes may cause sores of the inner nose, and bronchitis to develop with cough, phlegm, and/or shortness of breath. Ingestion: May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause systemic toxic effects of the heart, liver, and kidneys. It may affect the blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 4.3: Dangerous when wet material.

Identification: : Potassium UNNA: 2257 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Potassium Rhode Island RTK hazardous substances: Potassium Pennsylvania RTK: Potassium Massachusetts RTK: Potassium Massachusetts spill list: Potassium New Jersey: Potassium California Director's List of Hazardous Substances: Potassium TSCA 8(b) inventory: Potassium

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

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS E: Corrosive solid.

DSCL (EEC):
R14/15- Reacts violently with water, liberating extremely flammable gases. R34- Causes burns. S8- Keep container dry. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 3

Personal Protection: j

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

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

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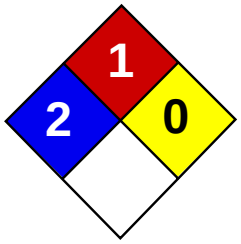

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Phenanthrene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Phenanthrene

Catalog Codes: SLP1318

CAS#: 85-01-8

RTECS: SF7175000

TSCA: TSCA 8(b) inventory: Phenanthrene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C14H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Phenanthrene	85-01-8	100

Toxicological Data on Ingredients: Phenanthrene: ORAL (LD50): Acute: 700 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. 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 immediate medical attention.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: OPEN CUP: 171°C (339.8°F).

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 178.22 g/mole

Color: Not available.

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

Boiling Point: 340°C (644°F)

Melting Point: 101°C (213.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.179 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 6.14 (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: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 700 mg/kg [Mouse].

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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: TSCA 8(b) inventory: Phenanthrene

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R43- May cause sensitization by skin contact.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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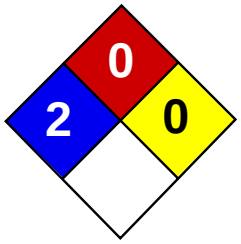

Health	2
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Nickel AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nickel AA Standard

Catalog Codes: SLN2371

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Nickel; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Nickel	7440-02-0	0.1
Water	7732-18-5	98.5
Nitric acid, fuming	7697-37-2	1.4

Toxicological Data on Ingredients: Nickel: ORAL (LD50): Acute: 5000 mg/kg [Rat]. 5000 mg/kg [Guinea pig]. Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC, + (PROVEN) by OSHA [Nickel]. Classified 2 (Reasonably anticipated.) by NTP [Nickel]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic

to lungs, the nervous system, mucous membranes. 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 an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. 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 immediate 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

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. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive 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. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. 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/ vapour/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 alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate 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:
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:
Nickel TWA: 1 (mg/m3) Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Clear)

Odor: Disagreeable and choking.

Taste: Not available.

Molecular Weight: Not applicable.

Color: Clear White or light-green.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 99.76°C (211.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1 (Water = 1)

Vapor Pressure:
The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 17.92 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: The product is insoluble in water and oil.

Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

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

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with alkalis. Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Highly corrosive in presence of aluminum, of zinc, of copper. Corrosive in presence of steel. Slightly corrosive to corrosive in presence of stainless steel(304), of stainless steel(316). 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:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 4786 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC, + (PROVEN) by OSHA [Nickel]. Classified 2 (Reasonably anticipated.) by NTP [Nickel]. The substance is toxic to lungs, the nervous system, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: 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 less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric acid, solution (Nitric acid, fuming) : UN2031 PG: II

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: Nickel California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Nickel Pennsylvania RTK: Nickel; Nitric acid, 70% Massachusetts RTK: Nickel; Nitric acid, 70% TSCA 8(b) inventory: Nickel; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Nickel; Nitric acid, 70% CERCLA: Hazardous substances.: Nickel; Nitric acid, 70%;

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

Other Classifications:

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

DSCL (EEC):
R23- Toxic by inhalation. R35- Causes severe burns. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection:

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

Health: 2

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 10:56 AM

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

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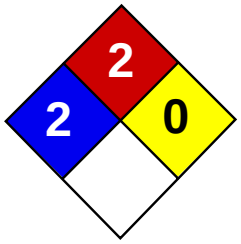

Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
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: Not available.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

Products of Combustion: These products are carbon oxides (CO, CO2).

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:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. 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. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
Israel: TWA: 10 (ppm) TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995] TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995]
Australia: STEL: 15 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

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

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol. Very slightly dispersed in cold water. See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. 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): 490 mg/kg [Rat]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene Pennsylvania RTK: Naphthalene Florida: Naphthalene Minnesota: Naphthalene Massachusetts RTK: Naphthalene TSCA 8(b) inventory: Naphthalene TSCA 8(a) PAIR: Naphthalene TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87 SARA 313 toxic chemical notification and release reporting: Naphthalene: 1% CERCLA: Hazardous substances.: Naphthalene: 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 B-4: Flammable solid. CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes. R40- Possible risks of irreversible effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation. R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 2

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. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

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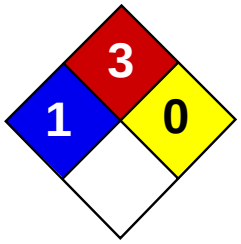

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Methyl ethyl ketone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl ethyl ketone

Catalog Codes: SLM2626, SLM3232

CAS#: 78-93-3

RTECS: EL6475000

TSCA: TSCA 8(b) inventory: Methyl ethyl ketone

CI#: Not applicable.

Synonym: 2-Butanone

Chemical Name: Methyl Ethyl Ketone

Chemical Formula: C4H8O

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl ethyl ketone	78-93-3	100

Toxicological Data on Ingredients: Methyl ethyl ketone: ORAL (LD50): Acute: 2737 mg/kg [Rat]. 4050 mg/kg [Mouse]. DERMAL (LD50): Acute: 6480 mg/kg [Rabbit]. VAPOR (LC50): Acute: 23500 mg/m 8 hours [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to gastrointestinal tract, upper respiratory tract, skin, eyes, 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. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

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. Cold water may be used.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.

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: Flammable.

Auto-Ignition Temperature: 404°C (759.2°F)

Flash Points: CLOSED CUP: -9°C (15.8°F). OPEN CUP: -5.5556°C (22°F) (Tag).

Flammable Limits: LOWER: 1.8% UPPER: 10%

Products of Combustion: These products are carbon oxides (CO, CO2).

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

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

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Ignition on contact with potassium t-butoxide. Vapor may cause a flash fire

Special Remarks on Explosion Hazards:
Reaction with Hydrogen Peroxide + nitric acid forms heat and shock-sensitive explosive product. Mixture with 2-propanol will produce explosive peroxides during storage.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. 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. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/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. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

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: 200 STEL: 300 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 150 STEL: 300 (ppm) [Australia] TWA: 590 STEL: 885 (mg/m3) from NIOSH TWA: 200 STEL: 300 (ppm) from NIOSH TWA: 590 STEL: 885 (mg/m3) [Canada] TWA: 200 STEL: 300 (ppm) from OSHA (PEL) [United States] TWA: 590 STEL: 885 (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:
Acetone-like Pleasant. Pungent. Sweetish. (Strong.)

Taste: Not available.

Molecular Weight: 72.12g/mole

Color: Clear Colorless.

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

Boiling Point: 79.6 (175.3°F)

Melting Point: -86°C (-122.8°F)

Critical Temperature: 262.5°C (504.5°F)

Specific Gravity: 0.805(Water = 1)

Vapor Pressure: 10.3 kPa (@ 20°C)

Vapor Density: 2.41 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 0.3

Ionicity (in Water): Not available.

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

Solubility: Soluble in cold water, diethyl ether, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, mechanical shock, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with chloroform, copper, hydrogen peroxide, nitric acid, potassium t-butoxide, 2-propanol, chlorosulfonic acid, strong oxidizers, amines, ammonia, inorganic acids, isocyanates, caustics, pyrindines. Vigorous reaction with chloroform +alkali.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2737 mg/kg [Rat]. Acute dermal toxicity (LD50): 6480 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 32000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. May cause damage to the following organs: gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause birth defects based on animal dats. Embryotoxic and/or foetotoxic in animal.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. May be absorbed through the skin. Eyes: Causes eye irritation. Inhalation: Inhalation of high concentrations may cause central nervous effects characterized by headache, dizziness, unconsciousness, and coma. Causes respiratory tract irritation and affects the sense organs. May affect the liver and urinary system. Ingestion: Causes gastrointestinal tract irritation with nausea, vomiting and diarrhea. May affect the liver. Chronic Potential Health Effects: Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 3220 mg/l 96 hours [Fathead Minnow]. 1690 mg/l 96 hours [Bluegill].

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 3: Flammable liquid.

Identification: : Ethyl methyl ketone UNNA: 1193 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Methyl ethyl ketone Rhode Island RTK hazardous substances: Methyl ethyl ketone Pennsylvania RTK: Methyl ethyl ketone Minnesota: Methyl ethyl ketone Massachusetts RTK: Methyl ethyl ketone New Jersey: Methyl ethyl ketone California Director's list of Hazardous Substances: Methyl ethyl ketone TSCA 8(b) inventory: Methyl ethyl ketone TSCA 8(d) H and S data reporting: Methyl ethyl ketone: Effective: 10/4/82; Sunset: 10/4/92 SARA 313 toxic chemical notification and release reporting: Methyl ethyl ketone CERCLA: Hazardous substances.: Methyl ethyl ketone: 5000 lbs. (2268 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 B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R36/37- Irritating to eyes and respiratory system. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 1

Flammability: 3

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.

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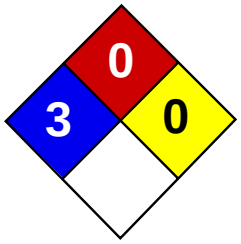

Health	3
Fire	0
Reactivity	0
Personal Protection	

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; Hydragyrum

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

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/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [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, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) 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.

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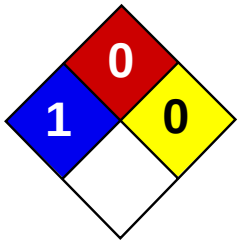

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Manganese MSDS

Section 1: Chemical Product and Company Identification

Product Name: Manganese

Catalog Codes: SLM2245

CAS#: 7439-96-5

RTECS: OO9275000

TSCA: TSCA 8(b) inventory: Manganese

CI#: Not available.

Synonym:

Chemical Name: Manganese

Chemical Formula: Mn

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Manganese	7439-96-5	100

Toxicological Data on Ingredients: Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

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

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Moderate fire potential, in the form of dust or powder, when exposed to flame. When manganese if heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence. Concentrated nitric acid reacts with powdered manganese with incandescence and explosion. Powdered manganese ignites in chlorine.

Special Remarks on Explosion Hazards: Moderate explosion potential, in the form of dust or powder, when exposed to flame.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.1 (mg/m3) from ACGIH (TLV) [United States] TWA: 5 (mg/m3) [Canada] TWA: 1 STEL: 3 (mg/m3) from NIOSH [United States] TWA: 5 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 54.94 g/mole

Color: Grayish white.

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

Boiling Point: 2095°C (3803°F)

Melting Point: 1244°C (2271.2°F)

Critical Temperature: Not available.

Specific Gravity: 7.44 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Superficially oxidized on exposure to air. Reacts with aqueous solutions of sodium or potassium bicarbonate. Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts. Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively. In the form of powder, it reduces most metallic oxides on heating. On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic. Also incompatible with hydroxides, cyanides, carbonates.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 9000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Manganese can cross the placenta. May cause cancer (tumorigenic) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritaiton Eyes: Dust may cause mechanical irritation. Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressivness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait,), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation). Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism. Ingestion: May cause digestive tract irritation. There is a low gastrointesitnal absorption of manganese. Chronic Potential Health Effects: Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degeneratiave changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice) Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Manganese Rhode Island RTK hazardous substances: Manganese Pennsylvania RTK: Manganese Minnesota: Manganese Massachusetts RTK: Manganese New Jersey: Manganese New Jersey spill list: Manganese Louisiana spill reporting: Manganese California Director's List of Hazardous Substances: Manganese TSCA 8(b) inventory: Manganese SARA 313 toxic chemical notification and release reporting: Manganese

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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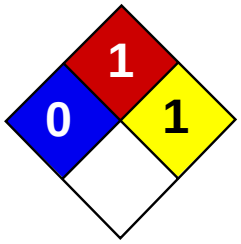

Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

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

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air. Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas with is highly flammable and eplosive

Section 6: Accidental Release Measures

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

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:
Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

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

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Very slightly soluble in hot water. Insoluble in cold water. Insoluble in chromium trioxides, and mineral acids, alkalies. Slightly soluble with decomposition in hot water. Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

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

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent chemical reaction with oxidizing agents. Reacts with water to create hydrogen gas and heat. Must be kept dry. Reacts with acids to form hydrogen gas which is highly flammable and explosive. Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing. Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing. Inhalation: Low hazard for ususal industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect. Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingeston of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia. Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Magnesium Rhode Island RTK hazardous substances: Magnesium Pennsylvania RTK: Magnesium Massachusetts RTK: Magnesium Massachusetts spill list: Magnesium New Jersey: Magnesium TSCA 8(b) inventory: Magnesium

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

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid. CLASS B-6: Reactive and very flammable material.

DSCL (EEC):
R11- Highly flammable. R15- Contact with water liberates extremely flammable gases. S7/8- Keep container tightly closed and dry. S43- In case of fire, use dry chemical. Never use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

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

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:00 PM

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

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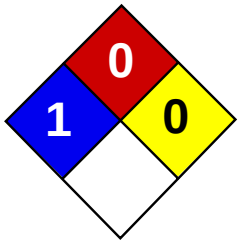

Health	1
Fire	0
Reactivity	0
Personal Protection	E

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

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

Eye Contact:

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

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

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

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

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

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

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

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

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

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

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

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

Other Classifications:

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

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

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

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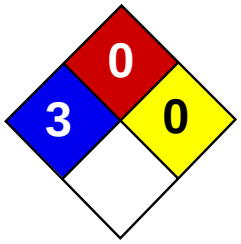

Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Iron AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Iron AA Standard

Catalog Codes: SLI1690

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Iron; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Iron	7439-89-6	0.1
Water	7732-18-5	95.5
Nitric acid, fuming	7697-37-2	4.41

Toxicological Data on Ingredients: Iron LD50: Not available. LC50: Not available. Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. 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:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes.

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 an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. 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 immediate 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

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. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive 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. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. 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/ vapour/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 alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate 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:
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:
Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) 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: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 99.23°C (210.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.02 (Water = 1)

Vapor Pressure:
The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 18.75 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: The product is insoluble in water and oil.

Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

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

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with alkalis. Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Highly corrosive in presence of aluminum, of zinc, of copper. Corrosive in presence of steel. Slightly corrosive to corrosive in presence of stainless steel(304), of stainless steel(316). 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:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 1519 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Nuisance dust. (Iron)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric acid, solution (Nitric acid, fuming) : UN2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Nitric acid, 70% Massachusetts RTK: Nitric acid, 70% TSCA 8(b) inventory: Iron; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Nitric acid, 70% CERCLA: Hazardous substances.: Nitric acid, 70%;

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-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R35- Causes severe burns.

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.

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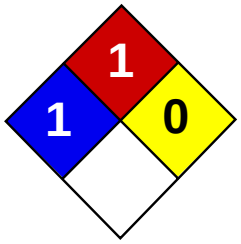

Health	1
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Fluorene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Fluorene

Catalog Codes: SLF1195

CAS#: 86-73-7

RTECS: LL5670000

TSCA: TSCA 8(b) inventory: Fluorene

CI#: Not available.

Synonym: o-Biphenylenemethane

Chemical Formula: C13H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Fluorene	86-73-7	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available.

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

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: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:
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 breathe dust.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 166.21 g/mole

Color: Colorless.

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

Boiling Point: 295°C (563°F)

Melting Point: 116.5°C (241.7°F)

Critical Temperature: Not available.

Specific Gravity: 1.202 (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: See solubility in water, diethyl ether.

Solubility:
Soluble in diethyl ether. Insoluble 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: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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:
Pennsylvania RTK: Fluorene Massachusetts RTK: Fluorene TSCA 8(b) inventory: Fluorene CERCLA: Hazardous substances.: Fluorene

Other Regulations: Not available..

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
This product is not classified according to the EU regulations.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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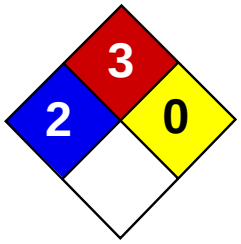

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to 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. Cold water may be used. WARM water MUST be used. Get medical attention.

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

Serious Skin Contact: Not available.

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

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

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:
CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

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

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

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

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

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

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: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m3) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

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

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

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

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

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 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

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

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

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:
-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., Nationial Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

Other Special Considerations: Not available.

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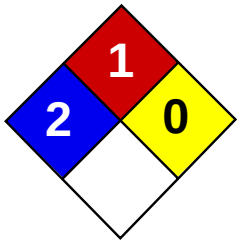

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper

Catalog Codes: SLC4939, SLC2152, SLC3943, SLC1150, SLC2941, SLC4729, SLC1936, SLC3727, SLC5515

CAS#: 7440-50-8

RTECS: GL5325000

TSCA: TSCA 8(b) inventory: Copper

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Cu

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper	7440-50-8	100

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

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. 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. 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: Not available.

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

Serious Inhalation: Not available.

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: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

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

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

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. 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 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 breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH [1990] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 63.54 g/mole

Color: Not available.

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

Boiling Point: 2595°C (4703°F)

Melting Point: 1083°C (1981.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.94 (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: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

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

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

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

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Copper Massachusetts RTK: Copper TSCA 8(b) inventory: Copper CERCLA: Hazardous substances.: Copper

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

Other Classifications:

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

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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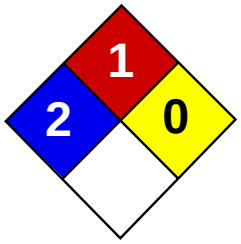

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cobalt MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cobalt

Catalog Codes: SLC1684, SLC3475

CAS#: 7440-48-4

RTECS: GF8750000

TSCA: TSCA 8(b) inventory: Cobalt

CI#: Not available.

Synonym:

Chemical Formula: Co

Contact Information:

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14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
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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
Cobalt	7440-48-4	100

Toxicological Data on Ingredients: Cobalt: ORAL (LD50): Acute: 6170 mg/kg [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Hazardous in case of inhalation. CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. 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. Do not use an eye ointment. Seek medical attention.

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

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

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

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

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Flammable solid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. 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. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

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

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

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

Exposure Limits:
TWA: 0.05 (mg/m3) from OSHA Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 58.93 g/mole

Color: Not available.

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

Boiling Point: 3100°C (5612°F)

Melting Point: 1493°C (2719.4°F)

Critical Temperature: Not available.

Specific Gravity: 8.92 (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: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 6170 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. The substance is toxic to lungs.

Other Toxic Effects on Humans: 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: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Metal powder, Flammable, n.o.s. (Cobalt metal, powder) : UN3089 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: Cobalt 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: Cobalt Pennsylvania RTK: Cobalt Massachusetts RTK: Cobalt TSCA 8(b) inventory: Cobalt

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

Other Classifications:

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

DSCL (EEC):
R36/38- Irritating to eyes and skin. R40- Possible risks of irreversible effects.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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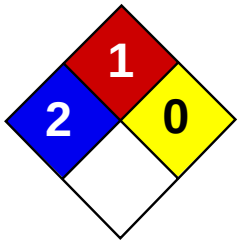

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

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14025 Smith Rd.
Houston, Texas 77396

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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
Chromium	7440-47-3	100

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

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) 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 kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

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

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.

Serious Inhalation: Not available.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

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

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

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

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 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): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

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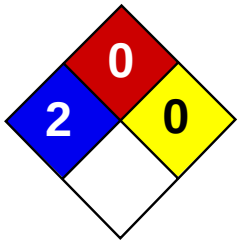

Health	2
Fire	0
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Chloroform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chloroform

Catalog Codes: SLC1888, SLC5044

CAS#: 67-66-3

RTECS: FS9100000

TSCA: TSCA 8(b) inventory: Chloroform

CI#: Not available.

Synonym: Trichloromethane; Methane, trichlor-

Chemical Name: Chloroform

Chemical Formula: CHCl3

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chloroform	67-66-3	100

Toxicological Data on Ingredients: Chloroform: ORAL (LD50): Acute: 695 mg/kg [Rat]. 36 mg/kg [Mouse]. 820 mg/kg [Guinea pig]. DERMAL (LD50): Acute: >20000 mg/kg [Rabbit]. VAPOR (LC50): Acute: 47702 mg/m 4 hours [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, heart. 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. Cold water may be used. WARM water MUST be used. Get medical attention.

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 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.

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 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: Not available.

Special Remarks on Explosion Hazards: May explode if it comes in contact with aluminum powder, lithium, perchlorate, pentoxide, bis(dimethylamino)dimethylstannane, potassium, potassium-sodium alloy, sodium (or sodium hydroxide or sodium methoxide), and methanol

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. 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. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers.

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: 10 (ppm) [Australia] Inhalation TWA: 2 (ppm) from OSHA (PEL) [United States] Inhalation STEL: 9.78 (mg/m3) from NIOSH Inhalation STEL: 2 (ppm) from NIOSH Inhalation TWA: 9.78 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 10 (ppm) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 2 (ppm) [United Kingdom (UK)] Inhalation TWA: 9.9 (mg/m3) [United Kingdom (UK)] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pleasant. Sweetish. Etheric. Non-irritating

Taste: Burning. Sweet.

Molecular Weight: 119.38 g/mole

Color: Colorless. Clear

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

Boiling Point: 61°C (141.8°F)

Melting Point: -63.5°C (-82.3°F)

Critical Temperature: 263.33°C (506°F)

Specific Gravity: 1.484 (Water = 1)

Vapor Pressure: 21.1 kPa (@ 20°C)

Vapor Density: 4.36 (Air = 1)

Volatility: Not available.

Odor Threshold: 85 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2

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, Light

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Light Sensitive. Incompatible with triisopropyl phosphine, acetone, disilane, fluorine, strong bases and reactive metals (aluminum, magnesium in powdered form), light.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, and coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 36 mg/kg [Mouse]. Acute dermal toxicity (LD50): >20000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 47702 mg/m 4 hours [Rat]. 3

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, heart.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (possible mutangen) and cause adverse reproductive effects(embryotoxicity and fetotoxicity) Suspected carcinogen (tumorigenic) and teratogen based on animal data. Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes skin irritation and may cause chemical burns. Eye: Causes eye irritation, burning pain and reversible injury to corneal epithelium. Inhalation: Causes irritation of the respiratory system (mucous membranes). May affect behavior/Nervous system (CNS depressant, fatigue, dizziness, nervousness, giddiness, euphoria, loss of coordination and judgement, weakness, hallucinations, muscle contraction/spasticity, general anesthetic, spastic paralysis, headache), anorexia (neurological and gastrointestinal symtoms resembling chronic alcoholism), and possibly coma and death. May affect the liver, kidneys and gastrointestinal tract (nausea, vomiting). Ingestion: Causes gastrointestinal tract irritation (nausea, vomiting). May affect the liver, urinary system (kidneys), respiration, behavior/nervous system (symptoms similar to inhalation),and heart. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect the liver (hepatitis, jaundice, hepatocellular necrosis), metabolism (weight loss), respiration (fibrosis, pneumoconoisis), behavior/central nervous system (symptoms similar to acute inhalation), blood, musculoskeletal system, and kidneys. Ingestion: Prolonged or repeated ingestion may affect the liver, kidneys, metabolism (weight loss), endocrine system (spleen), blood (changes in cell count).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 43.8 mg/l 96 hours [Trout].

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the 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 6.1: Poisonous material.

Identification: : Chloroform UNNA: UN1888 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: Chloroform California prop. 65 (no significant risk level): Chloroform: 0.02 mg/day (value) 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: Chloroform New York release reporting list: Chloroform Rhode Island RTK hazardous substances: Chloroform Pennsylvania RTK: Chloroform Massachusetts RTK: Chloroform New Jersey: Chloroform California Director's List of Hazardous Subtances (8 CCR 339): Chloroform Tennessee: Chloroform TSCA 8(b) inventory: Chloroform TSCA 8(d) H and S data reporting: Chloroform: effective: 6/1/87; sunset: 6/1/97 SARA 302/304/311/312 extremely hazardous substances: Chloroform SARA 313 toxic chemical notification and release reporting: Chloroform CERCLA: Hazardous substances.: Chloroform: 10 lbs. (4.536 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).

DSCL (EEC): R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R40- Possible risks of irreversible effects. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

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. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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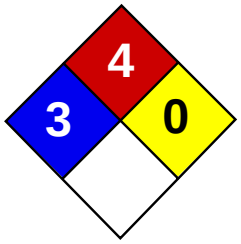

Health	3
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Carbon disulfide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Carbon disulfide

Catalog Codes: SLC4312, SLC1522

CAS#: 75-15-0

RTECS: FF6650000

TSCA: TSCA 8(b) inventory: Carbon disulfide

CI#: Not available.

Synonym:

Chemical Formula: CS2

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Carbon disulfide	75-15-0	100

Toxicological Data on Ingredients: Carbon disulfide: ORAL (LD50): Acute: 3188 mg/kg [Rat]. 2780 mg/kg [Mouse]. VAPOR (LC50): Acute: 12500 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (permeator). 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:
Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

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: Flammable.

Auto-Ignition Temperature: 90°C (194°F)

Flash Points: CLOSED CUP: -30°C (-22°F). (Setaflash)

Flammable Limits: LOWER: 1.3% UPPER: 50%

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of oxidizing materials.

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

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

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:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. 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 away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. 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:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°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:
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: 20 CEIL: 30 (ppm) TWA: 60 CEIL: 90 (mg/m3)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: 76.14 g/mole

Color: Clear Colorless.

pH (1% soln/water): 7 [Neutral.]

Boiling Point: 46.3°C (115.3°F)

Melting Point: -111.6°C (-168.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.2632 (Water = 1)

Vapor Pressure: 297.6 mm of Hg (@ 20°C)

Vapor Density: 2.63 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.1 ppm

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: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. 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): 2780 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 12500 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to kidneys, the nervous system, liver.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Embryotoxic and/or foetotoxic in animal. Human: passes through the placenta, excreted in maternal milk. Risk of spontaneous abortion in human. Causes sperm abnormalities in human. Menstrual disorders 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 3: Flammable liquid.

Identification: : Carbon Disulfide : UN1131 PG: II

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: Carbon disulfide 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: Carbon disulfide 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: Carbon disulfide 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: Carbon disulfide Pennsylvania RTK: Carbon disulfide Massachusetts RTK: Carbon disulfide TSCA 8(b) inventory: Carbon disulfide SARA 302/304/311/312 extremely hazardous substances: Carbon disulfide SARA 313 toxic chemical notification and release reporting: Carbon disulfide CERCLA: Hazardous substances.: Carbon disulfide

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

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 3

Flammability: 4

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 08:16 PM

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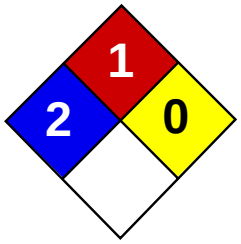

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Carbazole MSDS

Section 1: Chemical Product and Company Identification

Product Name: Carbazole

Catalog Codes: SLC4801

CAS#: 86-74-8

RTECS: FE3150000

TSCA: TSCA 8(b) inventory: Carbazole

CI#: Not available.

Synonym: 9-Azaflluorene; 9H-Carbazole; Dibenzo(b,d)ppyrrole; Dibenzopyrrole; Diphenyleneimine; Diphenylenimide; Diphenylenimine

Chemical Name: Carbazole

Chemical Formula: C12-H9-N

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Carbazole	86-74-8	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

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

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

Serious Skin Contact: Not available.

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

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. 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: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

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:
As with most organic solids, fire is possible at elevated temperatures. When heated to decomposition it emits toxic fumes of nitrogen oxides

Special Remarks on Explosion Hazards:
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

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: Not available.

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 167.21 g/mole

Color: White.

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

Boiling Point: 355°C (671°F)

Melting Point: 245°C (473°F)

Critical Temperature: Not available.

Specific Gravity: Density: 1.1 @ 18 deg. C(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: See solubility in water, acetone.

Solubility:
Partially soluble in acetone. Very slightly soluble in diethyl ether. Insoluble in cold water, hot water. 1 gram is soluble in 3 ml Quinoline, 6 ml Pyridine, 9 ml Acetone, 2 ml Acetone @ 50 deg. C., 35 ml Ether, 120 ml Benzene, 135 ml absolute alcohol. Slightly soluble in Petroleum Ether, chlorinated hydrocarbons, Acetic acid, Carbon Disulfide. Soluble in hot Chloroform, Toluene.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials, dust generation

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): >5000 mg/kg [Rat].

Chronic Effects on Humans: CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC.

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

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Rat] - Route: Oral; Dose: 500 mg/kg Lethal Dose/Conc 50% Kill: LD50 [Mouse] - Intraperitoneal; Dose: 200 mg/kg Lethal Dose/Conc: LD [Mouse] - Route: Oral; Dose: >400 mg/kg

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause cancer based on animal test data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: May cause eye irritation. Inhalation: May cause respiratory tract irritation. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting and diarrhea. Chronic Potential Health Effects: Ingestion: Prolonged or repeated ingestion may affect the liver and cause weight loss.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

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

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
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: Carbazole 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: Carbazole California Director's List of Hazardous Substances: Carbazole TSCA 8(b) inventory: Carbazole TSCA 8(d) H and S data reporting: Carbazole: Effective date: 3/07/86; Sunset date: 3/07/96

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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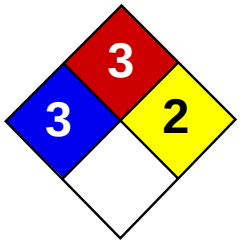

Health	3
Fire	3
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Calcium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Calcium

Catalog Codes: SLC2782

CAS#: 7440-70-2

RTECS: EV8040000

TSCA: TSCA 8(b) inventory: Calcium

CI#: Not available.

Synonym:

Chemical Formula: Ca

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Calcium	7440-70-2	100

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

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. 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. 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. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

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

Fire Fighting Media and Instructions:
Flammable solid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

Large Spill:
Corrosive solid. Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes Keep away from incompatibles such as acids, moisture.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Splash goggles. Lab coat. Vapor and 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. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 40.08 g/mole

Color: Not available.

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

Boiling Point: 1484°C (2703.2°F)

Melting Point: 839°C (1542.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.54 (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: Not available.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with acids. Reactive with moisture. The product reacts violently with water to emit flammable but non toxic gases.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: 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: 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 less toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.3: Material that emits flammable gases on contact with water.

Identification: : Calcium : UN1401 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Calcium Massachusetts RTK: Calcium TSCA 8(b) inventory: Calcium

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

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS E: Corrosive solid.

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 2

Personal Protection: j

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

Health: 3

Flammability: 3

Reactivity: 2

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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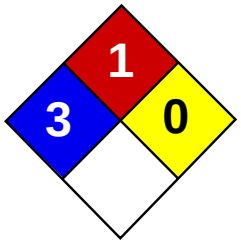

Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

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

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

Section 3: Hazards Identification

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

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

Section 4: First Aid Measures

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

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

Serious Skin Contact: Not available.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

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

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

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

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

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

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

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

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

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

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

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

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

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

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

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

Section 9: Physical and Chemical Properties

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

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

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

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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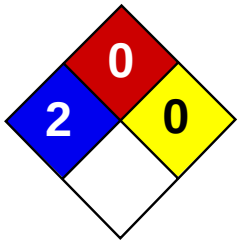

Health	2
Fire	0
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Bromoform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Bromoform

Catalog Codes: SLB4567

CAS#: 75-25-2

RTECS: PB5600000

TSCA: TSCA 8(b) inventory: Bromoform

CI#: Not applicable.

Synonym: Tribromomethane

Chemical Name: Methyl tribromide

Chemical Formula: CHBr3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

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For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Bromoform	75-25-2	100

Toxicological Data on Ingredients: Bromoform: ORAL (LD50): Acute: 933 mg/kg [Rat.]. 1072 mg/kg [Mouse].

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 A3 (Proven for animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. WARM water MUST be used. Get medical attention.

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 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.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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 heated to decomposition it emits highly toxic fumes.

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.. Do not ingest. Do not breathe gas/fumes/ vapor/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. Keep away from incompatibles such as oxidizing agents, metals, 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:
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: 0.5 from ACGIH (TLV) [United States] [1996] SKIN TWA: 5.2 from ACGIH (TLV) [United States] [1996] SKIN Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Chloroform.

Taste: Not available.

Molecular Weight: 252.77 g/mole

Color: Colorless.

pH (1% soln/water): 7 [Neutral.]

Boiling Point: 149.5°C (301.1°F)

Melting Point: 8.3 (46.9°F)

Critical Temperature: Not available.

Specific Gravity: 2.89 (Water = 1)

Vapor Pressure: 0.7 kPa (@ 20°C)

Vapor Density: 8.7(Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Partially soluble in methanol, diethyl ether. Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 933 mg/kg [Rat.].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Causes damage to the following organs: kidneys, the nervous system, liver, 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: Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Bromoform UNNA: UN2515 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: Bromoform 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: Bromoform Pennsylvania RTK: Bromoform Florida: Bromoform Minnesota: Bromoform Massachusetts RTK: Bromoform New Jersey: Bromoform TSCA 8(b) inventory: Bromoform SARA 313 toxic chemical notification and release reporting: Bromoform CERCLA: Hazardous substances.: Bromoform

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).

DSCL (EEC):
R22- Harmful if swallowed. R36/38- Irritating to eyes and skin. R40- Possible risks of irreversible effects.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

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. Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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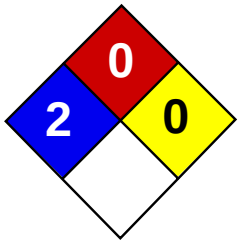

Health	2
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Beryllium AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Beryllium AA Standard

Catalog Codes: SLB2068

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Beryllium; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

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Houston, Texas 77396

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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
Beryllium	7440-41-7	0.1
Water	7732-18-5	98.5
Nitric acid, fuming	7697-37-2	1.4

Toxicological Data on Ingredients: Beryllium LD50: Not available. LC50: Not available. Nitric acid, fuming LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. 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. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death.

Potential Chronic Health Effects:
Hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Some evidence.) by NTP

[Beryllium]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. 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. Get medical attention.

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. Cold water may be used.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 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. Slightly explosive in presence of reducing materials, of combustible materials, of organic materials.

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:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. 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. Neutralize the residue with a dilute solution of sodium carbonate. 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. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. 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.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers.

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:
Beryllium TWA: 0.002 CEIL: 0.02 Nitric acid, fuming TWA: 2 CEIL: 4 TWA: 5 CEIL: 10 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: Not applicable.

Color: Not available.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6 (180.7°F) (Nitric acid, fuming). Weighted average: 99.76°C (211.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1 (Water = 1)

Vapor Pressure: The highest known value is 6 kPa (@ 20°C) (Nitric acid, fuming). Weighted average: 2.35 kPa (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily 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: Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Some evidence.) by NTP [Beryllium].

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: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Corrosive liquid, n.o.s. (Nitric acid, Beryllium Acetate, solution) (Nitric acid, fuming) UNNA: UN1760 PG: II

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: Beryllium 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: Beryllium Pennsylvania RTK: Beryllium; Nitric acid, 70% Massachusetts RTK: Beryllium; Nitric acid, 70% TSCA 8(b) inventory: Beryllium; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Beryllium 0.1%; Nitric acid, 70% 2% CERCLA: Hazardous substances.: Beryllium; Nitric acid, 70%;

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. 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. R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 2

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.

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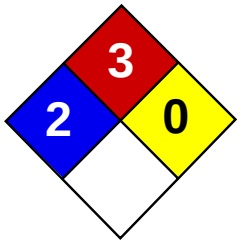

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

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14025 Smith Rd.
Houston, Texas 77396

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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
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. 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. 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. 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 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 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. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. 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. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. 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, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

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: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, 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: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:
Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

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 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

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: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) 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: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 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 B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

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.

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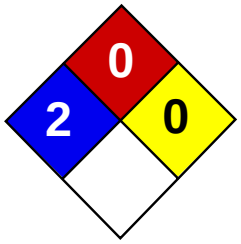

Health	2
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Barium AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Barium AA Standard

Catalog Codes: SLB1582

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Barium; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Barium	7440-39-3	0.1
Water	7732-18-5	98.5
Nitric acid, fuming	7697-37-2	1.4

Toxicological Data on Ingredients: Barium LD50: Not available. LC50: Not available. Nitric acid, fuming LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. 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.

Potential Chronic Health Effects:
Hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes.

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. Get medical attention.

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. Cold water may be used.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 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. Slightly explosive in presence of reducing materials, of combustible materials, of organic materials.

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:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

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. Neutralize the residue with a dilute solution of sodium carbonate. 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 alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

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. 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:
Barium TWA: 0.5 from ACGIH (TLV) [United States] Nitric acid, fuming TWA: 2 CEIL: 4 TWA: 5 CEIL: 10 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: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6 (180.7°F) (Nitric acid, fuming). Weighted average: 99.76°C (211.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1 (Water = 1)

Vapor Pressure: The highest known value is 6 kPa (@ 20°C) (Nitric acid, fuming). Weighted average: 2.35 kPa (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily 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:
Highly reactive with alkalis. Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Highly corrosive in presence of aluminum, of zinc, of copper. Corrosive in presence of steel. Slightly corrosive in presence of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: 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: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification:
: Corrosive liquid, acidic, inorganic, n.o.s (Nitric acid, solution; Barium Nitrate mixture) (Nitric acid, fuming) UNNA: UN3264 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Nitric acid, 70% Massachusetts RTK: Nitric acid, 70% TSCA 8(b) inventory: Barium; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Nitric acid, 70% 2% CERCLA: Hazardous substances.: Nitric acid, 70%;

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 2

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.

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Last Updated: 11/01/2010 12:00 PM

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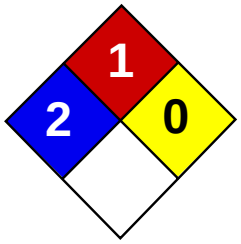

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Antimony MSDS

Section 1: Chemical Product and Company Identification

Product Name: Antimony

Catalog Codes: SLA1453, SLA4462

CAS#: 7440-36-0

RTECS: CC4025000

TSCA: TSCA 8(b) inventory: Antimony

CI#: Not available.

Synonym: Stibium

Chemical Name: Not available.

Chemical Formula: Sb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Antimony	7440-36-0	100

Toxicological Data on Ingredients: Antimony: ORAL (LD50): Acute: 7000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. 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.

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.

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: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In

case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

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:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 121.75 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 1635°C (2975°F)

Melting Point: 630°C (1166°F)

Critical Temperature: Not available.

Specific Gravity: 6.691 (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: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 7000 mg/kg [Rat].

Chronic Effects on Humans: Causes damage to the following organs: blood, kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Human: passes through the placenta, excreted in maternal milk.

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: : Antimony powder UNNA: UN2871 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Antimony Massachusetts RTK: Antimony TSCA 8(b) inventory: Antimony

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-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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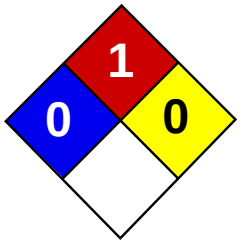

Health	0
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Anthracene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Anthracene

Catalog Codes: SLA3670

CAS#: 120-12-7

RTECS: CA9350000

TSCA: TSCA 8(b) inventory: Anthracene

CI#: Not available.

Synonym:

Chemical Formula: C14H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Anthracene	120-12-7	100

Toxicological Data on Ingredients: Anthracene LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. 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:
Very hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant), of inhalation. Hazardous in case of skin contact (permeator), of ingestion. CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

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 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 medical attention.

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: 540°C (1004°F)

Flash Points: CLOSED CUP: 121°C (249.8°F).

Flammable Limits: LOWER: 0.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
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 breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes.

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:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Slight.

Taste: Not available.

Molecular Weight: 178.22 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 342°C (647.6°F)

Melting Point: 218°C (424.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.25 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 6.15 (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: Insoluble 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: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Clear evidence.) by NTP, + (Proven.) by OSHA. Causes damage to the following organs: kidneys, lungs, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant, sensitizer), of inhalation. Hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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:
Pennsylvania RTK: Anthracene Massachusetts RTK: Anthracene TSCA 8(b) inventory: Anthracene SARA 313 toxic chemical notification and release reporting: Anthracene CERCLA: Hazardous substances.: Anthracene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes. R43- May cause sensitization by skin contact. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 0

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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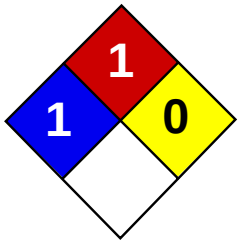

Health	1
Fire	0
Reactivity	0
Personal Protection	B

Material Safety Data Sheet
Aluminum MSDS

Section 1: Chemical Product and Company Identification

Product Name: Aluminum

Catalog Codes: SLA4735, SLA2389, SLA3895, SLA1549, SLA3055, SLA4558, SLA2212, SLA3715

CAS#: 7429-90-5

RTECS: BD0330000

TSCA: TSCA 8(b) inventory: Aluminum

CI#: Not applicable.

Synonym: Aluminum metal pellets; Aluminum metal sheet; Aluminum metal shot; Aluminum metal wire

Chemical Name: Aluminum

Chemical Formula: Al

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Aluminum	7429-90-5	100

Toxicological Data on Ingredients: Aluminum LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Slightly hazardous in case of skin contact (irritant). Non-irritating to the eyes. Non-hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage. 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. 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 immediately.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Do not ingest. 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, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Moisture sensitive.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Gloves.

Personal Protection in Case of a Large Spill: Safety glasses. Lab coat. Gloves.

Exposure Limits:
TWA: 5 (mg(Al)/m) from ACGIH (TLV) [United States] Inhalation (pyro powders, welding fumes) TWA: 10 (mg(Al)/m) from ACGIH (TLV) [United States] Inhalation (metal dust) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 26.98 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 2327°C (4220.6°F)

Melting Point: 660°C (1220°F)

Critical Temperature: Not available.

Specific Gravity: Density: 2.7 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in alkalies, Sulfuric acid, Hydrochloric acid. Insoluble in concentrated Nitric Acid, hot Acetic acid.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, exposure to moist air or water.

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Moisture sensitive. Aluminum reacts vigorously with Sodium Hydroxide. Aluminum is also incompatible with strong oxdizers, acids, chromic anhydride, iodine, carbon disulfide, methyl chloride, and halogenated hydrocarbons, acid chlorides, ammonium nitrate, ammonium persulfate, antimony, arsenic oxides, barium bromate, barium chlorate, barium iodate, metal salts

Special Remarks on Corrosivity:
In moist air, oxide film forms which protects metal from corrosion. Aluminum is strongly electropositive so that it corrodes rapidly in contact with other metals.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Not available.

Toxicity to Animals: Not available

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Slightly hazardous in case of skin contact (irritant). Non-hazardous in case of ingestion. Non-hazardous in case of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Exposure to aluminum may cause skin irritation. Eyes: Not expected to be a hazard unless aluminum dust particles are present. Exposure to aluminum dust may cause eye irritation by mechanical action. Aluminum particles deposited in the eye are generally innocous. Inhalation: Not expected to be an inhalation hazard unless it is heatedor if aluminum dust is present It heated or in dust form, it may cause respiratory tract irritation. Heating Aluminum can release Aluminum Oxide fumes and cause fume metal fever when inhaled. This is a flu-like illness with symptoms of metallic taste, fever, chills, aches, chest tightness, and cough. Ingestion: Acute aluminum toxicity is unlikely. Chronic Potential Health Effects: Skin: Contact dermatitis occurs rarely after aluminum exposure. Most cases of aluminum toxicity in humans are in one of two categories: patients with chronic renal failure, or people exposed to aluminum fumes or dust in the workplace. The main source of aluminum in people with chronic renal failure was in the high aluminum content of the water for the dialysate used for dialysis in the 1970's. Even though this problem was recognized and corrected, aluminum toxicity continues to occur in some individuals with renal who chronically ingest aluminum-containing phosphate binders or antacids. Inhalation: Chronic exposure to aluminum dust may cause dyspnea, cough, asthma, chronic obstructive lung disease, pulmonary fibrosis, pneumothorax, pneumoconiosis, encephalopathy, weakness, incoordination and epileptiform seizures and other neurological symptoms similar to that described for chronic ingestion. Hepatic necrosis is also a reported effect of exposure to airborne particulates carrying aluminum. Ingestion: Chronic ingestion of aluminum may cause Aluminum Related Bone Disease or aluminum-induced Osteomalacia with fracturing Osteodystrophy, microcytic anemia, weakness, fatigue, visual and auditory hallucinations, memory loss, speech and language impairment (dysarthria, stuttering, stammering, anomia, hypofluency, aphasia and eventually, mutism), epileptic seizures(focal or grand mal), motor disturbance(tremors, myoclonic jerks, ataxia, convulsions, asterixis, motor apraxia, muscle fatigue), and dementia (personality changes, altered mood, depression, diminished alertness, lethargy, 'clouding of the sensorium', intellectual deterioration, obtundation, coma), and altered EEG.

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 birth defects which would require a warning under the statute: No products were found. 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: No products were found. Connecticut hazardous material survey.: Aluminum Illinois toxic substances disclosure to employee act: Aluminum Rhode Island RTK hazardous substances: Aluminum Pennsylvania RTK: Aluminum Minnesota: Aluminum Massachusetts RTK: Aluminum New Jersey: Aluminum New Jersey spill list: Aluminum California Director's List of Hazardous Substances: Aluminum TSCA 8(b) inventory: Aluminum SARA 313 toxic chemical notification and release reporting: Aluminum

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: B

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Not applicable. Safety glasses.

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986. 037 Waste manifest or notification not required.

Other Special Considerations: Not available.

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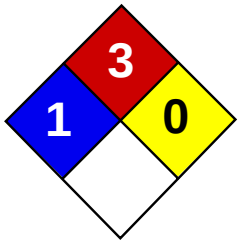

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone

Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808

CAS#: 67-64-1

RTECS: AL3150000

TSCA: TSCA 8(b) inventory: Acetone

CI#: Not applicable.

Synonym: 2-propanone; Dimethyl Ketone; Dimethylformaldehyde; Pyroacetic Acid

Chemical Name: Acetone

Chemical Formula: C3-H6-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Acetone	67-64-1	100

Toxicological Data on Ingredients: Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. 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. Get medical attention.

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. Cold water may be used.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: Flammable.

Auto-Ignition Temperature: 465°C (869°F)

Flash Points: CLOSED CUP: -20°C (-4°F). OPEN CUP: -9°C (15.8°F) (Cleveland).

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapor may travel considerable distance to source of ignition and flash back.

Special Remarks on Explosion Hazards:
Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. 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. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/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. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:
Store in a segregated and approved area (flammables area) . Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

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: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Austalia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 56.2°C (133.2°F)

Melting Point: -95.35 (-139.6°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.79 (Water = 1)

Vapor Pressure: 24 kPa (@ 20°C)

Vapor Density: 2 (Air = 1)

Volatility: Not available.

Odor Threshold: 62 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.2

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenicity) based on studies with yeast (S. cerevisiae), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizzness, drowsiness, confusion, headache, muscle weakeness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nevous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well at the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fatthead Minnow]. 0.1 ppm any hours [Water flea].

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 3: Flammable liquid.

Identification: : Acetone UNNA: 1090 PG: II

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 reproductive harm (male) which would require a warning under the statute: Benzene 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: Benzene 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: Benzene, Formaldehyde Connecticut hazardous material survey.: Acetone Illinois toxic substances disclosure to employee act: Acetone Illinois chemical safety act: Acetone New York release reporting list: Acetone Rhode Island RTK hazardous substances: Acetone Pennsylvania RTK: Acetone Florida: Acetone Minnesota: Acetone Massachusetts RTK: Acetone Massachusetts spill list: Acetone New Jersey: Acetone New Jersey spill list: Acetone Louisiana spill reporting: Acetone California List of Hazardous Substances (8 CCR 339): Acetone TSCA 8(b) inventory: Acetone TSCA 4(a) final test rules: Acetone TSCA 8(a) IUR: Acetone

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

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:
-Material safety data sheet issued by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

Other Special Considerations: Not available.

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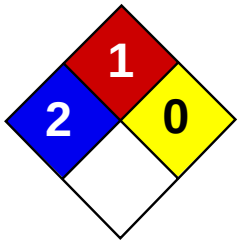

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Acenaphthene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acenaphthene

Catalog Codes: SLA2332

CAS#: 83-32-9

RTECS: AB1000000

TSCA: TSCA 8(b) inventory: Acenaphthene

CI#: Not applicable.

Synonym: Ethylenenaphthalene

Chemical Name: 1,8-Dehydroacenaphthalene

Chemical Formula: C10H6(CH2)2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Acenaphthene	83-32-9	100

Toxicological Data on Ingredients: Acenaphthene LD50: Not available. LC50: Not available.

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: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

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.

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: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of oxidizing materials.

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: Combustible.

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.

Section 7: Handling and Storage

Precautions:
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 breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. 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:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid needles.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 154.21 g/mole

Color: White.

pH (1% soln/water): Not applicable.

Boiling Point: 277.5°C (531.5°F)

Melting Point: 93.6 (200.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.02 (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: See solubility in water, methanol.

Solubility:
Partially soluble in methanol. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: 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: Not available.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: 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:

Pennsylvania RTK: Acenaphthene Massachusetts RTK: Acenaphthene New Jersey: Acenaphthene TSCA 8(b) inventory: Acenaphthene CERCLA: Hazardous substances.: Acenaphthene

Other Regulations: Not available.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

Other Special Considerations: Not available.

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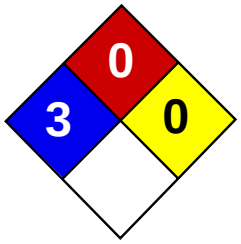


Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Zinc AA Standard MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc AA Standard

Catalog Codes: SLZ1090

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Zinc; Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc	7440-66-6	0.1
Water	7732-18-5	95.5
Nitric acid, fuming	7697-37-2	4.41

Toxicological Data on Ingredients: Zinc LD50: Not available. LC50: Not available. Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. 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:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes.

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 an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. 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 immediate 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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: 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. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

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. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive 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. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. 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/ vapour/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 alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate 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:
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:
Zinc TWA: 10 (mg/m3) from OSHA Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) 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: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 99.23°C (210.6°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.02 (Water = 1)

Vapor Pressure:
The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 18.75 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: The product is insoluble in water and oil.

Ionicity (in Water): Not available.

Dispersion Properties:
Very slightly dispersed in n-octanol. Is not dispersed in cold water, hot water, methanol, diethyl ether, acetone.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:
Highly reactive with alkalis. Slightly reactive to reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Highly corrosive in presence of aluminum, of zinc, of copper. Corrosive in presence of steel. Slightly corrosive to corrosive in presence of stainless steel(304), of stainless steel(316). 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:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 1519 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: 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 less toxic than the product itself.

Special Remarks on the Products of Biodegradation:
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source ia s potential dust explosion hazard. (Zinc)

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric acid, solution (Nitric acid, fuming) : UN2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Zinc; Nitric acid, 70% Massachusetts RTK: Zinc; Nitric acid, 70% TSCA 8(b) inventory: Zinc; Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Zinc; Nitric acid, 70% CERCLA: Hazardous substances.: Zinc; Nitric acid, 70%;

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-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R35- Causes severe burns.

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 12:18 AM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Appendix B

APPENDIX B

Insert Incident/ Near Miss Report (page 1 of 2)

Incident Investigation Report
Produced at the Request of Counsel

anteagroup

Privileged & Confidential

EMPLOYEE INFORMATION

Name of Primary Person Involved	Category of Employment	Title	Direct Manager	Manager Once Removed
Name of Person Reporting Incident	Category of Employment	Title	Direct Manager	Manager Once Removed
Delta Office Location	Division	Unit	Phone Number	Email

Time Received

PROJECT INFORMATION (*if applicable*)

Site Number/Project Name		Project Number	Project Address
Contractor Name	Contractor Contact	Client Name	Client Contact

INCIDENT INFORMATION

Incident Date	Incident Time	Time Started Work	Date Reported	Time Reported	Reported To
Incident Type			Incident Sub-Type		
Incident Location		Incident Country	Incident City & State		Incident County
Weather Conditions		Lighting Conditions	Primary Operation In Progress		
Witness Name			Witness Phone Number		Witness Type
Short Description					
Incident Description					

Date Received

Immediate Actions Taken

Corrective Actions	Responsible Person	Due Date

File Name

Party Making Potential Claim	Estimated Cost Exposure

Continues to 2nd page

Incident Investigation Report
Produced at the Request of Counsel

Privileged & Confidential

FIRST AID / ILLNESS / INJURY INCIDENT DETAILS

Injury Source	Nature of the Injury	Injury Event	Primary Body Part Affected	Injury Outcome
1st Health Care Provider	Name of Physician	Address of Provider	Phone Number	Type of Provider
2nd Health Care Provider	Name of Physician	Address of Provider	Phone Number	Type of Provider
Was First Aid given at the scene?	First Aid provided by?	What kind of First Aid Treatment?		
Was employee Hospitalized overnight?	Any prior injuries or pre-existing conditions?	How was employee transported to the medical provider?	Date Manager was Notified of Event	How Reported
Time Employee Began Work?	Did Employee lose any time from work?	1st Day Away From Work	Has Employee Returned to Work?	Return Status

SPILL / RELEASE / DISCHARGE INCIDENT DETAILS

Spill to:	Material	Agency Notification Required?	Name of Agency	Date Reported
	Quantity	Emergency Response Required?	Address of Agency	

AUTO INCIDENT DETAILS

Vehicle #1	Year	Make & Model	VIN	License Plate	Color
Name of Driver	DOB	DL State of Issue & Number	Home Address of Driver	Phone Number	Email Address
Insured By	Policy #	Estimated Repair Cost	Vehicle Towed?	Any Injuries Sustained?	Any Citations/Fines given?
Vehicle #2	Year	Make & Model	VIN	License Plate	Color
Name of Driver	DOB	DL State of Issue & Number	Home Address of Driver	Phone Number	Email Address
Insured By	Policy #	Estimated Repair Cost	Vehicle Towed?	Any Injuries Sustained?	Any Citations/Fines given?
Police Report Filed?	Date Filed	Jurisdiction	Contact Name & Number	Police Report Number	

PROPERTY / EQUIPMENT LOSS/THEFT INCIDENT DETAILS

Description of Item(s)		Owner	Year/Make/Model	Serial Number/Identifier
Police Report Filed?	Date Filed	Jurisdiction	Contact Name & Number	Police Report Number

PROPERTY DAMAGE INCIDENT DETAILS

Owner Name	Owner Phone Number	Repair Required?	Repair Status
Business Interrupted?	For how long?	Estimated Repair Cost	To Be Paid By

REPORT REVIEW/APPROVAL

Report Completed By:	Office Location	Title	Date	Time

•Return this form via e-mail to the Contracts & Claims Specialist at Delta's Corporate office on behalf of Mark Vargo, Legal Counsel

NOTE: This form is a blank copy for note-taking purposes only; this form should be completed in its electronic form with drop-down response options, etc., and should be submitted electronically.

Appendix C

APPENDIX C

5 Day Site Safety Checklist

SITE NAME: _____

SITE NUMBER: _____

Check if OK, NA if not applicable

DATE: ____

Pre-mobilization

Updated health and safety plan ____

Emergency phone numbers for utilities included ____

Proper personal protective equipment (PPE) selected & inspected-

- Hard hat ____
- Safety glasses (with side shields) ____
- Hearing protection ____
- Safety vest ____
- Work gloves ____
- Sampling gloves (PM specify type)_____ ____
- Protective coveralls (specify, Tyvek, Nomex, etc.) _____ ____
- Safety boots ____
- Respirator/cartridges (PM identify proper cartridges) ____

Other protective equipment-

- Eye wash (check expiration date) ____
- Fire extinguisher (visually inspected within last 30 days) ____
- First aid kit (inventory and check expiration dates) ____
- Safety cones (or flashing traffic light) ____

Underground utility hazards identified and addressed ____
(provide public utility one-call ticket or job number: _____.)

	DATE				
On-Site Pre-Work					
Review site hazards and HASP w/ site workers	____	____	____	____	____
Review route to hospital	____	____	____	____	____
Site workers sign HASP acknowledgement page	____	____	____	____	____
Place HASP and emergency numbers in visible location	____	____	____	____	____
Designate evacuation signal and meeting place	____	____	____	____	____

	DATE				
Delineate exclusion zone					
Check subcontractor PPE-					
Hard hat					
Safety glasses (with side shields)					
Hearing protection					
Safety vest					
Work gloves					
Sampling gloves					
Protective coveralls (specify, Tyvek, Nomex, etc.) _____					
Safety boots					
Respirator					
Subcontractors-					
Subcontractor has own HASP or field SOPs on-site (when required)					
Confirm sub. equipment (e.g., drill rig, ext. cords) is in sound working condition					
Drilling subcontractor: drill rig kill switch identified, located and tested					
Overhead hazards identified and addressed					
On-Site Work					
Proper PPE worn by site workers					
Breathing zone monitoring performed and recorded					

(Specify any new hazards identified on-site not addressed by site HASP. If new hazard cannot be mitigated by the existing scope-of-work and/or available equipment on-site, stop work and immediately contact the site project manager.)

_____

_____

_____

_____

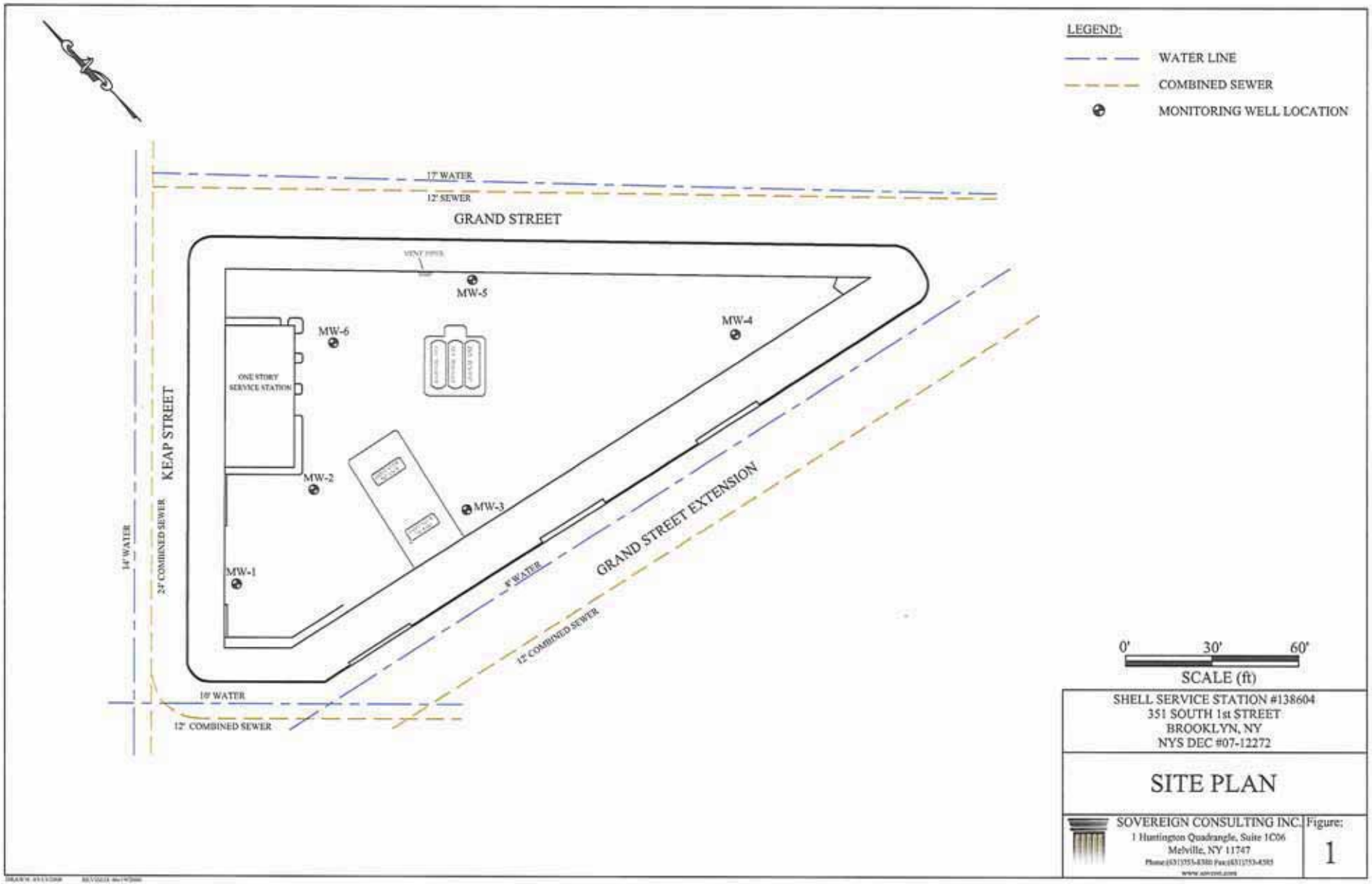
(Sign and date at the end of the field work.)

Name: _____

Signature: _____

Date: _____

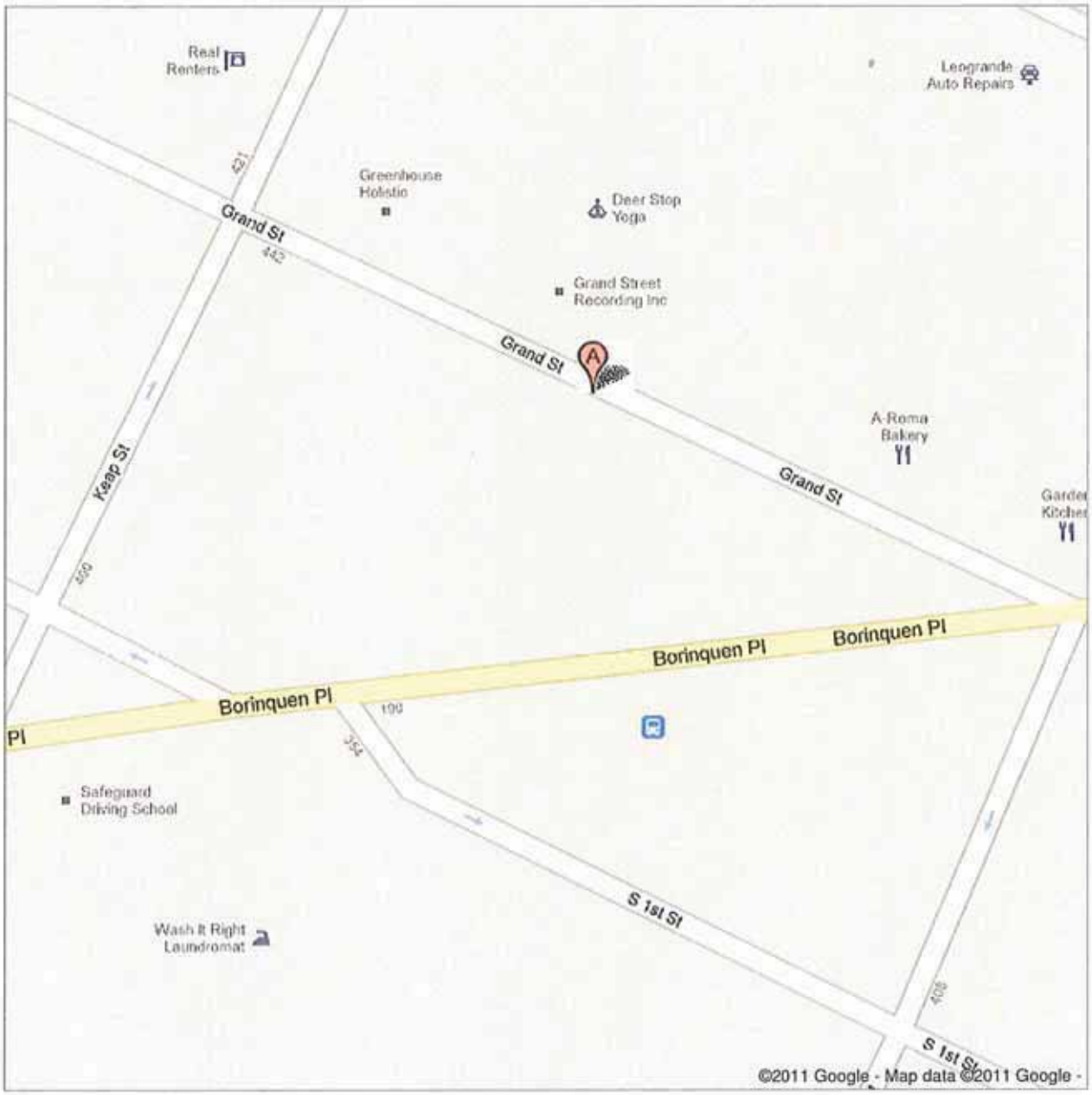
REPORT ALL INCIDENTS AND NEAR MISSES IMMEDIATELY


LEGEND:
WATER LINE
COMBINED SEWER
MONITORING WELL LOCATION
17' WATER
12' SEWER
GRAND STREET
VENT PIPES
MW-5
MW-4
MW-6
ONE STORY SERVICE STATION
KEAP STREET
MW-2
MW-3
MW-1
14' WATER
24' COMBINED SEWER
GRAND STREET EXTENSION
8' WATER
12' COMBINED SEWER
10' WATER
12' COMBINED SEWER
0'
30'
60'
SCALE (ft)
SHELL SERVICE STATION #138604
351 SOUTH 1st STREET
BROOKLYN, NY
NYS DEC #07-12272
SITE PLAN
SOVEREIGN CONSULTING INC.
1 Huntington Quadrangle, Suite 1C06
Melville, NY 11747
Figure:
1

Google maps

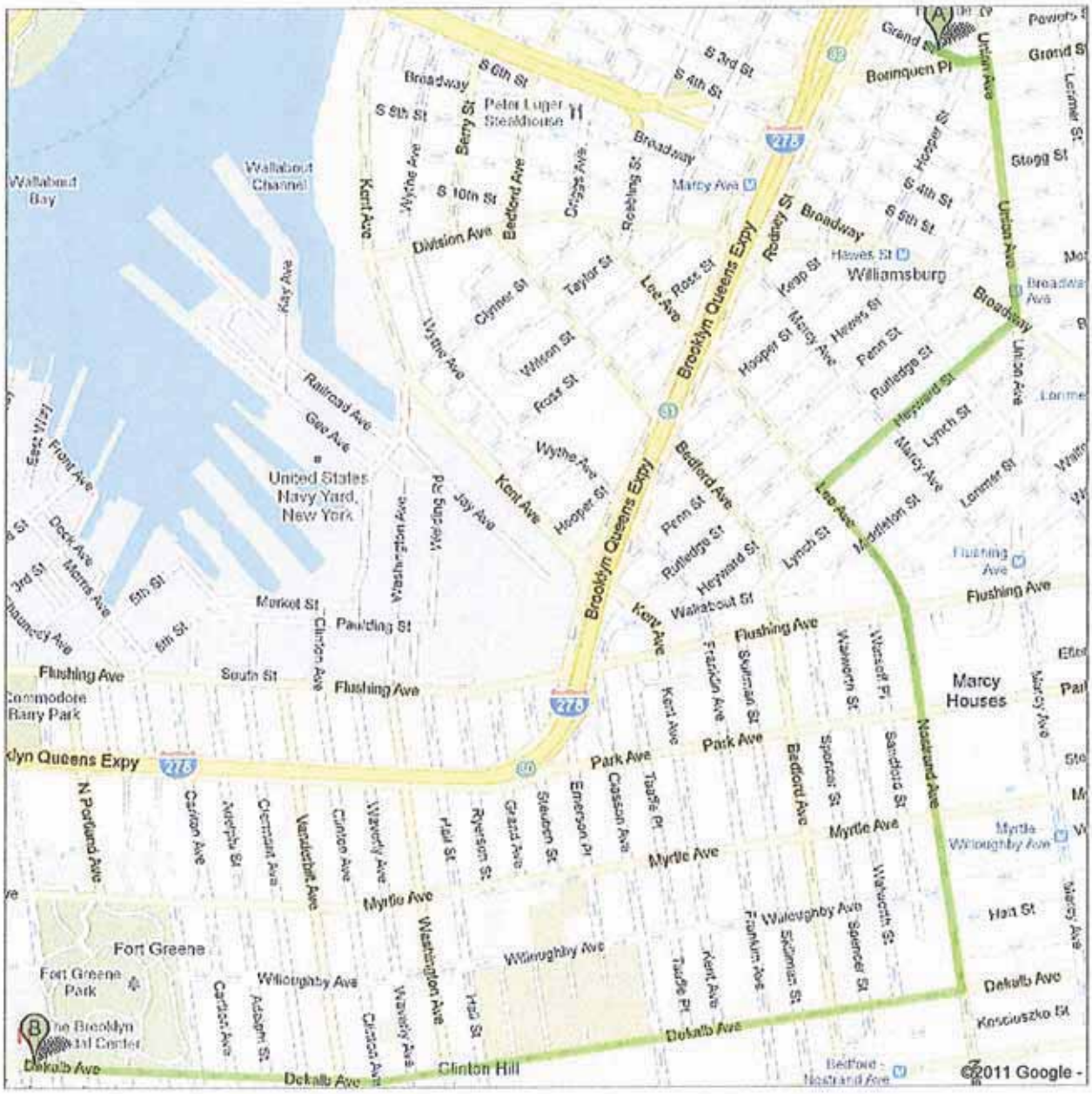
Address **456 Grand St**
Brooklyn, NY 11211

Notes Triangle Court Project
456 Grand Street
Brooklyn, NY



Google maps

Directions to 121 Dekalb Ave, Brooklyn, NY 11217
3.0 mi – about 10 mins
Directions to BROOKLYN HOSPITAL CENTER



456 Grand St, Brooklyn, NY 11211

	1. Head **southeast** on **Grand St** toward **Hooper St**	go 407 ft total 407 ft
	2. Turn right at **Union Ave** About 1 min	go 0.4 mi total 0.5 mi
	3. Turn right at **Heyward St** About 2 mins	go 0.4 mi total 0.8 mi
	4. Turn left at the 3rd cross street onto **Lee Ave** About 1 min	go 0.2 mi total 1.0 mi
	5. Continue onto **Nostrand Ave** About 2 mins	go 0.6 mi total 1.6 mi
	6. Turn right at **Dekalb Ave** Destination will be on the right About 4 mins	go 1.4 mi total 3.0 mi

121 Dekalb Ave, Brooklyn, NY 11217

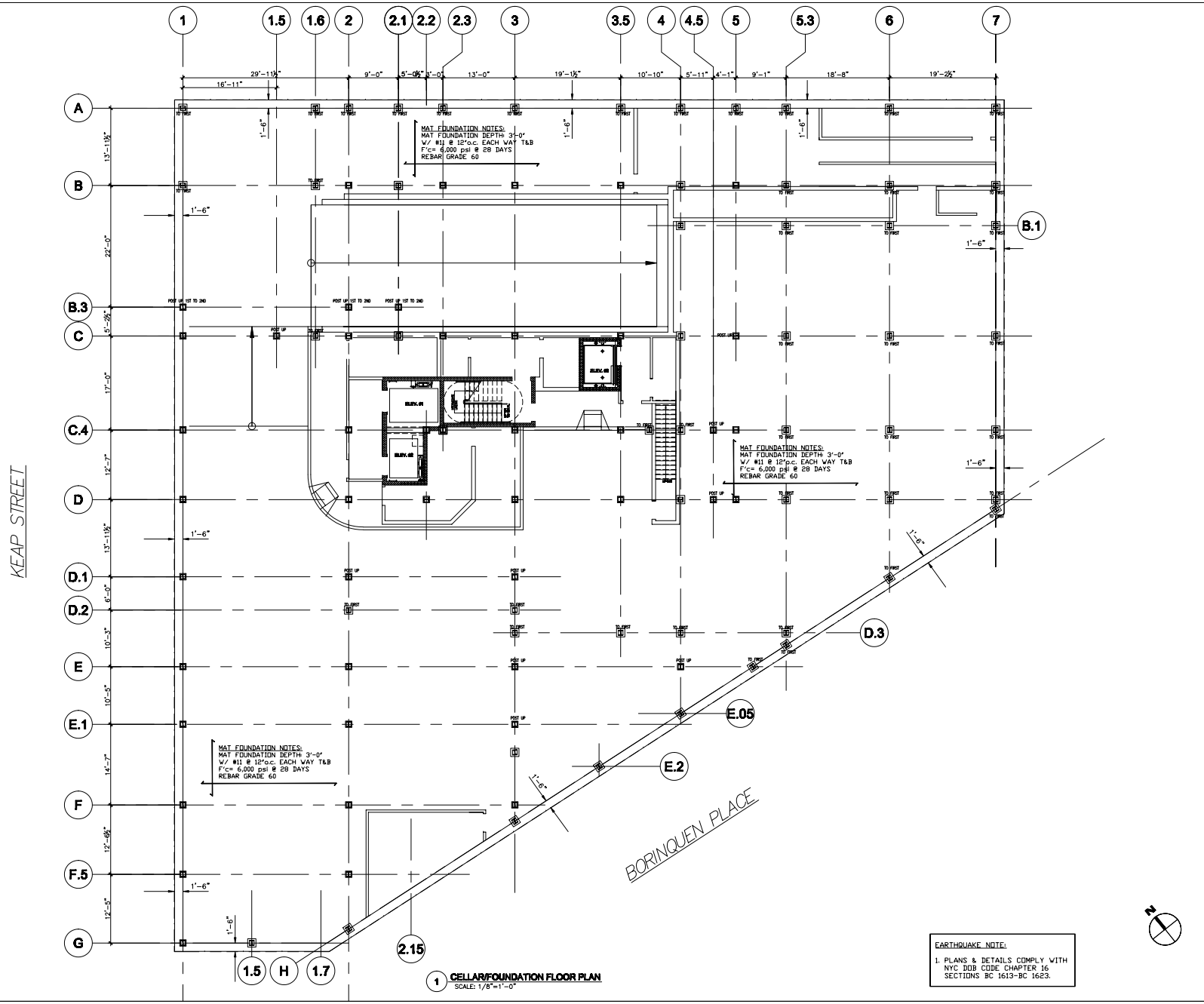
These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2011 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

APPENDIX 5

DESIGN DIAGRAMS AND SPECIFICATIONS FOR VAPOR BARRIER/WATERPROOFING MEMBRANE



1 CELLAR/FOUNDATION FLOOR PLAN
SCALE: 1/8"=1'-0"

KOH ARCHITECTURE PLLC
45-14 23rd STREET, SUITE 101
LITTLE NECK, NY 11362
(718) 225-6469 phone
(718) 225-6484 fax

DRAWINGS/SPECIFICATIONS BY:
■ LANDLORD'S CONSULTANT

ALL CONSTRUCTION WORK, UNLESS NOTED OTHERWISE, BY:
■ LANDLORD'S CONTRACTOR

BUILDING

NEW . . . . . ■
EXISTING . . . . . □
NEW SHELL ONLY . . □

NOTE: ALL WORK SHALL COMPLY WITH LOCAL, MUNICIPAL, AND STATE CODES, ORDINANCES, ETC.

CONTACT INFORMATION

OWNER:
TRIANGLE COURT LLC
ATTN: MEIR BARAEV
63-22 PARSONS BLVD.
JAMAICA, NY 11432
TELE:718-460-4444
E-MAIL: MAVERES@AOL.COM

ARCHITECT :
KOH ARCHITECTURE, PLLC
ATTN: DINAH KLAMERT, R.A.
45-14 23RST STREET, SUITE 101
LITTLE NECK, NY 11362
TELE: 718-225-6469
FAX: 718-225-6484
E-MAIL: DINAHK@KOHARCH.COM

STRUCTURAL ENGINEER:
ANTHONY GENNARO PE, P.C.
14 SIGENA WAY
MANALAPAN, NJ 07726
TELE: 732-972-9466
FAX: 732-972-7882
E-MAIL: AGENNAROPE@AOL.COM

M.E.P. ENGINEER:
TSF ENGINEERING PC
ATTN: NICK TUCCI PE.
230 PARK AVE SOUTH SUITE 1609
NEW YORK, NY 10003
TELE: 212-353-7288
FAX: 212-353-8812
E-MAIL: NTUCCI@TSFENGINEERS.COM

SPRINKLER NOTE

BUILDING IS EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH SECTION 903.3.1.1 / 903.3.1.2

NOTE:
ALL WORK SHALL COMPLY WITH LOCAL, MUNICIPAL, AND STATE CODES, ORDINANCES, ETC.

NO.	DATE	BY	DESCRIPTION	CONST
1	02.14.11	BY	STRUCTURAL ENGINNER	

REVISIONS

PROJECT NAME

TRIANGLE COURT

456 GRAND ST., BROOKLYN, NY

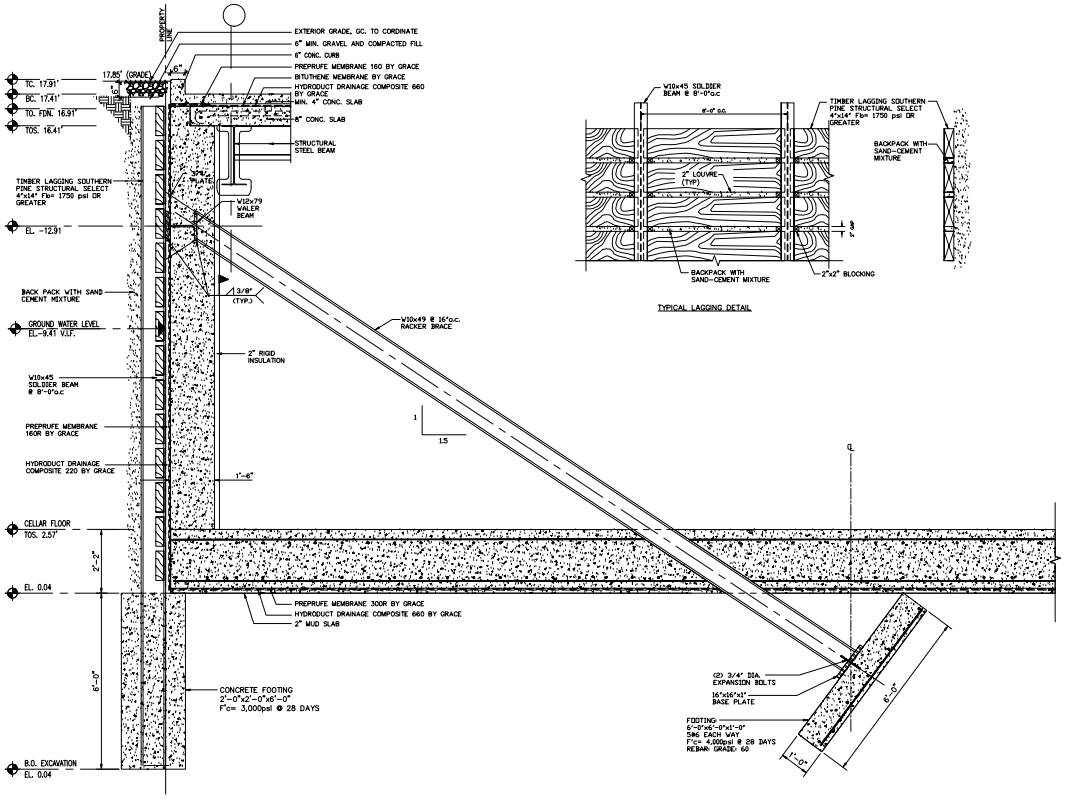
BLOCK: 2399, LOT: 01

DRAWING TITLE

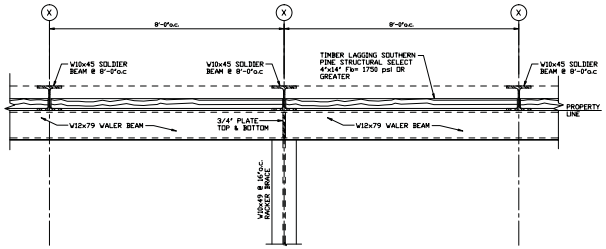
CELLAR/FOUNDATION FLOOR PLAN

SEAL & SIGNATURE

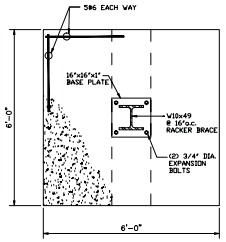
DATE:	01/28/11
PROJECT No:	2008-90
DRAWING BY:	FG
CHK BY:	AG
DWG No:	S100.00
SHEET:	OF



TYPICAL LAGGING DETAIL

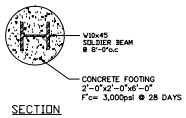


SUPPORT OF EXCAVATION PART PLAN



FOOTING:
6'-0"x6'-0"x1'-0"
5#6 EACH WAY
F'c= 4,000psi @ 28 DAYS
REBAR: GRADE: 60

6'-0"x6'-0"x1'-0"
REACTION BLOCK DETAIL



SECTION

1 SUPPORT OF EXCAVATION DETAIL

SCALE: N.T.S.

KOH ARCHITECTURE PLLC
45-14 235rd STREET, SUITE 101
LITTLE NECK, NY 11362
(718) 225-0469 phone
(718) 225-0484 fax

DRAWINGS/SPECIFICATIONS BY:
■ LANDLORD'S CONSULTANT

ALL CONSTRUCTION WORK, UNLESS NOTED OTHERWISE, BY:
■ LANDLORD'S CONTRACTOR

BUILDING

NEW . . . . . ■
EXISTING . . . . . □
NEW SHELL ONLY . . □

NOTE: ALL WORK SHALL COMPLY WITH LOCAL, MUNICIPAL, AND STATE CODES, ORDINANCES, ETC.

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14 SIENA WAY
MANALAPAN, NJ 07726
TELE: 732-972-0466
FAX: 732-972-7882
E-MAIL: AGENNAROPE@AOL.COM

M.E.P. ENGINEER:
TSF ENGINEERING PC
ATTN: NICK TUCCI PE.
230 PARK AVE SOUTH SUITE 1609
NEW YORK, NY 10003
TELE: 212-353-7288
FAX: 212-353-8842
E-MAIL: NTUCCI@TSFENGINEERS.COM

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NOTE:
ALL WORK SHALL COMPLY WITH LOCAL, MUNICIPAL, AND STATE CODES, ORDINANCES, ETC.

NO.	DATE	BY	DESCRIPTION	CONST

REVISIONS

PROJECT NAME

TRIANGLE COURT

456 GRAND ST., BROOKLYN, NY

BLOCK: 2399, LOT: 01

DRAWING TITLE

SUPPORT OF EXCAVATION DTL

SEAL & SIGNATURE

DATE:	01/26/11
PROJECT No:	2008-90
DRAWING BY:	FG
CHK BY:	AG
DWG No:	

SOE-201

SHEET: 4 OF 4

GRACE

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.

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted sand or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

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

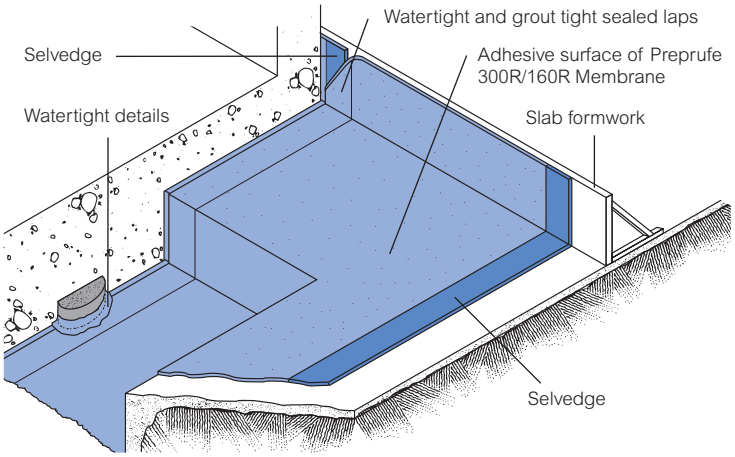
Installation

The most current application instructions, detail drawings and technical letters can be viewed at www.graceconstruction.com. Technical letters are provided for the following subjects to assist in the installation of Preprufe:

- Chemical Resistance
- Minimizing Concrete Shrinkage and Curling
- Rebar Chairs on Preprufe 300R Membrane
- Removal of Formwork Placed Against Preprufe Membranes
- Winter Lap Sealing and the use of Preprufe Tape LT

For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.



Drawings are for illustration purposes only.
Please refer to www.graceconstruction.com for specific application details.

BBA BRITISH BOARD OF AGREMENT CERTIFICATE No. 97/3325

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. 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.

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 selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letters for information on suitable rebar chairs for Preprufe.

Vertical substrates—Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Secure the top of the membrane using a batten such as a termination bar or similar 2 in. (50 mm) below the top edge (see Figure 3). Fastening can be made through the selvedge so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner. Any additional fasteners must be covered with a patch of Preprufe Tape (see Figure 4).

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 and roll firmly. Immediately remove printed plastic release liner from the tape.

Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit www.graceconstruction.com. This Manual gives comprehensive guidance and standard details for:

- internal and external corners
- penetrations
- tiebacks
- columns
- grade beam pilecaps
- tie-ins
- terminations

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by jet washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (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 selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe R Membrane and Tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Concrete must be placed and compacted carefully to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 1500 psi (10 N/mm^2) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

As a guide, to reach the minimum compressive strength stated above, a structural concrete mix with an ultimate strength of 6000 psi (40 N/mm^2) will typically require a cure time of approximately 6 days at an average ambient temperature of 25°F (-4°C), or 2 days at 70°F (21°C).

Figure 1

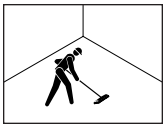


Figure 2

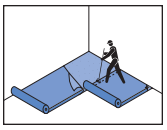
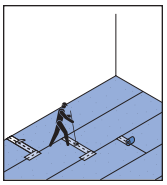
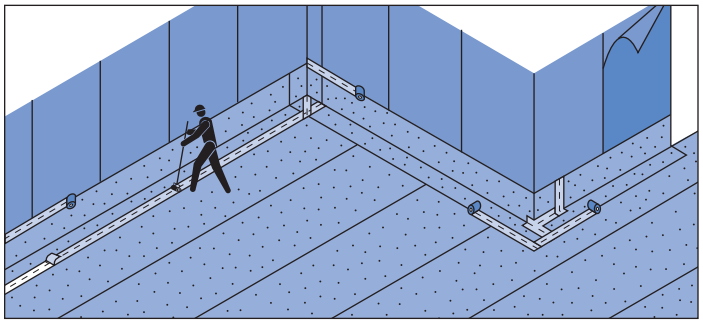


Figure 3

Figure 4

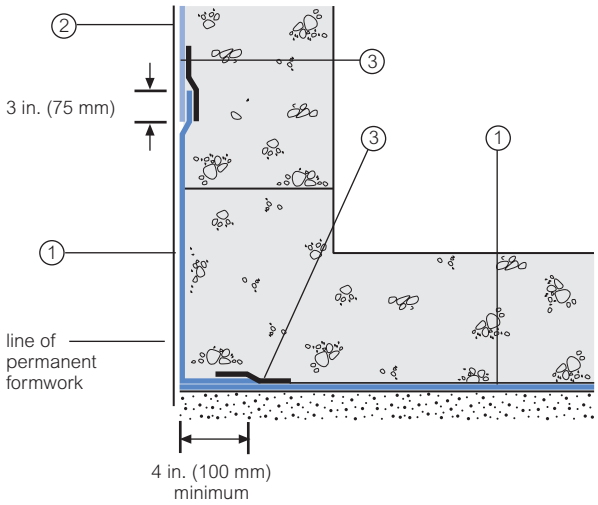




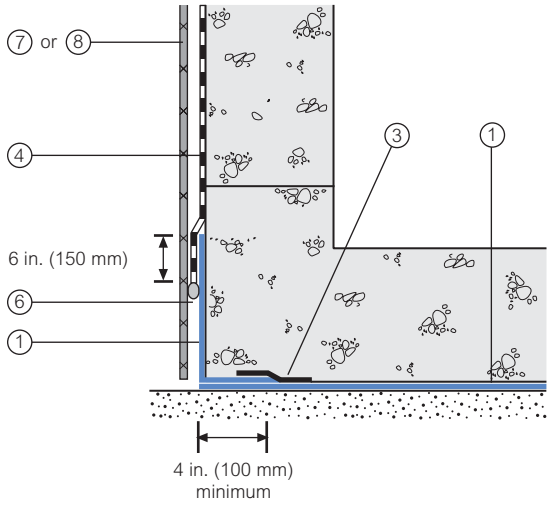
Detail Drawings

Details shown are typical illustrations and not working details. For a list of the most current details, visit us at www.graceconstruction.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

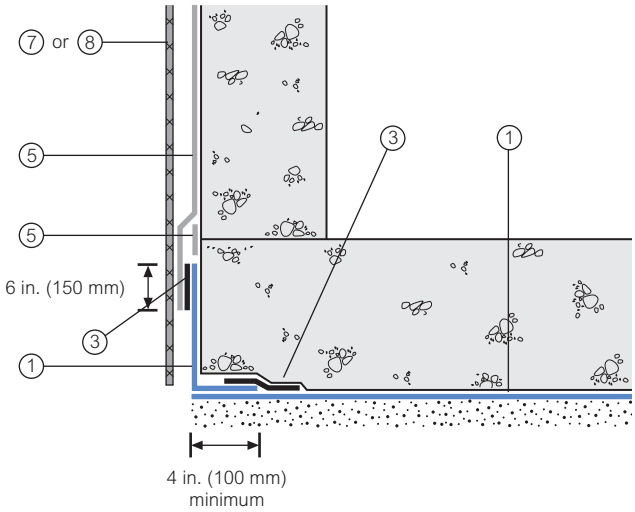
Wall base detail against permanent shutter



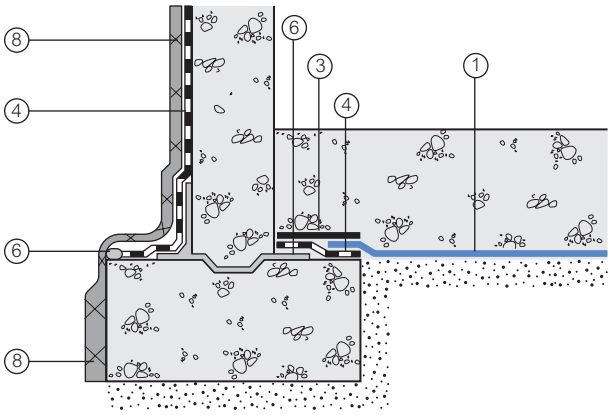
Bituthene wall base detail (Option 1)



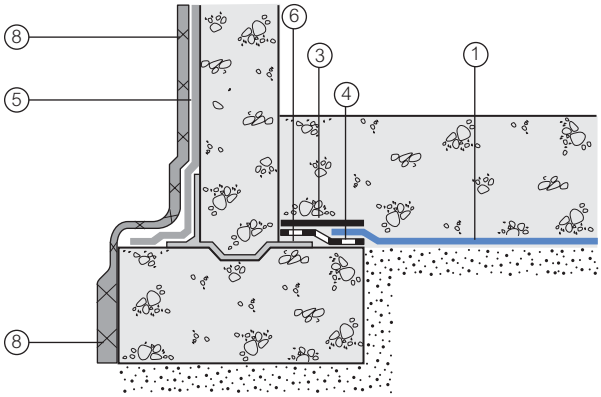
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



1 Preprufe 300R
2 Preprufe 160R
3 Preprufe Tape
4 Bituthene
5 Procor
6 Bituthene Liquid Membrane
7 Protection
8 Hydroduct®

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	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^2 (36 m^2)	460 ft^2 (42 m^2)	
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))			
Ancillary Products			
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) nominal	0.032 in. (0.8 mm) nominal	ASTM D3767
Low temperature flexibility	Unaffected at -10°F (-23°C)	Unaffected at -10°F (-23°C)	ASTM D1970
Resistance to hydrostatic head, minimum	231 ft (70 m)	231 ft (70 m)	ASTM D5385, modified[1]
Elongation, minimum	300%	300%	ASTM D412, modified[2]
Tensile strength, film, minimum	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -10°F (-23°C), 100 cycles	Unaffected	Unaffected	ASTM C836
Puncture resistance, minimum	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete, minimum	5.0 lbs/in. (880 N/m) width	5.0 lbs/in. (880 N/m) width	ASTM D903, modified[3]
Lap peel adhesion	2.5 lbs/in. (440 N/m) width	2.5 lbs/in. (440 N/m) width	ASTM D1876, modified[4]
Permeance to water vapor transmission, maximum	0.01 perms (0.6 ng/(Pa × s × m^2))	0.01 perms (0.6 ng/(Pa × s × m^2))	ASTM E96, method B
Water absorption, maximum	0.5%	0.5%	ASTM D570
Methane permeability	9.1 mls/m^2/day	N/A	University of London, QMW College[3]
Permeability[5] (hydraulic conductivity)	K=<1.4 x 10^{-11}cm.s^{-1}	K=<1.4 x 10^{-11}cm.s^{-1}	ASTM D5084-90

Footnotes:

1. Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 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.
2. Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
3. Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
4. The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute at 25°F (-4°C).
5. Result is lower limit of apparatus. Membrane therefore considered impermeable.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions.

Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

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We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.–Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

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APPENDIX 6

GENERIC PROCEDURES FOR MANAGEMENT OF UNDERGROUND STORAGE TANKS IDENTIFIED UNDER THE NYC BCP

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).

<u>Impacted Soil Excavation Methods</u>

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 indentified 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.