# 1665-1673 STILLWELL AVENUE

**BROOKLYN, NEW YORK 11223** 

# **Remedial Action Work Plan**

**NYSDEC BCP Number: C224307** 

# **Prepared for:**

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**OCTOBER 2024** 



# **CERTIFICATIONS**

I, Karen Tyll, P.E., certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.



NYS Professional Engineer # Date Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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# **LIST OF ACRONYMS**

Acronym	Definition		
AOC	Area of Concern		
CAMP	Community Air Monitoring Plan		
CEQR	City Environmental Quality Review		
CFR	Code of Federal Regulations		
CHASP	Construction Health and Safety Plan		
COC	Certificate of Completion		
CQAP	Construction Quality Assurance Plan		
ECs/ICs	Engineering Controls and Institutional Controls		
ELAP	Environmental Laboratory Accreditation Program		
HASP	Health and Safety Plan		
IRM	Interim Remedial Measure		
NYS DEC	New York State Department of Environmental Conservation		
NYCRR	New York Codes Rules and Regulations		
NYS DEC	New York State Department of Environmental Conservation		
NYS DEC DER	New York State Department of Environmental Conservation Division of		
N13 DEC DEN	Environmental Remediation		
NYS DOH	New York State Department of Health		
NYS DOT	New York State Department of Transportation		
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		
RAWP	Remedial Action Work Plan or Plan		
RCA	Recycled Concrete Aggregate		
RI	Remedial Investigation		
SCOs	Soil Cleanup Objectives		
SCG	Standards, Criteria and Guidance		
SMP	Site Management Plan		
SSDS	Sub-Slab Depressurization System		
SVE	Soil Vapor Extraction		
SVOC	Semi-Volatile Organic Compound		
TAL	Target Analyte List		
TCL	Target Compound List		
UST	Underground Storage Tank		
VOC	Volatile Organic Compound		

## **EXECUTIVE SUMMARY**

Tyll Engineering and Consulting, PC was retained by Mr. Sai Truong D.B.A. Refulgence LLC (the Participant) to prepare this Remedial Action Work Plan (RAWP) for the site located at 1665-1673 Stillwell Avenue, Brooklyn, New York (hereafter referred to as the Site). The Site was accepted into the New York State Brownfield Cleanup Program (BCP) and a Brownfield Cleanup Agreement (BCA) was executed with New York State Department of Environmental Conservation (NYSDEC) on June 14, 2021. 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 Site use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

This RAWP identifies and evaluates remedial action alternatives, including Track 1, Track 2, and Track 4 cleanups, their associated costs, and recommended and preferred remedy for this Site is a Track 2 cleanup. The remedy described in this document summarizes the nature and extent of contamination and provides sufficient information for establishment of remedial action objectives, evaluation of remedial action alternatives, and selection of a remedy that is protective of human health and the environment consistent with the use of the Site pursuant to RCNY§ 43-1407(f). This report is consistent with the procedures defined in the Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375-3.8 and the NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10), and complies with applicable federal, state and local laws, regulations and requirements.

## Site Description/Physical Setting/Site History

The Site is located at 1665 Stillwell Avenue in the Gravesend section of Brooklyn, NY. The Site consists of a rectangular-shaped lot identified as Block 6618; Lot 48 on the NYC Tax map and is located on the eastern side of Stillwell Avenue between Kings Highway to the north and Quentin Road to the south. The Site is enclosed by a one-story building (Brooklyn Public Library) and a two-story mixed-use building to the east, a one-story commercial building (garage) to the north, by a 2.5-story residential building to the south, and Stillwell Avenue to the west. The Site is

currently vacant, and was currently developed with a single-story concrete block building occupied by Ideal Cleaners. Access to the Site is via Stillwell Avenue to the west.

Information obtained from Fire Insurance maps during the performance of the Phase I ESA for the Site, indicated that the Site was developed prior to 1969 with a one-story building, with a parking area in the western portion of the lot. Past usage of the Site included a dairy, thrift shop and dry cleaners. Information obtained from City Directory for the Site listed previous occupant as Grandview Dairy from around year 1970 and 1973; 2) Stillwell Dairy in year 1976; 3) Wonder Hostess Thrift Shop around year 1985 and 1997; and then converted to a dry cleaner in 1999 (NYCDOB job number 300846155), and occupied by Ideal Cleaners from around 2000 through 2014. Information obtained from the NYCDOB records for the Site indicated usage of the Site was "ice cream dispensing stand" at 1671-1673 Stillwell Avenue in 1955 (Certificate of Occupancy # 142477, dated 01/19/1955), and "food store, with one loading/unloading berth and twelve accessory auto parking in open space" at 1665-1673 Stillwell Avenue, lots 48 and 50 (Certificate of Occupancy # 195912, dated 11/09/1966).

The site elevation is approximately 20-feet above sea level (USGS 7 1/2-Minute Coney Island, Brooklyn, NY Quadrangle, 2013) and the depth to groundwater on the Site was identified from approximately 16.68-feet to 17.5-feet below grade. Based on our interpretation of the physical setting sources, field data, and our experience, the Remedial Investigation inferred the groundwater flow direction in the vicinity of the Site is towards the southwest, in the direction of the Gravesend Bay. The Gravesend Bay is located approximately 1.05 miles from the Site. Surface water runoff on the Site flows to the surrounding streets that are connected to the City storm water sewer system. The topography in the vicinity of the Site is level with the ground surface covered by concrete and asphalt.

The Site was part of the Bensonhurst Rezoning dated 07/27/2005. The E-Designation for Hazardous Materials, (E-145) was placed on the Site by the New York City Department of City Planning (NYCDCP) under CEQR # 05DCP055K.

#### **Summary of the Remedial Investigation**

A Remedial Investigation (RI) was conducted by RSK Environmental Group (RSK) on May 5, 26-27, and 31, 2022. As part of the RI, RSK conducted a geophysical survey throughout the entire Site to determine the existence of any buried metallic anomalies and utilities and to clear the soil boring locations. RSK installed ten (10) soil borings across the entire Site and collected thirty (30) soil samples to evaluate soil quality. RSK installed six (6) permanent groundwater monitoring wells and collected six (6) groundwater samples. Four (4) soil vapor probes and one (1) outdoor air sample were installed.

The soil and groundwater samples were analyzed using Volatile Organic Compounds by EPA Method 8260, Semi-volatile Organic Compounds by EPA method 8270, Pesticides/PCBs by EPA Method 8081/8082, Target Analyte List metals by EPA Method 6010 and 7471 (All Groundwater samples were analyzed for both filtered (dissolved) and unfiltered (total) metals), and PFAS (NYSDC Analyte List) by LC-MS/MS via EPA 537.1 and 1,4-Dioxane via EPA Method 8270 SIM.

All five (5) air samples were submitted to a NYS ELAP Certified Laboratory for chemical analysis, TO-15.

The findings of the remedial investigation are summarized below based on the laboratory analytical data for soil, soil vapor, and groundwater collected from the Site:

<u>Geophysical Survey:</u> A metallic area was detected with the TW-6 in the northeastern corner of the Site. Approximate dimensions measure 8-feet by 8-feet. GPR transects over the area did not image any discernable features.

<u>Soil:</u> Laboratory analytical results of the soil samples collected did not depict any elevated VOCs, SVOCs, PCBs, or 1,4-Dioxane. However, the results identified an exceedance of 4,4'-DDT ranging from 6.3  $\mu$ g/kg to 8.7  $\mu$ g/kg in SB-6 and SB-10 above Unrestricted Use SCOs (UUSCOs).

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ug/kg)	Detections above Standards	Maximum Concentration (ug/kg)	Sample with max. concentration
4,4'-DDT	3.3/7,900/47,000/136,000	3/0/0/0	8.7	SB-10 (0'-2')

Analytical results of TAL Metals identified an exceedance above UUSCOs of Chromium ranging from 30.4 mg/kg to 40.7 mg/kg in SB-1 through SB-4; Copper at 51.9 mg/kg and 70.9 mg/kg in

SB-4 and SB-8, respectively; Lead ranging from 67.5 mg/kg to 309 mg/kg in SB-4 through SB-8 and SB-10; Mercury ranging from 0.27 mg/kg to 0.52 mg/kg in SB-4, SB-8, and SB-10; Nickel ranging from 30.9 mg/kg to 148 mg/kg in SB-1 through SB-10; and Zinc ranging from 109 mg/kg to 309 mg/kg in SB-5 through SB-8 and SB-10. Laboratory Analytical Results identified exceedance in Chromium above the PGW standards for all soil samples (ranging 19.2 ug/kg to 40.7 ug/kg), except in soil samples for deeper intervals in SB-5, SB-7 and SB-8.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (mg/kg)	Detections above Standards	Maximum Concentration (mg/kg)	Sample with max. concentration
Chromium	30/NS/NS/19	5/0/0/21	40.7	SB-4 (6'-8')
Copper	50/270/270/1,720	2/0/0/0	70.9	SB-8 (0'-2')
Lead	63/400/1,000/450	7/0/0/0	309	SB-5 (0'-2')
Mercury	0.18/0.81/2.8/0.73	3/0/0/0	0.52	SB-4 (0'-2')
Nickel	30/310/310/130	26/0/0/0	148	SB-1 (14'-16')
Zinc	109/10,000/10,000/2,480	6/0/0/0	309	SB-5 (0'-2')

Analytical results of Per- and Polyfluoroalkyl Substances (PFASs) identified an exceedance of PFOS at 1.84 ng/g in SB-2 above UUSCO and Protection of Groundwater (PGW) standards; and PFOA at 0.789 ng/g in SB-1 in UUSCOs, indicating the presence of emerging contaminants.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/g)	Detections above Standards	Maximum Concentration (ng/g)	Sample with max. concentration
PFOS	0.88/44/440/1.0	1/0/0/1	1.84	SB-2 (14'-16')
PFOA	0.66/33/500/0.8	1/0/0/0	0.789	SB-1 (0'-2')

<u>Groundwater:</u> Laboratory analytical results of the groundwater samples collected did not depict any exceedances of SVOCs, Pesticides, PCBs or 1,4-Dioxane. However, laboratory results identified a consistency of VOC exceedances: 2-Isopropyltoluene ranging from 7.3 ug/L to 8.6 ug/L in GW-1, GW-3, and GW-4; Benzene at 2.1 ug/L in GW-6; Isopropyl benzene ranging from 27 ug/L to 100 ug/L in GW-1, GW-3, GW-4, and GW-6; n-Butylbenzene ranging from 6.4 ug/L to 14 ug/L in GW-1, GW-3, and GW-4; n-Propyl benzene ranging from 26 ug/L to 140 ug/L in GW-1, GW-3, GW-4, and GW-6; and sec-Butylbenzene ranging from 11 ug/L to 17 ug/L in GW-1, GW-3, and GW-4.

Analyte	NYSDEC GQS (ug/L)	Detections above Standards	Maximum Concentration (ug/L)	Sample with max. concentration
2-Isopropyltoluene	5	3	8.6	SB-2/GW-1
Benzene	1	1	2.1	SB-6/GW-6
Isopropyl benzene	5	3	100	SB-3/GW-3
n-Butylbenzene	5	3	14	SB-4/GW-4
n-Propyl benzene	5	4	140	SB-3/GW-3
Sec-Butylbenzene	5	3	17	SB-2/GW-1

Several TAL Metals identified the following exceedances in the filtered samples: Iron ranging from 0.608 mg/L to 3.13 mg/L in GW-1, GW-3, GW-5, and GW-6; Magnesium at 40.8 mg/L in GW-1; Manganese ranging from 0.97 mg/L to 6.17 mg/L in all groundwater samples analyzed; and Sodium ranging from 57.6 mg/L to 394 mg/L in all groundwater samples analyzed.

Analyte	NYSDEC GQS (mg/L)	Detections above Standards	Maximum Concentration (mg/L)	Sample with max. concentration
Iron	0.5	4	3.13	SB-3/GW-3
Magnesium	35	1	40.8	SB-2/GW-1
Manganese	0.3	6	6.17	SB-3/GW-3
Sodium	20	6	292	SB-7/GW-2

Laboratory analytical results of PFAS identified the following exceedances: PFOS ranging from 10.4 ng/L to 130 ng/L in all groundwater samples collected and PFOA ranging from 14.6 ng/L to 222 ng/L in all groundwater samples analyzed. Both levels of PFOS and PFOA are substantially high in GW-6.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/L)	Detections above Standards	Maximum Concentration (ng/L)	Sample with max. concentration
PFOS	0.01	6	130	SB-6/GW-6
PFOA	0.01	6	222	SB-6/GW-6

<u>Soil Vapor:</u> Soil vapors associated with gasoline products (BTEX) and chlorinated VOCs were detected in all four soil vapor samples, excluding the outdoor air sample. The soil vapor samples were compared to the minimum Soil Vapor Concentrations as set forth in the NYSDOH October 2006 Guidance for Soil Vapor Intrusion in the NYS Decision Matrices for Sub-slab Vapor and Indoor Air and subsequent updates (2017). The total concentration of BTEX ranged from 644.3

ug/m³ to 5,364 ug/m³ in SV-1 through SV-4 and is at 6.37 ug/m³ in OA-1. Chlorinated VOCs 1,1,1-Trichloroethane, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, Methylene Chloride, and Vinyl Chloride were not detected. However, the total concentration of the chlorinated VOCs ranged from 1.34 ug/m³ to 949.3 ug/m³. Tetrachloroethene (PCE) significantly exceeded the NYSDOH matrices standards at concentration 915 ug/m³ in SV-1; Trichloroethene (TCE) was detected exceeding the NYSDOH matrices standards at concentration ranging from 3.54 ug/m³ to 17.7 ug/m³ in in all vapor samples except for SV-3; whereas, Carbon tetrachloride was detected at 0.51 ug/m³ in SV-3 and 0.47 ug/m³ in OA-1.

Additional compounds were detected: 1,2,4-Trimethylbenzene at concentration ranging from 79.6 ug/m³ to 614 ug/m³ in SV-1 through SV-4 and at 1.21 ug/m³ in OA-1; 1,3,5-Trimethylbenzene ranging from 18.2 ug/m³ to 136 ug/m³ in SV-1 through SV-4; Chloroform at 16.6 ug/m³ in SV-1; Chloromethane at 1.34 ug/m³ in SV-3 and 1.17 ug/m³ in OA-1; Hexane ranging from 112 ug/m³ to 1,100 ug/m³ in SV-1 through SV-4 and 2.09 ug/m³ in OA-1; and Styrene ranging from 1.82 ug/m³ to 19.5 ug/m³ in SV-1 through SV-4.

Analyte	NYSDOH Decision Matrices Min. Concentrations (ug/m³)	Detections above Standards	Maximum Concentration (ug/m³)	Sample with max. concentration
Tetrachloroethylene	100	2	915	SV-1
Trichloroethene	6	3	17.7	SV-1

According to the United States Geological Service (USGS), the glacial geology at the Site and in the immediate vicinity consists of Ordovician-Cambrian/Precambrian age Manhasset Formation, i.e., thin outwash from ice along Harbor Hill moraine, forming sandy plains. The Site is generally flat, with an average elevation of approximately 20-feet above mean sea level. According to the United States Department of Agriculture (USDA) the Site is underlain with urban land, outwash substratum consisting of cemented material up to 20-inches and deep gravelly coarse-loamy sand, with 0 to 3% slopes. Currently, the ground surface is covered by asphalt. According to previous environmental investigations performed by American Environmental Assessment & Solutions, Inc. (AEAS) during 2019, stratigraphy consists of historic fill material from surface to approximately 2-feet below grade underlain by clayey soil to a depth of 12-feet across the Site. Based on the remedial investigation (RI) activities completed on the Site by RSK, soil encountered consisted of brown to dark brown, fine grained-silty to clayey soil, with gravels and rocks.

#### **Qualitative Human Health Exposure Assessment**

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

Data and information reported in the RIR are sufficient to complete a QHHEA for this project. As part of the BCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10. A more descriptive outlook on the QHHEA is included in the *Section 4.5* of this report which explains the contaminant sources, release and transport, the points of exposure and receptor population, along with methods of mitigation to avoid human and environment exposure.

Environmental Media & Exposure Route	Human Exposure Assessment
Direct contact with surface soils (and incidental	People can come into contact if they trespass on
ingestion)	the Site.
Direct contact with subsurface soils (and incidental	People can come into contact if they complete
ingestion)	ground-intrusive work at the Site.
	Contaminated groundwater is not being used for
Ingestion of groundwater	drinking water, as the area is served by the public
	water supply.
	People may come into contact if they complete
Direct contact with groundwater	ground-intrusive work in the event groundwater is
	encountered.
Inhalation of air (exposures related to soil vapor	A monitoring program is being implemented to
intrusion)	verify if additional actions will be needed to address
inti distori)	exposures to soil vapor intrusion.
Direct contact and incidental ingestion of Surface	No sources of surface water were noted on-Site or
water	in the vicinity.

#### **Summary of the Remedy**

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

- Performance of a Special Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities;
- 2. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
- Utilizing Waste Characterization Study for soils generated during site redevelopment excavation activities for disposal purposes. The waste characterization soil samples were collected at a frequency dictated by the disposal facility;
- 4. Excavation of soil/fill exceeding RRSCOs and protection to groundwater (PGW) standards listed in **Table 2.** For remediation purposes, the top 4-feet of Sitewide soil/fill will be excavated to meet the Restricted Residential SCOs. Approximately 1,185-cubic yards (1,778 tons) of soil/fill will be generated during remediation excavation;
- 5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
- Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials;
- 7. Removal of all UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure

- of these petroleum spills in compliance with applicable local, State and Federal laws and regulations;
- 8. Collection and analysis of eight (8) confirmation samples at the remedial excavation depths will be used to verify that the SCOs for the site have been achieved. If confirmation sampling indicates that SCOs were not achieved at the stated remedial depth, the Applicant must notify DEC, submit the sample results and, in consultation with DEC, determine if further remedial excavation is necessary. Further excavation for development will proceed after confirmation samples demonstrate that SCOs for the site have been achieved;
- 9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
- 10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits, and (2) all Federal, State and local rules and regulations for handling and transport of material;
- 11. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
- 12. Construction and maintenance of a site cover to prevent human exposure to residual contaminated soil/fill remaining under the Site consisting of:
  - a. 4-inch-thick concrete building cellar slab under building footprint. A 6-inch layer of ¾-inch crushed blue stone will be installed below the full concrete building slab, and
  - b. 4-inch-thick concrete slab underlain by a 6 layer of ¾-inch crushed blue stone under the rear parking lot and driveway areas;
- 13. Installation of an active sub-slab depressurization system (SSDS) consisting of a single loop of horizontal pipe set in the middle of a 12-inch-deep gas permeable layer immediately beneath the building cellar slab and vapor barrier system. The SSDS gas permeable layer will consist of a 6-inch layer of ¾-inch crushed blue stone placed directly beneath the

building cellar slab. The SSDS piping will be installed within a trench an additional 6 inches below the permeable layer. The horizontal piping will consist of looped 4-inch slotted HDPE corrugated pipe which will be fabric wrapped and connected to a 6-inch cast iron solid riser pipe that will penetrate the foundation wall and travel along the building rear exterior wall to the roof. The riser pipe will be fitted with an inline vacuum fan (Radonaway RP265 or equal) on the roof and finished a minimum of 3-feet above the top of the parapet wall and finished with a 6-inch goose neck pipe to prevent rain infiltration. The fan is required to be at least 10 feet from any HVAC air intake and nearby windows. The Active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the entire building slab to prevent vapor migration into the building;

14. Installation of an active Soil Vapor Extraction (SVE) system within a vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs found in exceedance in that area. The system will be constructed with a fabric wrapped; 4-inch slotted (0.050" slot size) PVC SVE well installed vertically at a termination depth of 12-feet bgs with a porous annulus not to exceed 8inches diameter. The SVE annulus will be filled with ¾-inch crushed blue stone to surround the slotted piping and will be connected to a horizontal 4-inch solid PVC pipe which will run beneath site grade and perpendicular toward the rear of the building's most northeastern section and travel along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SVE is Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE was designed and properly installed to establish a vacuum in the vapor hotspot area;

- 15. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;
- 16. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations; and
- 17. Submission of a FER that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the NYSDEC-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

### REMEDIAL ACTION WORK PLAN

#### 1.0 INTRODUCTION

Refulgence LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in June 2021, to investigate and remediate a 0.184-acre property located at 1665-1673 Stillwell Avenue in the Bensonhurst neighborhood of Brooklyn, New York. Refulgence LLC is a Volunteer in the Brownfield Cleanup Program. Mixed residential and commercial usage is proposed for the property. When completed, the Site will contain a mixed-use five-story building with a commercial space in the cellar and 1<sup>st</sup> floor, and sixteen (16) residential units 2<sup>nd</sup> floor through 5<sup>th</sup> floor. Refer to the Brownfield Cleanup Program (BCP) application for additional details.

This Remedial Action Work Plan (RAWP) summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed between June 2019 and May 2022. It provides an evaluation of a Track 1 cleanup and other applicable Remedial Action alternatives, their associated costs, and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10, DER-31, and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements. The NYSDEC and New York State Department of Health (NYSDOH) have determined that this Site does not pose a significant threat to human health and the environment. The RI for this Site did not identify fish and wildlife resources.

#### 1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 1665 Stillwell Avenue in the Gravesend section of Brooklyn, NY, and is identified as Block 6618; Lot 48 on the NYC Tax Map. The Site consists of a rectangular parcel, approximately 8,000-sq. ft. (0.184-acre) in size, and is bounded by Stillwell Avenue to the west, Kings Highway to the north, Quentin Road to the south, and West 13th Street to the east. A copy of the Site Location Map is provided as **Figure 1**. A site boundary map is attached to the RAWP as **Figure 2**.

#### 1.2 CONTEMPLATED REDEVELOPMENT PLAN

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use is described here to provide the basis for this assessment. However, the Remedial Action contemplated under this RAWP may be implemented independent of the proposed redevelopment plan.

The proposed future use of the Site will consist of a new five-story (15,912.60-sq.ft.) mixed-use building with a commercial space in the cellar and 1<sup>st</sup> floor, and sixteen (16) residential units 2<sup>nd</sup> floor through 5<sup>th</sup> floor. The proposed FAR for the commercial use is 0.428 and for residential use it is 1.561 with a maximum building height of 59-feet 8-inches. The layout will consist of front yard/setback, a 38-feet paved rear yard to be utilized for off-street parking and a 14-feet 10-inch side yard to be utilized as a paved driveway. The proposed cellar depth (top of slab) for the new building will be 10-feet-4 inches below ground surface (bgs). The proposed elevator shaft will be 17.0-feet bgs. No uncapped or landscaped areas are proposed as part of this redevelopment.

The proposed cellar will have a 3,057-sq.ft. commercial space and the remainder will be utilized for bicycle parking, multiple mechanical/utility rooms, the elevator and stairs, refuse room, and two (2) restrooms. The proposed 1<sup>st</sup> floor will have a 3,499-sq. ft. commercial space, the residential lobby, a mechanical room, the elevator and stairs, and two (2) restrooms. Each residential floor above (2<sup>nd</sup> through 5<sup>th</sup> floors) will each contain four (4) 2-bedroom, residential units, elevator, stairs, and refuse room. Two (2) terraces are proposed for the residential units on the 5<sup>th</sup> floor. The proposed building will be serviced by an elevator on all floors. The roof bulkhead will consist of a 616.5-sq. ft. rooftop recreation space, elevator control room and will house the hot water heaters, boilers, and associated exhaust vents/stacks. A copy of the Site Redevelopment Plans is provided as **Appendix A**.

#### 1.3 DESCRIPTION OF SURROUNDING PROPERTY

The current uses of the surrounding properties are commercial, institutional, and residential purposes. Brooklyn Public Library, (K-12), and Happy Club Children's Centre (Day-care) were

identified within a 250-ft. radius of the Site. PS/IS 686 Brooklyn Middle School, Gold Material Montessori School, Garden of Eden Home for Adults (Assisted living facility) and Little Scholars Day Care Centre were identified within a 500-ft. radius of the Site. No hospital was identified within a 500-ft. radius of the Site.

DIRECTION	ADJOINING USE(S)	VICINITY USE(S)
North	Residential, commercial, and Institutional properties  • Along Kings Highway	Mixed-Use
South	Residential properties  • Along Quentin Road	Residential-Use
East	Institutional and commercial properties  • Along W 13 <sup>th</sup> Street	Mixed-Use
West	Residential properties  • Along Stillwell Avenue	Residential-Use

A copy of the surrounding land use map is provided as **Figure 3**.

#### 2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The Site was investigated in accordance with the scope of work presented in the NYSDEC-approved Remedial Investigation (RI) Work Plan dated November 2021. RSK Environmental Group (RSK) performed the scope of work on May 5, 26-27, and 31, 2022. The RI was submitted to NYSDEC on October 2022 and approved by NYSDEC on [insert date].

#### 2.1 SUMMARY REMEDIAL INVESTIGATIONS PERFORMED

#### 2.1.1 Borings and Wells

On May 26, 2022, RSK mobilized on-Site with the necessary drilling equipment to advance the ten (10) soil borings. The soil borings were advanced with a direct-push, Track-mounted Geoprobe Models 54LT and 6610DT drill rigs. The borings were installed throughout the Site for a full coverage and investigate the subsurface condition beneath the Site.

On May 26, 2022, RSK subcontracted with Coastal Environmental Solutions to provide and operate drilling equipment to install the six (6) permanent 2-inch diameter PVC groundwater wells on Site. An RSK representative was onsite to oversee the drilling activities. The monitoring wells were installed using direct push drilling methods.

Soil vapor and outdoor air sampling was conducted at the Site on May 31, 2022. Per approved RIWP, four (4) soil vapor samples (SV-1 through SV-4), from a depth of 10-feet bgs, and one (1) outdoor air sample (OA-1) were collected at the Site.

#### 2.1.2 Samples Collected

**SOIL:** At each boring locations, two (2) samples were collected at depth intervals 0-2 feet shallow, and 6-8 feet, and a third sample was collected within two feet of the groundwater interface at approximately 14-16 feet. Duplicate soil samples were collected from soil boring locations SB-2 (14'-16') and SB-6 (14'-16').

**GROUNDWATER:** The six (6) groundwater monitoring wells were gauged, and the depth from the benchmark ranged from 16.68-feet to 17.50-feet. Groundwater flow was determined to be

to the southwest. A duplicate groundwater sample was collected from monitoring well SB-4/GW-4.

**SOIL VAPOR:** The four (4) soil vapor samples and one (1) outdoor ambient air sample were collected using 6-liter, stainless-steel, cylindrical SUMMA canisters equipped with 8-hour flow controllers. The sampling canisters were provided by Phoenix Environmental Laboratories (PEL), of Manchester, CT.

#### 2.1.3 Chemical Analytical Work Performed

Soil, groundwater, and soil vapor samples were submitted to Phoenix Environmental Laboratories, a NYSDOH Environmental Laboratory Accreditation Program (ELAP No. 11301)-certified laboratory, in Manchester, CT, for full analysis.

#### Soil and groundwater samples were analyzed using:

- Volatile Organic Compounds by EPA Method 8260;
- Semi-volatile Organic Compounds by EPA method 8270;
- Pesticides/PCBs by EPA Method 8081/8082;
- Target Analyte List metals by EPA Method 6010 and 7471 (All Groundwater samples were analyzed for both filtered (dissolved) and unfiltered (total) metals); and
- PFAS (NYSDC Analyte List) by LC-MS/MS via EPA 537.1 and 1,4-Dioxane via EPA Method 8270 SIM.

#### Soil Vapor samples were analyzed using:

Volatile Organic Compounds by USEPA Method TO-15.

All holding times were met. The laboratory did not report any irregularities with respect to their internal Quality Assurance / Quality Control.

#### 2.1.4 Summary of RI Findings

Below is a summary of RI findings:

<u>Geophysical Survey:</u> A metallic area was detected in the northeastern corner of the Site. Approximate dimensions measure 8-feet by 8-feet. GPR transects over the area did not image any discernable features.

**Soil:** Laboratory analytical results of the soil samples collected did not depict any elevated VOCs, SVOCs, PCBs, or 1,4-Dioxane. However, the results identified an exceedance of 4,4'-DDT ranging from 6.3  $\mu$ g/kg to 8.7  $\mu$ g/kg in SB-6 and SB-10 above the UUSCOs.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ug/kg)	Detections above Standards	Maximum Concentration (ug/kg)	Sample with max. concentration
4,4'-DDT	3.3/7,900/47,000/136,000	3/0/0/0	8.7	SB-10 (0'-2')

Analytical results of TAL Metals identified an exceedance above UUSCOs of Chromium (30 mg/kg) ranging from 30.4 mg/kg to 40.7 mg/kg in SB-1 through SB-4; Copper (50 mg/kg) at 51.9 mg/kg and 70.9 mg/kg in SB-4 and SB-8, respectively; Lead (63 mg/kg) ranging from 67.5 mg/kg to 309 mg/kg in SB-4 through SB-8 and SB-10; Mercury (0.18 mg/kg) ranging from 0.27 mg/kg to 0.52 mg/kg in SB-4, SB-8, and SB-10; Nickel (30 mg/kg) ranging from 30.9 mg/kg to 148 mg/kg in SB-1 through SB-10; and Zinc (109 mg/kg) ranging from 109 mg/kg to 309 mg/kg in SB-5 through SB-8 and SB-10. Laboratory Analytical Results identified an exceedance in Chromium above the Protection of Groundwater (PGW) standards for all soil samples (ranging 19.2 ug/kg to 40.7 ug/kg), except in soil samples for deeper intervals in SB-5, SB-7 and SB-8.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (mg/kg)	Detections above Standards	Maximum Concentration (mg/kg)	Sample with max. concentration
Chromium	30/NS/NS/19	5/0/0/21	40.7	SB-4 (6'-8')
Copper	50/270/270/1,720	2/0/0/0	70.9	SB-8 (0'-2')
Lead	63/400/1,000/450	7/0/0/0	309	SB-5 (0'-2')
Mercury	0.18/0.81/2.8/0.73	3/0/0/0	0.52	SB-4 (0'-2')
Nickel	30/310/310/130	26/0/0/0	148	SB-1 (14'-16')
Zinc	109/10,000/10,000/2,480	6/0/0/0	309	SB-5 (0'-2')

Analytical results of PFAS identified an exceedance of PFOS at 1.84 ng/g in SB-2 above UUSCO and PGW standards; and PFOA at 0.789 ng/g in SB-1 in UUSCOs, indicating the presence of emerging contaminants.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/g)	Detections above Standards	Maximum Concentration (ng/g)	Sample with max. concentration
PFOS	0.88/44/440/1.0	1/0/0/1	1.84	SB-2 (14'-16')
PFOA	0.66/33/500/0.8	1/0/0/0	0.789	SB-1 (0'-2')

<u>Groundwater:</u> Laboratory analytical results of the groundwater samples collected did not depict any exceedances of SVOCs, Pesticides, PCBs or 1,4-Dioxane. However, laboratory results identified VOC exceedances: 2-Isopropyltoluene ranging from 7.3 ug/L to 8.6 ug/L in GW-1, GW-3, and GW-4; Benzene at 2.1 ug/L in GW-6; Isopropyl benzene ranging from 27 ug/L to 100 ug/L in GW-1, GW-3, GW-4, and GW-6; n-Butylbenzene ranging from 6.4 ug/L to 14 ug/L in GW-1, GW-3, and GW-4; n-Propyl benzene ranging from 26 ug/L to 140 ug/L in GW-1, GW-3, GW-4, and GW-6; and sec-Butylbenzene ranging from 11 ug/L to 17 ug/L in GW-1, GW-3, and GW-4.

Analyte	NYSDEC GQS (ug/L)	Detections above Standards	Maximum Concentration (ug/L)	Sample with max. concentration
2-Isopropyltoluene	5	3	8.6	SB-2/GW-1
Benzene	1	1	2.1	SB-6/GW-6
Isopropyl benzene	5	3	100	SB-3/GW-3
n-Butylbenzene	5	3	14	SB-4/GW-4
n-Propyl benzene	5	4	140	SB-3/GW-3
Sec-Butylbenzene	5	3	17	SB-2/GW-1

Several TAL Metals identified the following exceedances in the filtered samples: Iron ranging from 0.608 mg/L to 3.13 mg/L in GW-1, GW-3, GW-5, and GW-6; Magnesium at 40.8 mg/L in GW-1; Manganese ranging from 0.97 mg/L to 6.17 mg/L in all groundwater samples analyzed; and Sodium ranging from 57.6 mg/L to 394 mg/L in all groundwater samples analyzed.

Analyte	NYSDEC GQS (mg/L)	Detections above Standards	Maximum Concentration (mg/L)	Sample with max. concentration
Iron	0.5	4	3.13	SB-3/GW-3
Magnesium	35	1	40.8	SB-2/GW-1
Manganese	0.3	6	6.17	SB-3/GW-3
Sodium	20	6	292	SB-7/GW-2

Laboratory analytical results of PFAS identified the following exceedances: PFOS ranging from 10.4 ng/L to 130 ng/L in all groundwater samples collected and PFOA ranging from 14.6 ng/L to 222 ng/L in all groundwater samples analyzed. Both levels of PFOS and PFOA are substantially high in GW-6.

Analyte	NYSDEC UUSCO/RRSCO/CSCO/PGW (ng/L)	Detections above Standards	Maximum Concentration (ng/L)	Sample with max. concentration
PFOS	0.01	6	130	SB-6/GW-6
PFOA	0.01	6	222	SB-6/GW-6

<u>Soil Vapor:</u> Soil vapors associated with gasoline products (BTEX) and chlorinated VOCs were detected in all four soil vapor samples, excluding the outdoor air sample. The soil vapor samples were compared to the minimum Soil Vapor Concentrations as set forth in the NYSDOH October 2006 Guidance for Soil Vapor Intrusion in the NYS Decision Matrices for Sub-slab Vapor and Indoor Air and subsequent updates (2017). The total concentration of BTEX ranged from 644.3 ug/m³ to 5,364 ug/m³ in SV-1 through SV-4 and is at 6.37 ug/m³ in OA-1. Chlorinated VOCs 1,1,1-Trichloroethane, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, Methylene Chloride, and Vinyl Chloride were not detected. However, the total concentration of the chlorinated VOCs ranged from 1.34 ug/m³ to 949.3 ug/m³. Tetrachloroethene (PCE) significantly exceeded the NYSDOH matrices standards at concentration 915 ug/m³ in SV-1; Trichloroethene (TCE) was detected exceeding the NYSDOH matrices standards at concentration ranging from 3.54 ug/m³ to 17.7 ug/m³ in in all vapor samples except for SV-3; whereas, Carbon tetrachloride was detected at 0.51 ug/m³ in SV-3 and 0.47 ug/m³ in OA-1.

Additional compounds were detected: 1,2,4-Trimethylbenzene at concentration ranging from 79.6 ug/m³ to 614 ug/m³ in SV-1 through SV-4 and at 1.21 ug/m³ in OA-1; 1,3,5-Trimethylbenzene ranging from 18.2 ug/m³ to 136 ug/m³ in SV-1 through SV-4; Chloroform at 16.6 ug/m³ in SV-1; Chloromethane at 1.34 ug/m³ in SV-3 and 1.17 ug/m³ in OA-1; Hexane ranging from 112 ug/m³ to 1,100 ug/m³ in SV-1 through SV-4 and 2.09 ug/m³ in OA-1; and Styrene ranging from 1.82 ug/m³ to 19.5 ug/m³ in SV-1 through SV-4.

Analyte	NYSDOH Decision Matrices Min. Concentrations (ug/m³)	Detections above Standards	Maximum Concentration (ug/m³)	Sample with max. concentration
Tetrachloroethylene	100	2	915	SV-1
Trichloroethene	6	3	17.7	SV-1

#### 2.2 SIGNIFICANT THREAT

The NYSDEC and NYSDOH have determined that this Site does not pose a significant threat to human health and the environment. Notice of that determination has been provided for public review. A copy of the notice will be included in **Appendix H** once available.

#### **2.3 SITE HISTORY**

#### 2.3.1 Past Uses and Ownership

Based upon review of available historical information, the Site was vacant land prior to 1950, then developed sometime between 1950 and 1969, with a one-story building located in the eastern portion of the lot. Usage of the Site included a dairy, thrift shop and dry cleaners. The following occupants were identified at the Site:

- Grandview Dairy from around year 1970 and 1973;
- Stillwell Dairy in year 1976;
- Wonder Hostess Thrift Shop around year 1985 and 1997; and
- Ideal Cleaners from around 2000 through 2014.

NYCDOB job number 300846155 indicated that the Site was converted to a dry cleaner in 1999. Information obtained from the NYCDOB records for the Site indicated usage of the Site was "ice cream dispensing stand" at 1671-1673 Stillwell Avenue in 1955 (Certificate of Occupancy # 142477, dated 01/19/1955), and "food store, with one loading/unloading berth and twelve accessory auto parking in open space" at 1665-1673 Stillwell Avenue, lots 48 and 50 (Certificate of Occupancy # 195912, dated 11/09/1966).

#### 2.3.2 Phase I and Phase II Reports

A Phase-II Environmental Subsurface Investigation was conducted by American Environmental Assessment & Solutions, Inc. (AEAS) on June 19 and 24, 2019, to characterize the subsurface soil and groundwater quality to comply with the E-Designation requirements set forth by New York City Department of City Planning (NYCDCP) for the Site. As part of the Phase-II, a total of seven

(7) soil borings, three (3) temporary monitoring wells, and six (6) soil vapor probes were collected for laboratory analysis. The scope of work also included a geophysical survey of the Site.

No anomalies indicative of tanks, drums, or buried objects were identified during the geophysical survey at the Site. No VOCs, SVOCs, Pesticides, or Polychlorinated Biphenyls (PCBs) were detected exceeding their respective Restricted Use SCOs Part 375-6.8(b) Residential in any of the soil samples obtained. Tetrachloroethene (PCE) was identified in four (4) of the soil borings (detected at a max. of 580 µg/kg), but well below UUSCOs. Target Analyte List (TAL) Metals were identified exceeding UUSCOs in all soil borings, including Chromium, Copper, Lead, Nickel, Mercury, and Zinc. The compound 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFASs) were not detected in the soil samples.

Groundwater analysis identified four (4) VOCs and five (5) SVOCs exceeding their respective NYSDEC Groundwater Quality Standards (GQS). The compound 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFASs) were not detected in the groundwater samples. Soil vapor analytical results identified VOCs exceeding New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion, including petroleum-related VOCs (BTEX) and chlorinated VOCs PCE and TCE.

#### 2.3.3 Sanborn Maps

All Sanborn Maps available for this Site were reviewed prior to preparation of the RAWP. Sanborn maps were obtained from EDR for completion of the Phase I ESA for the Site. The Sanborn maps are presented in **Appendix B**. A summary of the review of the Sanborn maps is presented below:

Year(s)	Interpreted Property Use
1906, 1930, 1950	Vacant land.
1969, 1977, 1979, 1980, 1981, 1983, 1986, 1987	The Site was developed with a one-story building located in the eastern portion of the lot. Usage of the building was not noted; however, the western portion of the Site was noted as "parking". No changes were identified on the subsequent maps through 1989.

Year(s)	Interpreted Property Use
1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 2001, 2002, 2003, 2004, 2005, 2006, 2007	1 story building with parking area to the west. Usage noted as "commercial". No changes were identified on the subsequent Fire Insurance maps through 2007.
1895, 1929, 1968, 1976, 1991	No coverage

#### 2.4 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

#### Soil / Fill material

The stratigraphy of the site, from the surface down, consists of approximately two (2) feet of historic fill material, underlain by clayey soil to a depth of twelve (12) feet across the subsurface of the property.

Soil / fill material encountered during the RI consists of brown, fine-grained silty to clayey soil, containing rocks.

## **Hydrogeology**

Groundwater level measurements were collected during gauging events at the Site on June 24<sup>th</sup>, 2019 by a previous consultant. Groundwater was encountered in the monitoring wells at depths ranging from 16.89-feet to 17.25-feet below grade. Site-specific groundwater flow has been determined to be towards the southwest, in the direction of the Gravesend Bay. The Gravesend Bay is located approximately 1.05-miles from the Site. Surface water runoff on the Site flows to the surrounding Streets that are connected to the City storm water sewer system. The elevation of the Site is approximately 20-feet above sea level (USGS 7 1/2-Minute Coney Island, Brooklyn, NY Quadrangle, 2013). The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 3604970351F (effective September 2007) for the Site area was reviewed to assess whether the Site is located within a designated flood plain or flood zone. The FIRM indicated that the Site is located within flood Zone X. Areas within flood Zone X identified as Other Areas on the map (i.e., no hatch pattern) are determined to be outside the 0.2% annual chance or 500-year floodplain.

#### 2.5 CONTAMINATION CONDITIONS

This section of the RAWP describes the Areas of Concern (AOCs) identified and the detected contaminants in soil, groundwater and soil vapor based upon the RI data:

#### 2.5.1 Conceptual Model of Site Contamination

A conceptual Site model (CSM) was developed based on the findings of the RI to produce a simplified framework for understanding the distribution of impacted materials, potential migration pathways, and potentially complete exposure pathways. Consistent with NYSDEC RAWP guidance, the on-Site and Off-Site components are discussed independently with the interaction between the two noted where technically appropriate to complete the overall CSM

#### On-Site

Per the Phase-II ESI conducted by AEAS in July 2019, no VOCs, SVOCs, pesticides, PCBs, 1,4-Dioxane and PFAS were detected in soil samples. Several metals, below RRSCOs, were detected. However, in groundwater, petroleum-related four (4) VOCs and five (5) SVOCs were detected above GQS. No PCBs, pesticides, TAL metals or PFAS were detected above GQS were detected. Soil vapor samples showed significant exceeding concentrations of BTEX-related CVOCs contaminants.

A similar array of contaminants resulted from the RI activities conducted on-Site by RSK in May 2022. The primary COCs are petroleum-related (BTEX), VOCs, SVOCs, and heavy metals in the groundwater samples and petroleum-related VOCs and CVOCs in the soil vapors. The Contaminants identified had significant concentrations above the UUSCOs and PGW (Chromium in soil) Site-wide. PCE and TCE were found to be the primary Contaminant of Concern in soil vapor at the Site. The highest levels of PCE and TCE were identified in the northeastern corner of the Site at a depth of 10-feet below grade. The likely source of the PCE and TCE was the operations of a former dry cleaner tenant at the Site. The former dry cleaner tenant began operations in 1999/2000 and was reported to cease operations in 2014. Dry cleaning operations were halted shortly after transfer of ownership of the Site in 2014.

Based upon the historical usage of the Site as a dry cleaner and the concentrations of PCE and TCE identified in the soil vapor, it is likely that dry cleaning solvents historically spilled and entered the subsurface through the pavement in the northeastern portion of the Site. PCE and TCE were not identified in the groundwater during the RI. Groundwater was encountered in the monitoring wells at depths ranging from 16.68-feet to 17.50-feet below grade. Site-specific groundwater flow has been determined to be towards the southwest, in the direction of the Gravesend Bay.

#### Off-Site

PCE and TCE contaminants were not identified in the groundwater up-gradient or downgradient beneath the Site. Soil vapor generally migrates with groundwater contamination. Based upon the RI data, the soil vapor contaminants appear to be migrating horizontally between subsurface sediments.

The petroleum-related compounds are attributed to the spill site located at 125 Kings Highway, approximately 150-feet north of the Site at a higher gradient. 125 Kings Highway was historically utilized as a gasoline/service station with four (4) on-site 4,000-gallon gasoline USTs (PBS ID 2-151378). The tanks were closed and removed on March 13, 19, and 20, 2019 (NYCDOB Job # 321905042, December 12, 2018), and the spill was recorded on March 15, 2019 (Spill # 1812287); consequent to the leaking USTs. Based on the OER documents research (OER Site # 21EHAZ037K), remediation and construction were completed and the database was last updated on July 1, 2022. The soil samples indicated no exceedances in VOCs, and PCBs, however, one (1) SVOC, five (5) metals and two (2) PFAS compounds were detected. Groundwater samples indicated significant exceedances in petroleum-related compounds (BTEX) VOCs and SVOCs, two (2) metals and several PFAS compounds. Soil vapor samples indicated elevated levels of petroleum-related VOCs (ranging from 33.2 ug/m³ to 8,970 ug/m³), and CVOCs (ranging from 13.3 ug/m³ (TCE) to 668 ug/m³ (PCE)).

Another spill site located at 137 Kings Highway (east adjacent to 125 Kings Highway) was registered with the NYSDEC Spill database for a #2 fuel oil spill in June 15, 1998 (Spill #9803303), and closed on November 10, 1998. A 275-gallon waste/used oil AST is also currently registered with the PBS unit as ID 2-603523. Per the NYCDOB search, the site was historically utilized as a

parking lot with an office building circa 1959 (CO # 167139), a repair/lubrication shop for vehicles "no body work", with a loading dock and a fuel oil approval # 8491 dated 12/12/1963, circa 1964 (CO # 186981), a repair/lubrication shop for vehicles "no body work", and a loading dock circa 1983 (CO #221076), and a chemical manufacturer circa 1919 (CO # 120). Contaminants were not identified in the groundwater downgradient at the Site.

### 2.5.2 Description of Areas of Concern

The areas of concern on-Site are the soil vapor impacts identified at the Site. The specific area of concern is the northeastern portion of the Site, shed area, where the dry-cleaning solvents were reported to have been stored and where the soil vapor impacts were identified at the highest levels. There are no known USTs associated with the Site. There are no known additional sources of contamination other than low-levels of up-gradient groundwater impacts.

#### 2.5.3 Identification of Standards, Criteria and Guidance

The following standards and criteria typically were applied to the Remedial Investigation, and will apply to remedy selection, UST closures, and site management activities:

- DER-10 Technical Guidance for Site Investigation and Remediation
- DER-13 Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York
- DER-23 Citizen Participation Handbook for Remedial Programs (March, 2010)
- TOGS 1.1.1 Ambient Water Quality Standards & Guidance Values and Groundwater
   Effluent Limitations
- 6 NYCRR Part 613 Petroleum Bulk Storage
- 6 NYCRR Part 371 Identification and Listing of Hazardous Wastes
- 6 NYCRR Subpart 374-2 Standards for the Management of Used Oil
- 40 CFR Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- CP-51- Soil Cleanup Guidance (2010)
- Spill Response Guidance Manual (1995)
- Permanent Closure of Petroleum Storage Tanks (2003)

- DAR-1 (formerly Air Guide 1) (1997) Guidelines for the Control of Toxic Ambient Air Contaminants
- 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 Underground Injection Control Program
- 10 NYCRR Part 67 Lead Poisoning Prevention and Control
- 12 NYCRR Part 56 Industrial Code Rule 56 (Asbestos)
- 6 NYCRR Part 175 Special Licenses and Permits--Definitions and Uniform Procedures
- 6 NYCRR Part 372 Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 374-1 Standards for the Management of Specific Hazardous
   Wastes and Specific Types of Hazardous Waste Management Facilities
- 6 NYCRR Subpart 374-3 Standards for Universal Waste
- 6 NYCRR Part 375 Environmental Remediation Programs
- 6 NYCRR Part 608 Use and Protection of Waters
- 6 NYCRR Parts 700-706 Classifications and Standards of Quality and Purity
- DER-2 Making Changes To Selected Remedies (Revised April, 2008)
- STARS #1 Petroleum-Contaminated Soil Guidance Policy (1992) (Sections III and IV have been replaced CP-51)
- STARS #2 Bio cell and Bio pile Designs for Small-Scale Petroleum-Contaminated Soil
   Projects
- TAGM 3028 "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.3.8 New Discharges to Publicly Owned Treatment Works
- TOGS 2.1.2 Underground Injection/Recirculation (UIR) at Groundwater Remediation
   Sites
- U.S. EPA OSWER Directive 9200.4-17 Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)

 NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies -Activated Carbon Treatment Systems".

#### 2.5.4 Soil/Fill Contamination

#### 2.5.4.1 Summary of Soil/Fill Data

- Laboratory analytical results of the soil samples collected did not depict any elevated VOCs, SVOCs, PCBs, or 1,4-Dioxane. However, the results identified an exceedance of 4,4′-DDT ranging from 6.3 μg/kg to 8.7 μg/kg in SB-6 and SB-10 above UUSCOs. Analytical results of TAL Metals identified an exceedance above UUSCOs of Chromium ranging from 30.4 mg/kg to 40.7 mg/kg in SB-1 through SB-4; Copper at 51.9 mg/kg and 70.9 mg/kg in SB-4 and SB-8, respectively; Lead ranging from 67.5 mg/kg to 309 mg/kg in SB-4 through SB-8 and SB-10; Mercury ranging from 0.27 mg/kg to 0.52 mg/kg in SB-4, SB-8, and SB-10; Nickel ranging from 30.9 mg/kg to 148 mg/kg in SB-1 through SB-10; and Zinc ranging from 109 mg/kg to 309 mg/kg in SB-5 through SB-8 and SB-10. Laboratory Analytical Results identified exceedance in Chromium above the PGW standards for all soil samples (ranging 19.2 ug/kg to 40.7 ug/kg), except in soil samples for deeper intervals in SB-5, SB-7 and SB-8. Analytical results of PFAS identified an exceedance of PFOS at 1.84 ng/g in SB-2 above UUSCO and PGW standards; and PFOA at 0.789 ng/g in SB-1 in UUSCOs, indicating the presence of emerging contaminants.
- **Tables 3** through **Table 9** of the Remedial Investigation Report by RSK outlines the above results.

## 2.5.4.1 Comparison of Soil/Fill with SCGs

Laboratory Analytical Results identified exceedance in Chromium above the PGW standards for all soil samples, except in soil samples for the deeper intervals in SB-5, SB-7 and SB-8; along with four metals exceeded above UUSCOs. Analytical results of PFAS identified an exceedance of PFOS above UUSCO and PGW standards; and PFOA above UUSCOs, indicating the presence of emerging contaminants.

 Figure 3A of the RIR is a spider map that shows the location and summarizes the exceedances of UUSCOs for all soil/fill.

### 2.5.5 On-Site and Off-Site Groundwater Contamination

## 2.5.5.1 Summary of Groundwater Data

- Laboratory analytical results of the groundwater samples collected did not depict any exceedances of SVOCs, Pesticides, PCBs or 1,4-Dioxane. However, laboratory results identified a consistency of VOC exceedances: 2-Isopropyltoluene ranging from 7.3 ug/L to 8.6 ug/L in GW-1, GW-3, and GW-4; Benzene at 2.1 ug/L in GW-6; Isopropyl benzene ranging from 27 ug/L to 100 ug/L in GW-1, GW-3, GW-4, and GW-6; n-Butylbenzene ranging from 6.4 ug/L to 14 ug/L in GW-1, GW-3, and GW-4; n-Propyl benzene ranging from 26 ug/L to 140 ug/L in GW-1, GW-3, GW-4, and GW-6; and sec-Butylbenzene ranging from 11 ug/L to 17 ug/L in GW-1, GW-3, and GW-4. Several TAL Metals identified the following exceedances in the filtered samples: Iron ranging from 0.608 mg/L to 3.13 mg/L in GW-1, GW-3, GW-5, and GW-6; Magnesium at 40.8 mg/L in GW-1; Manganese ranging from 0.97 mg/L to 6.17 mg/L in all groundwater samples analyzed; and Sodium ranging from 57.6 mg/L to 394 mg/L in all groundwater samples analyzed. Laboratory analytical results of PFAS identified the following exceedances: PFOS ranging from 10.4 ng/L to 130 ng/L in all groundwater samples collected and PFOA ranging from 14.6 ng/L to 222 ng/L in all groundwater samples analyzed. Both levels of PFOS and PFOA are substantially high in GW-6.
- Tables 9 through Table 17 of the Remedial Investigation Report by RSK outlines the results of the RI in a tabular format.

## 2.5.5.2 Comparison of Groundwater with SCGs

Six (6) VOCs including 2- Isopropyl toluene, Benzene, Isopropyl benzene, n-Butylbenzene,
 n-Propyl benzene, and sec-Butylbenzene; nine (9) SVOCs including Acenaphthene,
 Fluoranthene, Naphthalene, Benzo(a)Anthracene, Benzo(b)Fluoranthene,

Benzo(k)Fluoranthene, Bis(2-ethylhexyl) phthalate, Chrysene, and Indeno(1,2,3-cd) pyrene; four (4) Iron, Magnesium, Manganese, and Sodium; and two (2) PFAS (PFOA and PFOS) were all detected throughout the Site.

 A spider map that indicates the location(s) of and summarizes exceedances of AWQS prior to the remedy is shown in Figure 3B of the RIR by RSK.

## 2.5.6 On-Site and Off-Site Soil Vapor Contamination

- Soil vapors associated with BTEX and chlorinated VOCs were detected in all air samples, excluding the outdoor air sample. The total concentration of BTEX ranged from 644.3 ug/m³ to 5,364 ug/m³ in SV-1 through SV-4 and is at 6.37 ug/m³ in OA-1. Chlorinated VOCs 1,1,1-Trichloroethane, 1,1-Dichloroethene, Cis-1,2-Dichloroethene, Methylene Chloride, and Vinyl Chloride were not detected. PCE was detected at concentration ranging from 1.14 ug/m³ to 915 ug/m³ in SV-1 through SV-4 and 0.41 ug/m³ in OA-1; TCE was detected at concentration ranging from 3.54 ug/m³ to 17.7 ug/m³ in in all vapor samples except for SV-3; Carbon tetrachloride was detected at 0.51 ug/m³ in SV-3 and 0.47 ug/m³ in OA-1. Additional compounds were detected in the vapor samples: 1,2,4-Trimethylbenzene at concentration ranging from 79.6 ug/m³ to 614 ug/m³ in SV-1 through SV-4 and at 1.21 ug/m³ in OA-1; 1,3,5-Trimethylbenzene ranging from 18.2 ug/m³ to 136 ug/m³ in SV-1 through SV-4; Chloroform at 16.6 ug/m³ in SV-1; Chloromethane at 1.34 ug/m³ in SV-1 through SV-4 and 2.09 ug/m³ in OA-1; and Styrene ranging from 1.82 ug/m³ to 19.5 ug/m³ in SV-1 through SV-4.
- Table 18 of the Remedial Investigation Report by RSK outlines these results.

## 2.5.6.1 Comparison of Soil Vapor with SCGs

VOCs including 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Chloroform,
 Chloromethane, Hexane, Styrene, BTEX, PCE (Tetrachloroethene), Trichloroethene (TCE)
 and Carbon Tetrachloride were detected above NYSDOH Ambient Air Background Levels.

• A spider map that indicates the location(s) of and summarizes soil vapor data prior to the remedy is shown in Figure 3C of the RIR by RSK.

### 2.6 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

## 2.6.1 Qualitative Human Health Exposure Assessment

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

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

Environmental Media & Exposure Route	Human Exposure Assessment
Direct contact with surface soils (and	People can come into contact if they trespass
incidental ingestion)	on the Site.
Direct contact with subsurface soils (and	People can come into contact if they complete
incidental ingestion)	ground-intrusive work at the Site.

Ingestion of groundwater	Contaminated groundwater is not being used
	for drinking water, as the area is served by the
	public water supply.
Direct contact with groundwater	People may come into contact if they
	complete ground-intrusive work in the event
	groundwater is encountered.
Inhalation of air (exposures related to soil	A monitoring program is being implemented
vapor intrusion)	to verify if additional actions will be needed to
	address exposures to soil vapor intrusion.
Direct contact and incidental ingestion of	No sources of surface water were noted on-
Surface water	Site or in the vicinity.

- Known and Potential Contaminant Sources and the fate and extent of contamination:
  - Soil: A Pesticide was found in shallow (0-2 feet) soils at elevated concentrations towards the back (eastern) portion of the Site. Heavy metals were found throughout the Site at concentrations above the UUSCOs and PGW SCOs, and at higher levels towards the front portion of the lot which will be excavated and removed as part of the redevelopment. PFOA and PFOS were identified at depths (0-2 feet and 14-16 feet) on the most northern corner of the Site.
  - Groundwater: Six (6) VOCs including 2- Isopropyl toluene, Benzene, Isopropyl benzene, n-Butylbenzene, n-Propyl benzene, and sec-Butylbenzene; nine (9) SVOCs including Acenaphthene, Fluoranthene, Naphthalene, Benzo(a)Anthracene, Benzo(b)Fluoranthene, Benzo(k)Fluoranthene, Bis(2-ethylhexyl) Phthalate, Chrysene, and Indeno(1,2,3-cd) Pyrene; four (4) Iron, Magnesium, Manganese, and Sodium; and two (2) PFAS (PFOA and PFOS) were all detected throughout the Site.

Soil Vapor: Ten (10) VOCs including 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Chloroform, Chloromethane, Hexane, Styrene, BTEX, PCE (Tetrachloroethene), Trichloroethene (TCE) and Carbon Tetrachloride (CTC) were detected throughout the Site.

## Receptor Populations:

- o **On-Site Receptors:** The Site is currently a vacant parcel enclosed with an 8-ft. high wooden construction fence. The proposed future use of the Site will consist of a new five-story (15,912.60-sq. ft.) mixed-use building with a commercial space in the cellar and 1<sup>st</sup> floor, and sixteen (16) residential units 2<sup>nd</sup> floor through 5<sup>th</sup> floor. The layout will consist of no front yard, a 38-feet paved rear yard to be utilized for off-street parking and a 14-foot 10-inch side yard to be utilized as a paved driveway. The proposed cellar depth (top of slab) for the new building will be 10-feet 4-inches bgs. No uncapped or landscaped areas are proposed as part of this redevelopment. Onsite receptors are limited to contractors, trespassers, site representatives and visitors granted access to the Site. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers and visitors.
- Off-Site Receptors: Potential off-site receptors within a 500-foot radius of the Site include Brooklyn Public Library, (K-12), and Happy Club Children's Centre (Day-care), PS/IS 686 Brooklyn Middle School, Gold Material Montessori School, Garden of Eden Home for Adults (Assisted living facility) and Little Scholars Day Care Centre. No hospital was identified within a 500-ft. radius of the Site. Commercial and construction workers; pedestrians; and trespassers based on the following land uses within 500-feet of the Site:
  - Municipal and Institutional Buildings existing and future
  - Commercial Businesses existing and future

- Residential Buildings existing and future
- Building Construction/ Renovation existing and future
- Pedestrians, Trespassers, Cyclists existing and future
- Schools existing and future

## Potential Exposure Points

- o **Current Conditions:** The front of the Site is capped with concrete and there are no potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill. The remainder of the Site is uncapped, and potential exposure points include inhalation, ingestion, or dermal contact with the surface soils, subsurface soils, and soil vapor that may volatilize during excavation. Groundwater is not exposed at the Site. The Site is served by the public water supply and groundwater is not used at the Site for potable supply and there is no potential for exposure. Because the Site is currently undeveloped, there is no potential for soil vapor to accumulate on Site.
- o Construction/ Remediation Conditions: During the remedial action, onsite workers will come into direct contact with surface and subsurface soils as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale, or have dermal contact with exposed impacted soil and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. Due to the depth of groundwater, direct contact with groundwater is not expected. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan (SMMP), dust controls, and through the implementation of the Community Air-Monitoring Program (CAMP) and a Construction Health and Safety Plan (HASP).
- Proposed Future Conditions: Under future remediated conditions, all soil in excess of RRSCOs will be removed. The Site will be fully capped, preventing

potential direct exposure to soil and groundwater remaining in place, and engineering controls (SSDS and SVE) will prevent any potential exposure due to inhalation by preventing soil vapor intrusion. The Site is served by the public water supply, and groundwater is not used at the Site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the Site.

### Overall Human Health Exposure Assessment

 There are potential complete exposure pathways for the current Site condition. There are potential complete exposure pathways that require mitigation during implementation of the remedy. There are no complete exposure pathways under future conditions after the Site is developed. This assessment takes into consideration the reasonably anticipated use of the Site, which includes a residential structure, site-wide surface cover, and a subsurface vapor barrier system, sub-slab depressurization system and soil vapor extraction system for the building and the Site. Under current conditions, on-Site exposure pathways exist for those with access to the Site and trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program (CAMP), the Soil/Materials Management Plan (SMMP), and a Construction Health and Safety Plan (CHASP). Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters near the Site that could be impacted or threatened.

## 2.6.2 Fish & Wildlife Remedial Impact Analysis

In accordance with DER-10, the purpose of the FWRIA is to identify actual or potential impacts to fish and wildlife resources from site contaminants of ecological concern. The Lower New York Bay is 1.15-miles southwest of the Site. An FWRIA is not required since there are no federal, state

or local natural resources, including waterways, wildlife refuges, wetlands or critical habitats of endangered or threatened species on, adjacent to, or impacted by the Site.

### 2.7 INTERIM REMEDIAL ACTION

No IRMs have been performed or are proposed at the Site.

#### 2.8 REMEDIAL ACTION OBJECTIVES

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

### 2.8.1 Groundwater

## RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.

## RAOs for Environmental Protection

• Remove the source of ground water contamination.

## 2.8.2 Soil

## **RAOs for Public Health Protection**

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of, or exposure to, contaminants volatilizing from contaminated soil.

# **RAOs for Environmental Protection**

• Prevent migration of contaminants that would result in groundwater contamination.

# 2.8.3 Soil Vapor

Following RAOs have been identified for the Site:

- RAOs for Public Health Protection
  - Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

## 3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

### 3.1 Evaluation of Remedial Alternatives

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

- Protection of human health and the environment;
- Compliance with standards, criteria, and guidelines (SCGs);
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implement ability;
- Cost effectiveness;
- Community Acceptance;
- Green and Sustainable Remediation (including climate resiliency); and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. This analysis was prepared in accordance with 6 NYCRR Part 375-1.8(f) and Part 375-3.8(f) and Section 4.3(c) of NYSDEC DER-10. Three (3) remedial alternatives are evaluated, as follows:

#### Alternative 1:

- Selection of Track 1 cleanup.
- Removal of all soil/fill exceeding Unrestricted Use SCOs throughout the entire Site at a termination depth of 17-feet bgs or the groundwater table whichever is encountered first (Figure 4.1). Confirmation that Unrestricted Use SCOs have been achieved will be accomplished with post-excavation endpoint sampling. Approximately 5,037-cubic yards (7,556 tons) of soil/fill will be removed from the Site and properly disposed of at an appropriately licensed or permitted facility. If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at a termination depth of 17-feet bgs, additional excavation would be performed to ensure complete removal of soil/fill that does not meet Unrestricted Use SCOs. This would require some extraordinary support of excavation (SOE) measures to allow full sitewide excavation to the depth of 17-feet bgs and backfilling the 17-feet excavation with certified clean fill to meet the desired redevelopment depth.

### Alternative 2:

- Selection of Track 2 cleanup.
- Removal of all soil/fill exceeding restricted residential Use SCOs (RRSCOs) throughout the entire Site at a termination depth of 4-feet bgs or the end-point samples compliant with Restricted Residential SCOs (Figure 4.2). Approximately 1,185-cubic yards (1,778 tons) of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility. Additional excavation will be achieved in the building (12-feet bgs) and elevator pit areas (17-feet bgs) for development purposes totaling 1,142 yds (1,714 tons) (Figure 11). If soil/fill containing analytes at concentrations above Restricted Residential Use SCOs is still present at the base of the proposed remedial excavation, additional excavation would be performed.
- Installation of a Sub-Slab Depressurization System (SSDS) within the building footprint and an SVE system in the rear yard.

 Long-term institutional / engineering controls are allowed to address or prevent exposures from other impacted media. A Site Management Plan would ensure that these controls remained protective for the long term.

#### Alternative 3:

- Selection of Track 4 cleanup.
- Removal of all soil/fill exceeding RRSCOs and confirmation that Track 4 SCOs have been achieved with post-excavation end point sampling. For remediation purposes, the top 2-feet of Sitewide soil/fill will be excavated to remove historic fill and meet the RRSCOs (Figure 4.3). Approximately 593-cubic yards (890 tons) of soil/fill will be generated during remediation excavation of historic fill. Additional excavation will be achieved in the building (12-feet bgs) and elevator pit areas (17-feet bgs) for development purposes totaling 1,142 yds (1,714 tons) (Figure 11). If soil/fill containing analytes at concentrations above RRSCOs is still present at the base of the excavations, additional excavation would be performed.
- This alternative would include the installation of two (2) engineering controls: an active Sub Slab Depressurization System (SSDS), and a Soil Vapor Extraction (SVE) system; and two (2) protective systems: a 20-mil or better vapor barrier (an element of construction (not an EC)) beneath the entire Site and capping with a 4-inch-thick concrete slab to prevent potential exposures from soil vapor in the future.
- Establishment of use restrictions including prohibitions on the use of groundwater from
  the Site; prohibitions of restricted Site use, such as farming or vegetable gardening, to
  prevent future exposure pathways; and prohibition of a higher level of land use without
  the NYSDEC approval.
- Establishment of an approved SMP to ensure long-term management of these
  Engineering and Institutional Controls including the performance of periodic inspections
  and certification that the controls are performing as they were intended. The SMP will
  note that the property owner and property owner's successors and assigns must comply
  with the approved SMP.

### THRESHOLD CRITERIA

#### Protection of Public Health and the Environment

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

Alternative 1 would be protective of human health and environmental exposure to these constituents on-site would be eliminated by excavation and removing all historic fill soils exceeding Unrestricted Use SCO's and groundwater protection standards, disposing excavated materials off-site and backfilling as needed with certified clean fill, virgin mined materials or recycled concrete materials from a NYSDEC permitted recycling facilities thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contaminants leaching into groundwater. This Alternative would not require Engineering Controls since it is a Track 1 cleanup.

Alternative 2 would achieve comparable protections of human health and environmental exposure to these constituents on-site would be eliminated by the excavation and removal of the maximum of the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Restricted Residential SCOs, as well as installation of an SSDS within the building footprint and SVE system in the rear yard. Establishment of RRSCOs would minimize the risk of contamination leaching into groundwater and exposed to human health and environment. A Site Management Plan would ensure that these controls remained protective for the long term.

**Alternative 3** would achieve comparable protections of human health and the environment by excavation and removal of 2-feet bgs Site soil/fill material and further excavation for the proposed redevelopment and by ensuring that remaining soil/fill on-Site meets RRSCOs, as well as by placement of Institutional and Engineering Controls, i.e., active SSDS within the building footprint, and SVE system in the rear yard; along with vapor barrier installation under the building

and composite cover construction as protective systems (elements of construction (not ECs)). The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Engineering Controls including a SMP for the Site would ensure that the composite cover system remains intact and protective of public health. Establishment of RRSCOs would minimize the risk of contamination leaching into groundwater.

For all Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil/Materials Management Plan, and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing (as part of construction) a vapor barrier below the building slab and outside foundations walls below grade.

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

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

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Unrestricted Use SCO's and Protection of Groundwater SCO's. Compliance with SCGs for soil vapor would also be achieved by installing (as part of construction) a vapor barrier system below the new building's cellar slab and continuing the vapor barrier outside of subgrade foundation walls, as part of development.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet Restricted Residential SCO's. Compliance with SCG's for soil vapor would also be achieved by installing an active SSDS beneath the new building footprint, a SVE system in the rear yard, and installing a vapor barrier system below the new building's cellar slab and continuing the vapor barrier outside of subgrade foundation walls (as part of construction). A Site Management Plan would ensure that the SSDS and SVE systems remained protective for the long term.

Alternative 3 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet RRSCO's. Compliance with SCG's for soil vapor would also be achieved by installing an active SSDS beneath the new building footprint, a SVE system in the rear yard, and two (2) protective systems: a site-wide vapor barrier system below the new building's cellar slab and continuing the vapor barrier outside of subgrade foundation walls and composite cover system throughout the Site (elements of construction (not ECs)). A Site Management Plan would ensure that the engineering controls remained protective for the long term.

During remedial and construction activity for any of the Alternatives, workers and area residents may be exposed to impacted soil and vapors. Worker exposure to soil and vapors will be minimized through implementation of a Site-specific Construction Health and Safety Plan. Exposures to area residents from dust and/or vapors will be minimized through the use of engineering controls and through implementation of a CAMP. Health and safety measures contained in the CHASP and CAMP will be implemented during Site redevelopment under this RAWP. For the three (3) Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

### **BALANCING CRITERIA**

## **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 short-term effects during the remedial action on public health and the environment during implementation of the remedial action, including protection of the community, protection of onsite workers and environmental impacts. All three (3) alternatives have similar short-term effectiveness during their implementation, as each requires excavation of historic fill material. The alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts

could potentially be higher for Alternatives 1 and 2 since excavation of greater amounts of historical fill material would take place. However, focused attention to means and methods during a Track 1, 2 (or Track 4) removal action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An additional short-term adverse impact and risk to the community associated with all the three (3) remedial alternative is increased truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flag persons will be used to protect pedestrians at Site entrances and exits.

The potential adverse impact to the community, workers, and the environment for all the three (3) alternatives would be minimized through implementation of control plans including a Construction Health and Safety Plan, a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. The alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would provide protection from on-Site contaminants by using personal protective equipment would be worn consistent with the documented risks within the respective work zones.

## Long-term effectiveness and permanence

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

Alternative 1 and Alternative 2 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above UUSCOs and

RRSCOs. Removal of on-Site contaminant sources will also prevent future groundwater contamination.

Alternative 3 would provide long-term effectiveness by removing most on-Site contamination and attaining RRSCOs; installing two (2) engineering controls: an active SSDS beneath the new building cellar, and a SVE system in the rear yard; along with two (2) protective systems: a vapor barrier system across the entire Site and a composite cover (as part of construction); maintaining use restrictions; and establishing an SMP to ensure long-term management of ECs. The SMP would ensure long-term effectiveness of all ECs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy continue to provide the required level of protection.

## Reduction of Toxicity, Mobility, or Volume of Contaminated Material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total Mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

**Alternatives 1 and 2** will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Unrestricted Use and Restricted Use SCO's, respectively. Alternative 1 would remove a greater total mass of contaminants from the Site.

**Alternative 3** would remove the historic fill at the Site 2-feet bgs, and all remaining on-Site soil/fill beneath the new building will meet RRSCO's.

## Implement ability

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

The techniques, materials, and equipment to implement all three (3) alternatives are readily available and have been proven to be effective in remediating the contaminants present on the Site.

Alternative 1 does not require the use of long-term engineering or institutional controls to address impacted media or prevent exposures within the proposed building due to 20-feet bgs remedial excavation. However, Alternatives 2 and 3 will include the installation of two (2) engineering controls, i.e., an active Sub Slab Depressurization System (SSDS), and a Soil Vapor Extraction (SVE) system; and two (2) protective systems (elements of construction (not ECs)): a 20-mil or better vapor barrier beneath the entire Site and capping with a 4-inch-thick concrete slab to prevent potential exposures from soil vapor in the future. They use standard equipment and technologies that are well established in the industry.

The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

### **Cost Effectiveness**

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Since historic fill at the Site appeared to be found to extend to a depth of up to 2-feet below grade during the RI, and the new building requires excavation excavating to 2-feet bgs for the

rear and side yards; 10-feet bgs for the proposed building cellar; 12-feet bgs for the foundation footings; and 17-feet bgs for the proposed elevator shaft.

The costs associated with Alternative 1 will be approximately \$1,500,000.00, which is significantly higher than Alternatives 2 and 3 to remove additional soils to achieve Unrestricted Use SCOs. This cost estimate includes the following elements and assumptions:

- Demolition of former building slab and paving;
- Sheeting and shoring/underpinning to allow excavation to a minimum depth of 20-feet to the lot line;
- Excavation to a depth of 17-feet across the entire Site to removal all historic fill material to meet Unrestricted Use SCOs;
- Disposal of approximately 5,037-cu.yds. (7,556 tons) of historic fill soil as non-hazardous;
- Importation of certified clean fill to meet the desired redevelopment grade; and
- HASP and CAMP monitoring for the duration of the remedial activities.

The costs associated with **Alternative 2** will be approximately \$850,000.00. This cost estimate includes the following elements and assumptions:

- Demolition of former building slab and paving;
- Sheeting and shoring/underpinning to allow excavation to a maximum depth of 4-feet to the lot line;
- Development excavation for the elevator pit to a depth of 17-feet, foundation footings, and cellar including the remainder of the lot (side yard and rear yar) to a depth of 12-feet;
- Disposal of approximately 1,185-cubic yards (1,778 tons) of historic fill soil as non-hazardous. An additional 1,143 yds (1,714 tons) of soil will be excavated for development purposes;
- Importation of certified clean fill to meet the desired redevelopment grade;

- Installation and operation of SSDS beneath the new building cellar, and SVE system beneath the rear yard; and
- HASP and CAMP monitoring for the duration of the remedial activities.

The costs associated with Alternative 3 will be approximately \$425,000.00. This cost estimate includes the following elements and assumptions:

- Demolition of former building slab and paving;
- 2-feet bgs site-wide remedial excavation followed by Support of Excavation (S.O.E.) to continue the development excavation;
- Disposal of approximately 593-cubic yards (889 tons) of historic fill soil as non-hazardous.
   An additional 1,578 yds (2,365 tons) of soil will be excavated for development purposes;
- Limited site backfilling with certified clean fill to meet the desired redevelopment grade;
- Installation and operation of an active Sub Slab Depressurization System (SSDS), a Soil Vapor Extraction (SVE) system; and
- HASP and CAMP monitoring for the duration of the remedial activities.

If additional soil with analytes above Restricted Residential SCOs remain after excavation for the new building, long-term costs for Alternative 3 are likely higher than Alternatives 1 and 2 based on implementation of a Site Management Plan as part of Alternative 3.

The remedial plan would couple the remedial action with the redevelopment of the Site, lowering total costs. The remedial plan will also consider the selection of the most appropriate disposal facilities to reduce transportation and disposal costs during cleanup and redevelopment of the Site.

## **Community Acceptance**

This evaluation criterion addresses community opinion and support for remedial action.

Observations here will be supplemented by public comment received on the RAWP.

This RAWP will be subject to a public review under the NYSDEC Brownfields Cleanup Program for 45-days and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by NYSDEC prior to approval of this plan. The Citizen Participation Plan (CPP) for the project is provided in **Appendix C**. Observations here will be supplemented by public comment received on the RAWP. Under both alternatives, the overall goals of the remedial program, to protect public health and the environment and eliminate potential contaminant exposures, have been broadly supported by citizens in NYS communities.

### **Land Use**

This evaluation criterion addresses the proposed use of the Site. 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 Site is zoned as R6B/C2-3, residential district with commercial overlays. The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes a new five-story (15,912.60-sq. ft.) mixed-use building with a commercial space in the cellar and 1<sup>st</sup> floor, and sixteen (16) residential units 2<sup>nd</sup> floor onwards.

Following remediation, the Site will meet a RRSCOs which is protective of public health and the environment for its planned residential use. The proposed use is compliant with the Site's zoning and is consistent with recent development patterns. The areas surrounding the Site is urban and consists of predominantly mixed-use (residential and commercial buildings) in zoning districts designated for commercial and residential uses. The development would remediate a contaminated lot and provide a modern mixed-use building. The proposed development would clean up the Site and make it safer, create new employment opportunities, and other economic benefits from land revitalization.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet RRSCOs which is protective of public health and the environmental for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area and not in proximity to fish or wildlife and neither alternative would result in any potential exposure pathways of contaminant migration affecting fish or wildlife. The remedial action is also protective of groundwater natural resources. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. All alternatives are equally protective of natural resources and cultural resources. Improvements in the current environmental condition of the Site achieved by the three (3) alternatives considered in this plan are consistent with the City's goals for cleanup of contaminated land.

## 3.2 SELECTION OF THE PREFERRED REMEDY

The preferred remedy for the Site is Alternative 2, Track 2 cleanup which will meet the RRSCOs and protection to groundwater (PGW) criteria. Data generated during the Site investigation support the conclusion that Unrestricted Use SCOs for soil cannot be achieved with the proposed excavations for the building footprint at this Site.

The Alternative 2 remedy will remove all soil/fill exceeding RRSCOs 4-feet beneath the Site, which will be confirmed with post-excavation sampling. If soil/fill containing analytes at concentrations above RRSCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level and slab are complete, additional excavation would be performed to ensure complete removal of soil/ fill that does not meet RRSCOs.

Engineering Controls are required for a Track 2 Cleanup. An active SSDS will be installed within the footprint of the proposed building cellar, and an SVE system in a vapor hotspot region on the northeastern corner of the Site; along with a composite cover consisting of a concrete cap to prevent potential exposures from soil vapor.

Use restrictions will be imposed on the Site (including prohibitions on any use higher than Restricted Residential, e.g., the use of groundwater from the Site; prohibitions of restricted Site use, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without NYSDEC approval).

## 3.2.1 **Zoning**;

The Site current zoning designation is R6B; Residential District, with the Commercial overlay zoning C2-3 that allows for commercial usage. R6B zoning districts are often traditional row house districts, which preserve the scale and harmonious streetscape of neighborhoods of four-story attached buildings developed during the 19th century. Many of these houses are set back from the street with stoops and small front yards that are typical of Brooklyn's "brownstone" neighborhoods, such as Park Slope, Boerum Hill and Bedford Stuyvesant.

Districts C2-1 through C2-5 are commercial overlays mapped within residence districts. Mapped along streets that serve local retail needs, they are found extensively throughout the city's lowerand medium-density areas and occasionally in higher-density districts. The proposed use is consistent with existing zoning for the property.

The Site was part of the Bensonhurst Rezoning dated 07/27/2005. The E-Designation for Hazardous Materials, (E-145) was placed on the Site by the New York City Department of City Planning (NYCDCP) under CEQR # 05DCP055K.

## 3.2.2 Applicable Comprehensive Community Master Plans or Land Use Plans

Based upon review of City of New York Planning Department documents, there are no applicable comprehensive community master plans or land use plans that would impact remedy implementation.

## 3.2.3 Surrounding Property Uses

The surrounding property uses consist of a variety of land uses including residential and commercial. The adjoining property to the north was identified as commercial (auto repair shop), the adjoining property to the east was identified as mixed-use and commercial (Brooklyn public library-Highlawn branch), the adjoining property to the south was identified as residential, and the properties directly across Stillwell Avenue to the west was identified as residential. A gasoline station was identified on the northwest corner of Stillwell Avenue and Kings Highway. Mixed use and residential properties were identified along Kings Highway. The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy.

## 3.2.4 Citizen Participation

Citizen Participation during implementation of a remedial program will proceed in accordance with the Citizen Participation Plan included as **Appendix C** of this RAWP.

### 3.2.5 Environmental Justice

There are no known environmental justice concerns associated with this project.

## 3.2.6 Proximity to Natural Resources

The closest natural resources or water body is the Gravesend Bay, which is located approximately 1.05-miles southwest from the Site. There are no mapped wetlands on or in the near vicinity of the Site. Surface water runoff on the Site flows to the surrounding Streets that are connected to the NYC storm water sewer system.

## 3.2.7 Off-Site Groundwater Impacts

The petroleum-related compounds in the groundwater samples are attributed to the spill site located at 125 Kings Highway, approximately 150-feet north of the Site at a higher gradient, historically utilized as a gasoline/service station with four (4) on-site 4,000-gallon gasoline USTs (PBS ID 2-151378). The tanks were closed by removal on March 13, 19, and 20, 2019 (NYCDOB Job # 321905042, December 12, 2018), and the spill was recorded on March 15, 2019 (Spill # 1812287); consequent to the leaking USTs. Based on the OER documents research (OER Site # 21EHAZ037K), remediation and construction were completed and the database was last updated on July 1, 2022. The soil samples indicated no exceedances in VOCs or PCBs, however, one (1) SVOC, five (5) metals and two (2) PFAS compounds were detected. Groundwater samples indicated significant exceedances in petroleum-related compounds (BTEX) VOCs and SVOCs, two (2) metals and several PFAS compounds.

## 3.2.8 Proximity to Floodplains

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 3604970351F (effective September 2007) for the Site area was reviewed to assess whether the Site is located within a designated flood plain or flood zone. The FIRM indicated that the Site is located within Flood Zone X. Areas within Flood Zone X identified as Other Areas on the map (i.e., no hatch pattern) are determined to be outside the 0.2% annual chance or 500-year floodplain. According to the NYC Flood Hazard Mapper, the Site is not located in a mapped flood hazard zone (A, V, or X).

### 3.2.9 Current Institutional Controls

There are no current institutional controls associated with the Site. However, institutional control will be evaluated and implemented as appropriate as part of the Site Management Plan (SMP) development process.

#### 3.3 SUMMARY OF SELECTED REMEDIAL ACTIONS

The remedial action outlined below aims to achieve all the remedial action goals established for the project. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry. The proposed remedial action will consist of:

- Performance of a Special Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities;
- 2. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
- Utilizing Waste Characterization Study for soils generated during site redevelopment excavation activities for disposal purposes. The waste characterization soil samples were collected at a frequency dictated by the disposal facility;
- 4. Excavation of soil/fill exceeding RRSCOs and protection to groundwater (PGW) standards listed in **Table 2.** For remediation purposes, the top 4-feet of Sitewide soil/fill will be excavated to meet the Restricted Residential SCOs. Approximately 1,185-cubic yards (1,778 tons) of soil/fill will be generated during remediation excavation; An additional 1,142 yds (1,714 tons) of soil will be excavated for development purposes;
- 5. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
- Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials;
- Removal of all UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations;

- 8. Collection and analysis of eight (8) confirmation samples at the remedial excavation depths will be used to verify that the SCOs for the site have been achieved. If confirmation sampling indicates that SCOs were not achieved at the stated remedial depth, the Applicant must notify DEC, submit the sample results and, in consultation with DEC, determine if further remedial excavation is necessary. Further excavation for development will proceed after confirmation samples demonstrate that SCOs for the site have been achieved;
- 9. Appropriate off-Site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
- 10. Import of materials to be used for backfill and cover in compliance with: (1) chemical limits, and (2) all Federal, State and local rules and regulations for handling and transport of material;
- 11. Dewatering is anticipated during the proposed elevator shaft excavation, and will be done in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under the Long Island Well permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system;
- 12. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
- 13. Construction and maintenance of a site cover to prevent human exposure to residual contaminated soil/fill remaining under the Site consisting of:
  - a. 4-inch-thick concrete building cellar slab underlain with a 20-mil vapor barrier (Raven VaporBlock Plus VBP-20) followed by a 6 layer of ¾-inch crushed blue stone under building footprint. A 12-inch layer of ¾-inch crushed blue stone will be installed below the 6 inches in the SSDS trench areas, and

- b. 4-inch-thick concrete slab underlain by a 6 layer of ¾-inch crushed blue stone under the rear parking lot and driveway areas;
- 14. As a part of the development, installation of a vapor barrier system consisting of 20-mil vapor barrier (or better) beneath the building cellar slab, footings and outside of subgrade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system, which is considered a green remediation technique that may improve energy efficiency, will consist of a 20-mil Raven Industries Vapor Block Plus (VBP-20) below the slabs within the full building area. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration, and installed per the manufacturer's specifications. The remedial engineer will oversee and certify in the FER that the vapor barrier was designed and properly installed within the new building footprint;
- 15. Installation of an active sub-slab depressurization system (SSDS) consisting of a single loop of horizontal pipe set in the middle of a gas permeable layer immediately beneath the building cellar slab and vapor barrier system. The SSDS gas permeable layer will consist of a 6-inch layer of \(^3\)-inch crushed blue stone placed directly beneath the building cellar slab. The SSDS piping will be installed within a trench an additional 6 inches below the 6 inch permeable layer. The horizontal piping will consist of looped 4-inch slotted HDPE corrugated pipe which will be fabric wrapped and connected to a 6-inch cast iron solid riser pipe that will penetrate the foundation wall and travel along the building rear exterior wall to the roof. The riser pipe will be fitted with an inline vacuum fan (Radonaway RP265 or equal) on the roof and finished a minimum of 3-feet above the top of the parapet wall and finished with a 6-inch goose neck pipe to prevent rain infiltration. The fan is required to be at least 10 feet from any HVAC air intake and nearby windows. The Active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the entire building slab to prevent vapor migration into the building;

- 16. Installation of an active Soil Vapor Extraction (SVE) system within a vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs found in exceedance in that area. The system will be constructed with a fabric wrapped; 4-inch slotted (0.050" slot size) PVC SVE well installed vertically at a termination depth of 12-feet bgs with a porous annulus not to exceed 8inches diameter. The SVE annulus will be filled with %-inch crushed blue stone to surround the slotted piping and will be connected to a horizontal 4-inch solid PVC pipe which will run beneath site grade and perpendicular toward the rear of the building's most northeastern section and travel along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SVE is Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE was designed and properly installed to establish a vacuum in the vapor hotspot area;
- 17. Publication of a Site Management Plan for long term management of residual contamination as required by the Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;
- 18. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations; and
- 19. Submission of a FER that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the NYSDEC-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

## 4.0 REMEDIAL ACTION PROGRAM

#### 4.1 GOVERNING DOCUMENTS

The primary documents governing the remedial action are summarized in this section. Where referenced, copies of the full plan are provided in the appendices.

## 4.1.1 Standards, Criteria and Guidance (SCGs)

The following standards, criteria, and guidance are typically applicable to Remedial Action projects in New York State, and will be consulted and adhered to as applicable:

- 6 NYCRR Part 364 NYS Waste Transporter Permits
- 6 NYCRR Part 360 NYS Solid Waste Management Requirements
- 6 NYCRR Part 371 Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 374-2 Standards for the Management of Used Oil
- 6 NYCRR Part 375 Environmental Remediation Programs
- 6 NYCRR Part 376 Land Disposal Restrictions
- 6 NYCRR Part 613 Petroleum Bulk Storage
- 6 NYCRR Part 661 Tidal Wetlands Land Use Regulations
- 6 NYCRR Part 663 Freshwater Wetlands Permit Requirements
- 6 NYCRR Parts 700-706 Classes and Standards of Quality and Purity
- 6 NYCRR Part 750 State Pollutant Discharge Elimination System (SPDES) Permits
- 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response
- 40 CFR Part 144 Underground Injection Control Program
- CP-43 Commissioner Policy on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-49 Climate Change and DEC Action (2022)
- CP-51- Soil Cleanup Guidance (2010)

- CP-60 Screening and Assessment of Contaminated Sediment (2014)
- DER-2 Making Changes to Selected Remedies (April 2008)
- DER-4 Management of Coal Tar Waste & Coal Tar Contaminated Soils from Manufactured Gas Plants (2001)
- DER-10 Technical Guidance for Site Investigation and Remediation (2010)
- DER-13 Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York
   (2006)
- DER-23 Citizen Participation Handbook for Remedial Programs (2010)
- DER-31 Green Remediation (2010)
- DER-32 Brownfield Cleanup Program Applications and Agreements (2017)
- DER-33 Guide to Drafting and Recording Institutional Controls (2010)
- TAGM 3028 "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.1.1 Ambient Water Quality Standards & Guidance Values and Groundwater
   Effluent Limitations (1998, Addenda 2000, 2004 and 2023)
- TOGS 1.3.8 New Discharges to Publicly Owned Treatment Works (1994)
- TOGS 2.1.2 Underground Injection/Recirculation (UIR) at Groundwater Remediation
   Sites (1990)
- New York State Standards and Specifications for Erosion and Sediment Control (2016)
- DAR-1 (formerly Air Guide 1) Guidelines for the Control of Toxic Ambient Air Contaminants (1997)
- U.S. EPA OSWER Directive 9200.4-17 Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring
   Plan
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2017)

## 4.1.2 Site Specific Health & Safety Plan (HASP)

The Health and Safety Plan is included in Appendix F

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. All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, such as 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

The Site Safety Coordinator will be [TBD]. A resume will be provided to NYSDEC prior to the start of remedial construction.

## 4.1.3 Quality Assurance Project Plan (QAPP)

A QAPP for the project in included as **Appendix D**. All field sampling procedures and analytical methods will be implemented in accordance with this QAPP.

### 4.1.4 Construction Quality Assurance Plan (CQAP)

The Construction Quality Assurance Plan (CQAP) describes the quality control components that will ensure that the proposed remedy accomplishes the remedial goals, remedial action objectives, and is completed in accordance with the design specifications. The CQAP will provide a detailed description of the observation and testing activities that will be used to monitor construction quality and confirm that remedy construction is in conformance with the remediation objectives and specifications. The CQAP will address the following:

- Responsibilities and authorities of the organizations and key personnel involved in the design and construction of the remedy.
- Qualifications of the quality assurance personnel that demonstrate that they possess the proper training and experience necessary to fulfill project-specific responsibilities.

The observations and tests that will be used to monitor construction and the frequency

of performance of such activities.

• The sampling activities, sample size, sample locations, frequency of testing, acceptance

and rejection criteria, and plans for implementing corrective measures as addressed in

the plans and specifications.

• Requirements for project coordination meetings between the Applicant and its

representatives, the Construction Manager, Excavation Contractor, remedial or

environmental subcontractors, and other involved parties.

Description of the reporting requirements for quality assurance activities including such

items as daily summary reports, schedule of data submissions, inspection data sheets,

problem identification and corrective measures reports, evaluation reports, acceptance

reports, and final documentation.

• Description of the final documentation retention provisions.

The Contractor and Construction Manager will have the primary responsibility to provide

construction quality. The principal personnel who will participate in the remedial action, and

implement this RAWP include the following project personnel.

**Professional Engineer:** Karen Tyll, P.E.

**QEP/Project Manager:** Dhanraj "Danny" Singh

Qualified Environmental Professional and/or his/her designee (QEP), under the direct supervision

of the Professional Engineer (PE), will:

• Be on-site during remedial action to monitor particulates and organic vapor in accordance

with the Health and Safety Plan (HASP). Any exceedances will be reported to the NYSDEC

and NYSDOH in the daily reports.

A QEP will meet with the Construction Superintendent on a daily basis to discuss the plans

for that day and schedule upcoming activities. The QEP will document all remedial

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activities in the daily report. This document will be forwarded to the Field Supervisor on a daily basis and to the PM and the RE on a weekly basis.

- A QEP will screen the excavation with a PID during intrusive activities. All readings will be noted in the record. Elevated readings will be reported to the NYSDEC and NYSDOH in the daily reports.
- A QEP will collect the excavation endpoint samples in accordance with the Plan.

# 4.1.5 Soil/Materials Management Plan (SMMP)

The SMMP is included in the RAWP under Section 5.4 and includes detailed plans for managing all soils/materials that are disturbed at the Site, including excavation, handling, storage, transport and disposal. It also includes all of the controls that will be applied to these efforts to assure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations.

## 4.1.6 Storm-Water Pollution Prevention Plan (SWPPP)

To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection. The erosion and sediment controls will be in conformance with requirements presented in the New York State Standards and Specifications for Erosion and Sediment Control.

## 4.1.7 Community Air Monitoring Plan (CAMP)

Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. The CAMP was prepared as part of the Site-specific HASP, which is enclosed as **Appendix F**.

4.1.8 Contractors' Site Operations Plan (SOP)

The Remedial Engineer has reviewed all plans and submittals for this remedial project (including

those listed above and contractor and sub-contractor document submittals) and confirms that

they comply with this RAWP. The Remedial Engineer is responsible to ensure that all later

document submittals for this remedial project, including contractor and sub-contractor

document submittals, comply with this RAWP. All remedial documents will be submitted to

NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.9 Citizen Participation Plan

A certification of mailing will be sent by the Volunteer to the NYSDEC project manager following

the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets

were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients

(contact list); and (5) a statement that the repository was inspected on [specific date] and that it

contained all of applicable project documents.

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without

written consent of the NYSDEC. No other information, such as brochures and flyers, will be

included with the Fact Sheet mailing.

The approved Citizen Participation Plan for this project is attached in **Appendix C** 

Document repositories have been established at the following locations and contain all

applicable project documents:

**Brooklyn Public Library – Highlawn Branch** 

1664 West 13th Street, at Kings Highway

Brooklyn, NY 11223

Phone: 718-234-7208

Hours: 10 AM – 6 PM (Mon, Wed, Fri), 1 PM – 8 PM (Tue), 10 AM – 5 PM (Sat), Closed on

Sundays

In addition, an electronic repository can be accessed via DEC Info Locator at the following link:

https://extapps.dec.nv.gov/data/DecDocs/C224307/

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## 4.1.10 Green Remediation Principles

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term.
- Reducing direct and indirect greenhouse gases and other emissions Increasing energy efficiency and minimizing use of non-renewable energy.
- Conserving and efficiently managing resources and materials.
- Reducing waste, increasing recycling and increasing reuse of materials that will otherwise be considered a waste.
- Maximizing habitat value and creating habitat when possible.
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals.
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

Some of the Green Remediation strategies that are being proposed during this remedial action include:

- Chose a remedial alternative that will reduce the number of trucks and provide an adequate cleanup of the Site as per NYSDEC requirements.
- Reduce both water consumption and control dust during the remedial activities by direct loading soil into the disposal transport trucks. Minimize double handling of excavated materials. Less stockpiling means less dust generated as they are being made.
- Tracking the BMPs used during the Remedial action using SEFA workbooks or other methods.

#### 4.2 GENERAL REMEDIAL CONSTRUCTION INFORMATION

## 4.2.1 Project Organization

Information regarding the organization/personnel and their associated responsibilities is provided below. An organization chart is included in **Figure 12**.

Resumes of key personnel involved in the Remedial Action are included in **Appendix G**.

# 4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Karen Tyll, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the 1665 Stillwell Avenue Site (NYSDEC Site No. C224307). The Remedial Engineer will certify in the Final Engineering Report that the remedial activities were observed by qualified environmental professionals under her supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The RE and/or designees will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of backfill material, and management of waste transport and disposal. The RE will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will provide the certifications listed in Section 10.1 in the FER.

#### 4.2.3 Remedial Action Construction Schedule

A remedial action schedule is discussed below in Section 10. If the schedule for remediation and development activities changes, it will be updated and submitted to NYSDEC. Currently, a three-month remediation period is anticipated.

# 4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings (DOB) construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by DOB. NYSDEC reserves the right to deny alternate remedial construction hours.

# 4.2.5 Site Security

Site access will be controlled by a locking wooden construction fence along the boundary of the property, with entry / exit access on Stillwell Avenue. The purpose of the fencing is to limit Site access to authorized personnel, protect pedestrians from Site activities, and maintain Site security.

#### 4.2.6 Traffic Control

Drivers of trucks leaving the Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on **Figure 5**.

If necessary, a flagging system will be used to protect workers, pedestrians and authorized guests.

Traffic will also adhere to applicable local, state, and federal laws.

# 4.2.7 Contingency Plan

If an unknown source of contamination or AOC that may require remediation (USTs, stained soil, drums, etc.) is identified during the site remediation, then this soil contingency plan will be implemented.

A 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 NYSDEC's Project Manager. Petroleum spills will be reported to the NYSDEC 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 NYSDEC. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

## 4.2.8 Worker Training and Monitoring

Worker training and monitoring will be conducted in accordance with the Site-specific CHASP, included as **Appendix F**.

# 4.2.9 Agency Approvals

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of City Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all federal, state and local governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work will be provided to the NYSDEC prior to start of remedial activities and construction. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

## 4.2.10 NYSDEC BCP Signage

Signs are optional for BCP sites and will be discussed with the NYSDEC Project Manager. If a sign is to be displayed, it will be erected at the main entrance to the Site prior to the start of any remedial activities. The sign will indicate that the project is being performed under the New York State Brownfield Cleanup Program. The sign will meet the detailed specifications provided by the NYSDEC Project Manager.

## 4.2.11 Pre-Construction Meeting with NYSDEC

A pre-construction meeting will be held between the NYSDEC, Volunteer, Remedial Environmental team, Construction Manager, and Contractor to discuss project roles, responsibilities, and expectations associated with the RAWP, and remedial process prior to the start of remedial construction activities. No remedial action work on Site should commence until after this meeting is held.

## 4.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in the HASP which will be updated as necessary throughout the project. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

## 4.2.13 Remedial Action Costs

The total estimated cost of the Remedial Action is \$850,000.00. This will be revised based on actual costs and submitted as an Appendix to the Final Engineering Report.

## **4.3 SITE PREPARATION**

#### 4.3.1 Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Prior to commencing the remedial excavation, the Remediation Contractor will mobilize to the Site and

prepare for remedial activities. Descriptions of some of the mobilization and Site preparation activities may include the following:

- Construction of fencing and barriers;
- Utility and subsurface structures locating and marking;
- Setup of construction equipment and facilities;
- Construction of erosion and sediment control measures; and
- Construction of a decontamination and staging area.

# 4.3.2 Monitoring Well / Vapor Probe Decommissioning

Existing groundwater monitoring wells will either be protected during remediation and development for use in post-remedial monitoring or will be properly decommissioned in accordance with NYSDEC Commissioners Policy CP-43. The only exception to this is if the full length of the well is to be excavated during remediation.

Similarly, existing soil vapor probes will be properly decommissioned unless they are to be fully removed during remediation or used for post-remedial monitoring.

#### 4.3.3 Erosion and Sedimentation Controls

Erosion and sediment controls will be implemented as required throughout remedy implementation and post remedial inspection and monitoring.

# 4.3.4 Stabilized Construction Entrance(s)

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 pads 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.

## 4.3.5 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

## 4.3.6 Sheeting and Shoring

A Support of Excavation (SOE), which may consist of sheet pile walls will be installed to support the excavation of the contaminated fill. Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities include excavation is the sole responsibility of the Volunteer and its contractors. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this Plan. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved Plan.

## 4.3.7 Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. Equipment and material staging areas are expected to be relocated throughout the Site during remedial construction.

#### 4.3.8 Decontamination Area

A decontamination area is not required, however, all equipment will be decontaminated and demobilized at the completion of all field activities.

## 4.3.9 Site Fencing

The Site perimeter will be secured by a lockable wooden construction fence and gates, with entry/exit access on Stillwell Avenue. The purpose of the fencing is to limit site access to authorized personnel, protect pedestrians from site activities, and maintain site security.

#### 4.3.10 Demobilization

The Demobilization will should address:

- Restoration of areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management area[s], and access area);
- Removal of temporary access areas (whether on-Site or off-Site) and restoration of disturbed access areas to pre-remediation conditions;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules 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.

#### 4.4 REPORTING

All daily and monthly Reports will be included in the Final Engineering Report.

## 4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP finding, including excursions; and
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

Daily Reports will include a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC is attached in **Figure 2**.

The NYSDEC assigned project number will appear on all reports.

## 4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers within one week following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;

- Sampling results received following internal data review and validation, as applicable;
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays; and
- Tracking of GSR metrics determined during the design process should be included in monthly reports.

## 4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the Final Engineering Report.

Progress with respect to green and sustainable remediation metrics will be Tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial program. Regular updates to the metrics used (SEFA, SiteWise<sup>TM</sup> or otherwise approved method) should be included.

Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

## 4.4.4 Complaint Management Plan

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

# 4.4.5 Deviations from the Remedial Action Work Plan

Any deviations from the RAWP will be coordinated with the NYSDEC in advance. Notification will be provided to the NYSDEC by telephone/email for conditions requiring immediate action (e.g., conditions judged to be a danger to the surrounding community). In the event of any deviations, the following will be noted:

- Reasons for deviating from the approved RAWP;
- Approval process to be followed for changes/editions to the RAWP; and
- Effect of the deviations on overall remedy.

# 5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

#### **5.1 SOIL CLEANUP OBJECTIVES**

The Soil Cleanup Objectives for this Site are listed in **Appendix E.** Soil and materials management on-Site and off-Site will be conducted in accordance with the Soil Management Plan as described below.

Table [x] summarizes all soil samples that exceed the SCOs proposed for this Remedial Action. A spider map that shows all soil samples that exceed the SCOs proposed for this Remedial Action is shown in Figure 3A of the RIR by RSK.

UST closures will, at a minimum, conform to criteria defined in DER-10.

# 5.2 REMEDIAL PERFORMANCE EVALUATION (POST EXCAVATION END-POINT SAMPLING)

## 5.2.1 End-Point Sampling Frequency

Removal actions for development purposes under this plan will be performed in conjunction with confirmation endpoint soil sampling. Eight (8) endpoint samples (EP-1 through EP-8) will be collected (see a copy of Endpoint Sampling Location Plan attached as **Figure 6**) to evaluate attainment of RRSCOs, and confirm the removal of soil/fill exceeding PGW SCOs.

- 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-feet 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-sq. ft. of bottom area.
  - For subsurface removals, one sample from the excavation bottom for every 900sq. ft. of bottom area.

- 3. For sampling of volatile organics, bottom samples will be taken within 24 hours of excavation, and will be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours will be taken at six to twelve inches.
- 4. For contaminated soil removal, post remediation soil samples for laboratory analysis will be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

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

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

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

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

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

In the event the soil samples exceed RRSCOs and PGW SCOs, further excavation will take place, and five (5) post-excavation confirmatory samples will be collected post excavation to meet RRSCOs and PGW standards.

## 5.2.2 Methodology

End-point samples will be collected from the sidewalls and base of the remedial excavation at any hotspot locations identified in the Remedial Investigation, in accordance with NYSDEC DER-10. End-point samples will be analyzed for SCO trigger parameters.

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

# **5.2.3 Reporting of Results**

The analytical results of the end-point samples will be tabulated and compared to the RRSCOs. The tabulated data as well as the laboratory reports will be included in the FER. The samples will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory. The results will be reported in accordance with the NYSDEC requirements for Category B data deliverables as outlined in DER-10.

#### 5.2.4 QA/QC

QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering

compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. A summary of the field and laboratory QA/QC procedures is provided below.

Field QA/QC will include the following procedures:

- Calibration of field equipment, including PID, on a daily basis;
- Use of dedicated and/or disposable field sampling equipment;
- Proper sample handling and preservation;
- Proper sample chain of custody documentation; and
- Completion of report logs.

The above procedures will be executed as follows:

- Two duplicate samples (one soil and one groundwater sample) will be collected to
  evaluate field sampling precision or reproducibility of measurements of the same
  parameter under the given set of conditions;
- Disposable sampling equipment, including acetate sleeves, latex gloves, and disposable bailers (or sample tubing), will be used to minimize cross-contamination between samples;
- For each of the parameters analyzed, a sufficient sample volume will be collected to adhere to the specific analytical protocol, and provide sufficient sample for reanalysis if necessary;
- Because plasticizers and other organic compounds inherent in plastic containers may contaminate samples requiring organic analysis, samples will be collected in glass containers, with the exception of the nitrate-preserved groundwater sample for metals analysis; and
- Appropriate sample preservation techniques, including cold temperature storage at 4º C,
   will be utilized to ensure that the analytical parameters concentrations do not change
   between the time of sample collection and analysis.

Samples will be analyzed prior to the expiration of the respective holding time for each analytical parameter to ensure the integrity of the analytical results.

## 5.2.5 Data Usability Summary Reports (DUSRs)

ASP Category B deliverables will be prepared for all remedial performance samples collected during implementation of this RAWP. Data Usability Summary Reports (DUSR) will be prepared by a qualified data validator and the findings will be reported in the FER.

## 5.2.6 Reporting of End-Point Data in FER

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

## **5.3 ESTIMATED MATERIAL REMOVAL QUANTITIES**

The estimated quantity of soil/fill to be removed from the Site is 1,185 cubic yards (1,778-tons). An additional 1,142 yds (1,714-tons) of soil/fill will be excavated for development purposes. The location of planned excavations is shown in **Figure 4.3.** 

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

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the final remedial report. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the final remedial report. 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 NYSDEC 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

The Final Engineering 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 FER.

# **5.4 SOIL/MATERIALS MANAGEMENT PLAN**

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. Approximately 3,492-tons of soil material may be required to be excavated during the remedial construction and disposed of offsite. Any required fill material will meet NYSDEC-approved backfill and cover soil quality objectives for this Site. Imported soils will not exceed groundwater protection standards established in Part 375. Imported soils for Track 1 cleanup remedial action projects will not exceed UUSCOs.

## **5.4.1 Soil Screening Methods**

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field geologist under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the Final Engineering Report.

Screening will be performed by qualified environmental professionals. Resumes will be provided for all personnel responsible for field screening (i.e. those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

## **5.4.2 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. 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. 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.

Soil stockpiles will be continuously encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points. A dedicated water truck equipped with a water cannon will be available on-Site for dust control.

#### 5.4.3 Materials Excavation and Load Out

The Remedial Engineer or a qualified environmental professional under his/her supervision will oversee all invasive work and the excavation and load-out of all excavated material. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site will be investigated by the Remedial Engineer prior to the start of Remedial Activities.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Vehicles leaving the Site will not be overloaded. The Remedial Engineer's representative will make reasonable efforts to ensure that vehicles are not loaded beyond their NYSDOT weight rating and that all material is secured beneath the truck bed cover.

A truck wash will be operated on-Site. The Remedial Engineer will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the remedial construction is complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment Tracking.

The Remedial Engineer will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan. Each hotspot and structure to be remediated (USTs, vaults and associated piping, transformers, etc.) will be removed and end-point remedial performance sampling completed before excavations related to Site development commence proximal to the hotspot or structure.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation

required by this plan. Mechanical processing of historical fill and contaminated soil on-Site is prohibited.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the Final Engineering Report.

## **5.4.4 Materials Transport Off-Site**

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Truck transport routes are as follows [describe route and provide map]. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

Proposed in-bound and out-bound truck routes to the Site are shown in **Figure 5**. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting 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; [(g) community input [where necessary].

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development. Queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be prohibited.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

## **5.4.5 Materials Disposal Off-Site**

Disposal locations will be established at a later date will be reported to the NYSDEC Project Manager.

Based on the Remedial Investigation, the total quantity of material expected to be disposed off-Site is 2,328-cubic yards (3,492-tons).

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

The following documentation will be obtained and reported by the Remedial Engineer for each disposal facility used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the Remedial Engineer or BCP [Applicant / Volunteer / Participant] to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

Non-hazardous historic fill and contaminated soils taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360.2. The Remedial Engineer is responsible for assuring material is properly characterized and determining the appropriate disposal methods based on the characterization results.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360.15 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the Final Engineering Report.

Hazardous wastes derived from on-Site will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.

Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state and local laws rules and regulations and facility-specific permits. Sampling and analytical

methods, sampling frequency, analytical results and QA/QC associated with waste characterization activities will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt. Waste characterization data will be used solely for complying with requirements for off-site disposal.

## 5.4.6 Materials Reuse On-Site

Soil reuse is not planned for this project. In the event any site soils are reused, a "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to material reuse on the site.

Concrete crushing or processing on-Site is prohibited, unless NYSDEC has specifically approved on-site processing and reuse of acceptable demolition material.

Contaminated on-Site material, including historic fill and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. This will be expressed in the final Site Management Plan.

## 5.4.7 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Dewatering fluids will be managed off-Site.

Discharge of water generated during remedial construction to surface waters (i.e. a local pond, stream, river and/or storm sewer) is prohibited without a SPDES and NYCDEP Discharge permit.

#### 5.4.8 Demarcation

After the completion of soil removal and any other invasive remedial activities and prior to backfilling, a land survey will be performed by a New York State licensed surveyor. The survey

will define the top elevation of residual contaminated soils. A physical demarcation layer, consisting of orange snow fencing material or equivalent material will be placed on this surface to provide a visual reference. This demarcation layer will constitute the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the Site Management Plan. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and subsoils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the Site Management Plan. A map showing the survey results will be included in the Final Engineering Report and the Site Management Plan.

#### 5.4.9 Backfill from Off-Site Sources

All materials proposed for import onto the Site will be approved by the NYSDEC and the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. Additionally, materials brought to the Site will be in accordance with DER-10 5.4(e) and will meet the requirements of NYCRR 375-6.7(d).

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Solid waste will not be imported onto the Site.

The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all import of soils from off-Site, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan".

All imported soils will meet NYSDEC approved backfill or cover soil quality objectives for this Site. These NYSDEC approved backfill or cover soil quality objectives are the lower of the protection of groundwater or the protection of public health soil cleanup objectives for [site specific use] as set forth in Table 375-6.8(b) of 6 NYCRR Part 375 and listed in Tables [x]. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved

Remedial Action Work Plan or its approval by NYSDEC should be construed as an approval for this purpose.

Soils that meet 'general or exempt fill' requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Nothing in this Remedial Action Work Plan should be construed as an approval for this purpose.

## 5.4.10 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Silt fencing or hay bales will be installed around the entire perimeter of the remedial construction area.

## 5.4.11 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment and surrounding soils, etc. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides, PCBs and PFAS).

Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and periodic electronic media reports.

## 5.4.12 Community Air Monitoring Plan

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

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

A Special Community Monitoring Plan is put in place for this Site to fulfil the special requirements for work within 20-feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities as per the following:

- Special Requirements for work within 20-feet of potentially exposed individuals and structures: As the Site is within 20-feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates will reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices are considered to prevent exposures related to the work activities and to control dust and odors. Consideration is given to implementing the planned activities during weekends or evening hours in non-residential settings, when the potentially exposed populations are at a minimum.
  - o If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring will occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions will also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings will be discussed with NYSDOH prior to commencement of the work.
  - o If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities will be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.
  - Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions will be pre-determined, as necessary, for each site.
- Special Requirements for Indoor Work with Co-Located Residences or Facilities: Unless a self-contained, negative-pressure enclosure with proper emission controls will

encompass the work area, all individuals not directly involved with the planned work will be absent from the room in which the work will occur. Monitoring requirements will be as stated above under "Special Requirements for Work Within 20-feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, will be understood and the monitoring locations established accordingly. In these situations, as recommended, the exhaust fans or other engineering controls will be used to create negative air pressure within the work area during remedial activities. Additionally, the planned work will be implemented during hours (e.g., weekends or evenings) when building occupancy is at a minimum.

# **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. Similarly, upwind concentrations will also be monitored continuously during all ground intrusive work. 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 shut down.

All 15-minute readings must be recorded and be available for DEC 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 will be visually assessed during all work activities.

• If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 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/m3 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/m3 of the upwind level and in preventing visible dust migration

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

## 5.4.13 Odor, Dust and Nuisance Control Plan

The Final Engineering Report will include the following certification by the Remedial Engineer: "I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."

## 5.4.13.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site [and on-Site, if there are residents or tenants on the property]. Specific odor control methods to be used on a routine basis 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 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. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Remedial Engineer, who is responsible for certifying the Final Engineering Report.

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

## 5.4.13.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work, will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-Site water truck
  for road wetting. The truck will be equipped with a water cannon capable of spraying
  water directly onto off-road areas including excavations and stockpiles. [Alternate
  language: Water will be available on-site at suitable supply and pressure for use in
  dust control.]
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water spraying.

## 5.4.13.3 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

## 6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Residual contaminated soil vapor is not expected to exist beneath the Site after the remedy is complete, and Engineering and Institutional Controls (ECs and ICs) will be installed to protect human health and the environment. These ECs and ICs are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have three (3) primary EC systems. These are: (1) Composite Cover, (2) Active Sub-Slab Depressurization System, and (3) Soil Vapor Extraction System.

The FER will report residual contamination on the Site in tabular and map form. This will include presentation of exceedances of both UUSCOs and RRSCOs.

# 7.0 ENGINEERING CONTROLS: COMPOSITE COVER SYSTEM

Exposure to residual contaminated soils will be prevented by an engineered, composite cover system that will be built on the Site. To incorporate green remediation principles and techniques to the extent feasible in the development at this site, the building will include as an element of construction (not an EC) a minimum 20-mil vapor barrier membrane on and under the foundation, which may improve energy efficiency. Proposed development plans are provided in Appendix A.

The cover will consist of the structures such as buildings, pavement, and sidewalks comprising the Site development. This composite cover system will be comprised of 4-inches of reinforced concrete cellar slab underlain by a 20-mil vapor barrier (an element of construction (not an EC)) and 6-inches of ¾-inch imported crushed stone to be placed beneath the entire proposed building footprint, and 4-inches of reinforced concrete slab underlain by 8-inches of ¾-inch imported crushed stone and 1 to 1.5-ft. of certified clean fill for the proposed rear and side yard.

A diagram showing the cover type locations are shown as **Figure 8** and the design detail for each cover type is shown in **Figure 8**.

An Excavation Plan will be included in the Site Management Plan and will outline the procedures to be followed if the site cover system and underlying residual contamination are disturbed after the Remedial Action is complete.

The components of the site cover system will be documented in the FER. Maintenance of this site cover system will be described in the SMP.

## 8.0 ENGINEERING CONTROLS: TREATMENT SYSTEMS

Engineering Controls will be employed in the remedial action to address residual contamination remaining at the Site. The Site has two (2) primary Engineering Control Systems. These are:

- (1) Active Sub-Slab Depressurization System
- (2) Soil Vapor Extraction System

#### SUB-SLAB DEPRESSURIZATION SYSTEM

Migration of soil vapor into the building will be mitigated with the construction of an active Sub-Slab Depressurization System (SSDS). The SSDS will consist of a single loop of horizontal pipe set in the middle of a 6-inch gas permeable layer immediately beneath the building cellar slab and vapor barrier system (an element of construction (not an EC)). The gas permeable layer will be constructed using %-inch crushed blue stone placed directly beneath the building cellar slab. The horizontal piping will consist of fabric wrapped, perforated 4-inch diameter corrugated HDPE pipe manifolded to a schedule-40 6-inch solid cast iron riser pipe that penetrates the most northeastern section foundation wall and travels along the building rear exterior wall to the firstfloor roof. The riser pipe will be equipped with an inline vacuum fan and finished at 6.5-feet above the top of the first-floor roof with a 6-inch goose neck pipe to prevent rain infiltration. The final location of the extraction fan will be verified prior to installation in order to maintain appropriate discharge and comply with 10-feet minimum away from any fresh air intake or windows. The active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the active SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the building slab to prevent vapor migration into the building.

The location and layout of the SSDS is shown in **Figure 10**. A typical section of the system is shown in **Figure 10(B)**.

## SOIL VAPOR EXTRACTION (SVE) SYSTEM

The SVE system is proposed to reduce the PCE and BTEX contaminant mass in soil in the vicinity of the vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs. The installation and operation of an active SVE will comprise of an 8-feet length 4-inch diameter slotted (0.050-inch) scheduled-40 PVC screen (extraction pipe) wrapped with a filter fabric sock and installed vertically in an 8-inch coring at a termination depth of 12-feet bgs. The annular around the 4-inch PVC screen will be filled with 3/4inch crushed blue stones to a height not to exceed 4-feet bgs. At 4-feet below grade, the extraction pipe will be connected to a solid 4-inch diameter scheduled-40 PVC and run horizontally west-southwest towards the building rear exterior wall. The extraction PVC piping will run vertically along the building exterior wall and will be equipped with an inline vacuum fan and finished at 6.5-feet above the top of the first-floor roof with a 6-inch goose neck pipe to prevent rain infiltration. The final location of the extraction fan will be verified prior to installation in order to maintain appropriate discharge and comply with 10-feet minimum away from any fresh air intake or windows. The SVE system is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE system was designed and properly installed to establish a vacuum in the gas permeable layer and a negative pressure.

The location and layout of the SVE is shown in **Figure 10**. A typical section of the system is shown in **Figure 10(A)**.

The SSDS and SVE are permanent engineering controls. These systems will be inspected, and its performance certified at specified intervals as required by the Site Management Plan submitted as part of the FER. Maintenance of the systems will be described in the Site Management Plan in the FER. All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER.

# 9.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

## 9.1 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

## 9.2 Sub-Slab Depressurization System (SSDS)

The active SSD system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSD system may be submitted by the property owner based on confirmatory data that justifies such request. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

## 9.3 Soil Vapor Extraction System [SVE System]

The SVE system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the system may be submitted by the property owner after residual contamination concentrations in groundwater: (1) are cleaned up to levels below NYSDEC standards, (2) have become asymptotic over an extended period of time as mandated by the NYSDEC and the NYSDOH, or (3) if NYSDEC has determined that the AS/SVE system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the Site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by NYSDEC and NYSDOH. These sampling/monitoring activities will adhere to stipulations outlined in the Monitoring Plan section of the SMP.

### **10.0 INSTITUTIONAL CONTROLS**

After the remedy is complete, the Site will have residual contamination remaining in place. Engineering Controls (ECs) for the residual contamination have been incorporated into the remedy to render the overall Site remedy protective of public health and the environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan.

All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER. A Site -specific Environmental Easement will be recorded with the City of New York to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

### **10.1 ENVIRONMENTAL EASEMENT**

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left on-Site after the Remedial Action is complete. As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the City of New York, Office of the City Register. The Environmental Easement will be submitted as part of the Final Engineering Report.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the Brooklyn County Office of the City Register before the Certificate of Completion can be issued by NYSDEC. A series of Institutional Controls are required

under this remedy to implement, maintain and monitor these Engineering Control systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to mixed commercial and residential uses only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the Site Management Plan, which provides all of the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All Engineering Controls must be operated and maintained as specified in this SMP;
- A composite cover system consisting of 4-inches of reinforced concrete cellar slab underlain by a 20-mil vapor barrier (an element of construction (not an EC)) and 6-inches of ¾-inch imported crushed stone to be placed beneath the entire proposed building footprint, and 4-inches of reinforced concrete slab underlain by 8-inches of ¾-inch imported crushed stone and 1 to 1.5-ft. of certified clean fill for the proposed rear yard and side yard, must be inspected, certified and maintained as required in the SMP (Figure 8);
- A sub-slab depressurization system (SSDS) under all building structures must be inspected, certified, operated and maintained as required by the SMP;
- A soil vapor extraction system under all building structures must be inspected, certified,
   operated and maintained as required by the SMP;
- All Engineering Controls on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;

- Any other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-Site environmental monitoring devices, including but not limited to, [groundwater monitor wells and soil vapor probes], must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- Engineering Controls may not be discontinued without an amendment or extinguishment of the Environmental Easement.

Adherence to these Institutional Controls for the Site is mandated by the Environmental Easement and will be implemented under the Site Management Plan (discussed in the next section). The Controlled Property (Site) will also have a series of Institutional Controls in the form of Site restrictions and requirements. The Site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the Site Management Plan;
- The Controlled Property may be used for [usage type: e.g. restricted commercial] use only, provided the long-term Engineering and Institutional Controls included in the Site Management Plan are employed;
- The Controlled Property may not be used for a higher level of use, such as [restricted residential] use without an amendment or extinguishment of this Environmental Easement;

• Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

### **10.2 SITE MANAGEMENT PLAN**

Site Management is the last phase of remediation and begins with the approval of the Final Engineering Report and issuance of the Certificate of Completion (COC) for the Remedial Action. The Site Management Plan is submitted as part of the FER but will be written in a manner that allows its removal and use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the Site Management Plan are performed.

Site Management Plans should include methods to incorporate and Track GSR. Measures should be taken to maintain a cost-effective, protective remedy that remains conscientious of the Site's environmental footprint. At a minimum, the following should be assessed: waste generation, energy usage, emissions, and water usage.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate,

preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be on an annual basis. The Site Management Plan will be based on a calendar year and will be due for submission to NYSDEC by March 1 of the year following the reporting period.

The Site Management Plan in the Final Engineering Report will include a monitoring plan for groundwater at the down-gradient Site perimeter to evaluate Site -wide performance of the remedy. Groundwater monitor wells will also be installed immediately down-gradient of all VOC remediation areas for the purpose of evaluation of the effectiveness of the remedy that is implemented.

No exclusions for handling of residual contaminated soils will be provided in the Site Management Plan (SMP). All handling of residual contaminated material will be subject to provisions contained in the SMP.

### 11.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The Final Engineering Report will include as-built drawings for all constructed elements, calculation and manufacturer documentation for treatment systems, certifications, manifests, bills of lading as well as the complete Site Management Plan (formerly the Operation and Maintenance Plan). The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the Final Engineering Report review.

The Final Engineering Report will include written and photographic documentation of all remedial work performed under this remedy. The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Unrestricted Use SCO in 6NYCRR Part 375-6. A table that shows exceedances from Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

Final Engineering Reports must include a discussion of the green remediation practices/technologies employed throughout the remedial program. A final footprint analysis using a DER accepted model, and any Tracking methods used through the construction including restoration activities. Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

#### 11.1 CERTIFICATIONS

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer Karen Tyll, PE who is a Professional Engineer registered in New York State This certification will be appropriately signed and stamped. The certification will include the following statements:

I, <u>Karen Tyll, PE</u>, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 1665-1673 Stillwell Avenue Site (NYSDEC Site No. C224307).

I certify that the Site description presented in this FER is identical to the Site descriptions presented in the Environmental Easement, the Site Management Plan, and the Brownfield Cleanup Agreement for 1665-1673 Stillwell Avenue and related amendments.

I certify that the Remedial Action Work Plan dated [month day year] and Stipulations [if any] in a letter dated [month day year] and approved by the NYSDEC were implemented and that all requirements in those documents have been substantively complied with.

I certify that the remedial activities were observed by qualified environmental professionals under my supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and all operation and maintenance requirements applicable to the Site are contained in an Environmental Easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded. A Site Management Plan has been submitted by the Volunteer for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the NYSDEC.

I certify that the export of all contaminated soil, fill, water or other material from the property was performed in accordance with the Remedial Action Work Plan, and were taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that all import of soils from off-Site, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan.

I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology and soil screening methodology defined in the Remedial Action Work Plan.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

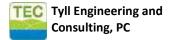
It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York. State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

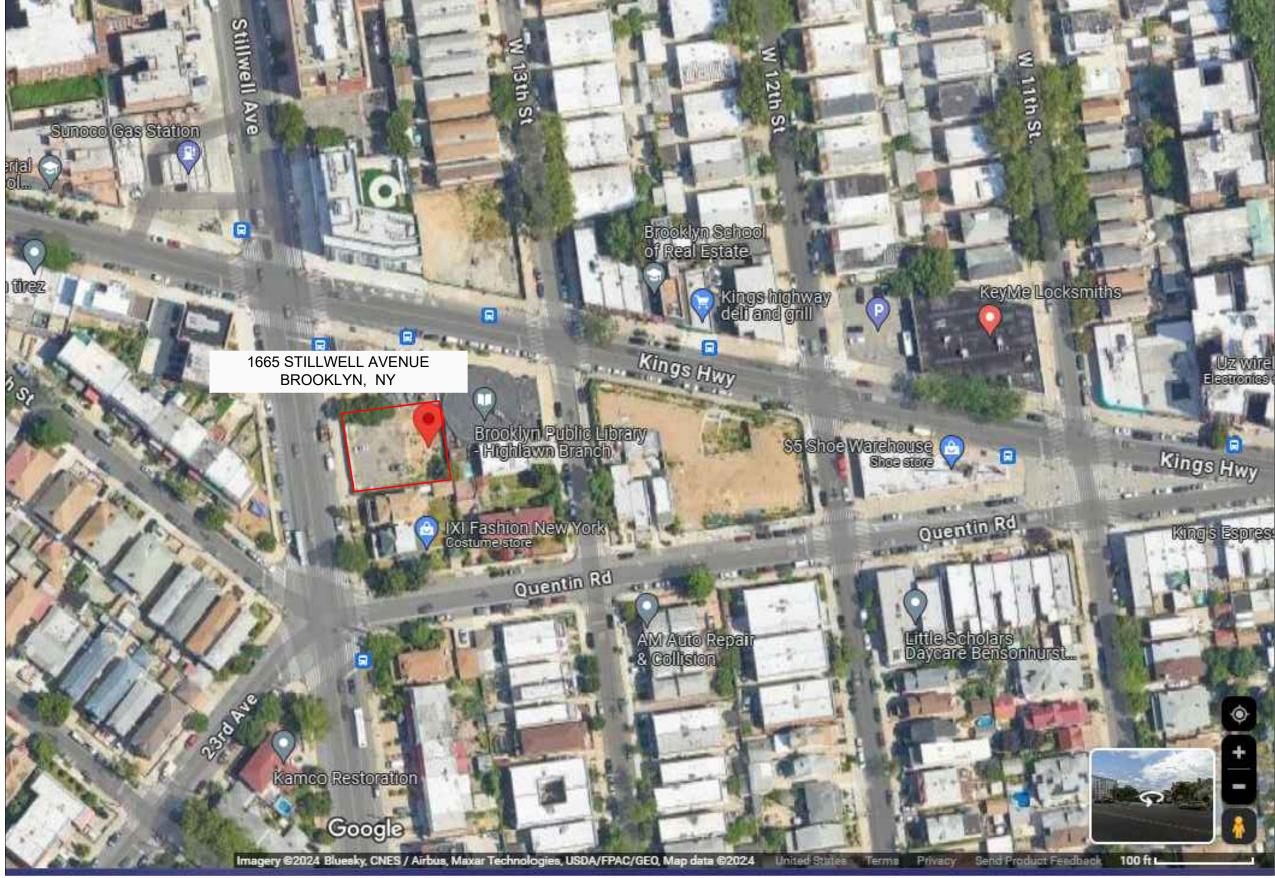
### 12.0 SCHEDULE

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 NYSDEC. Currently, a three-month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial	Duration (weeks)
	Action Start	
NYSDEC Approval of RAWP	0	-
Fact Sheet 2 announcing start of	0	4
remedy		
Mobilization	4	2
Remedial Excavation	6	16
Demobilization	22	2
Submit Final Engineering Report	30	6

### **Figures**





PREPARED BY:

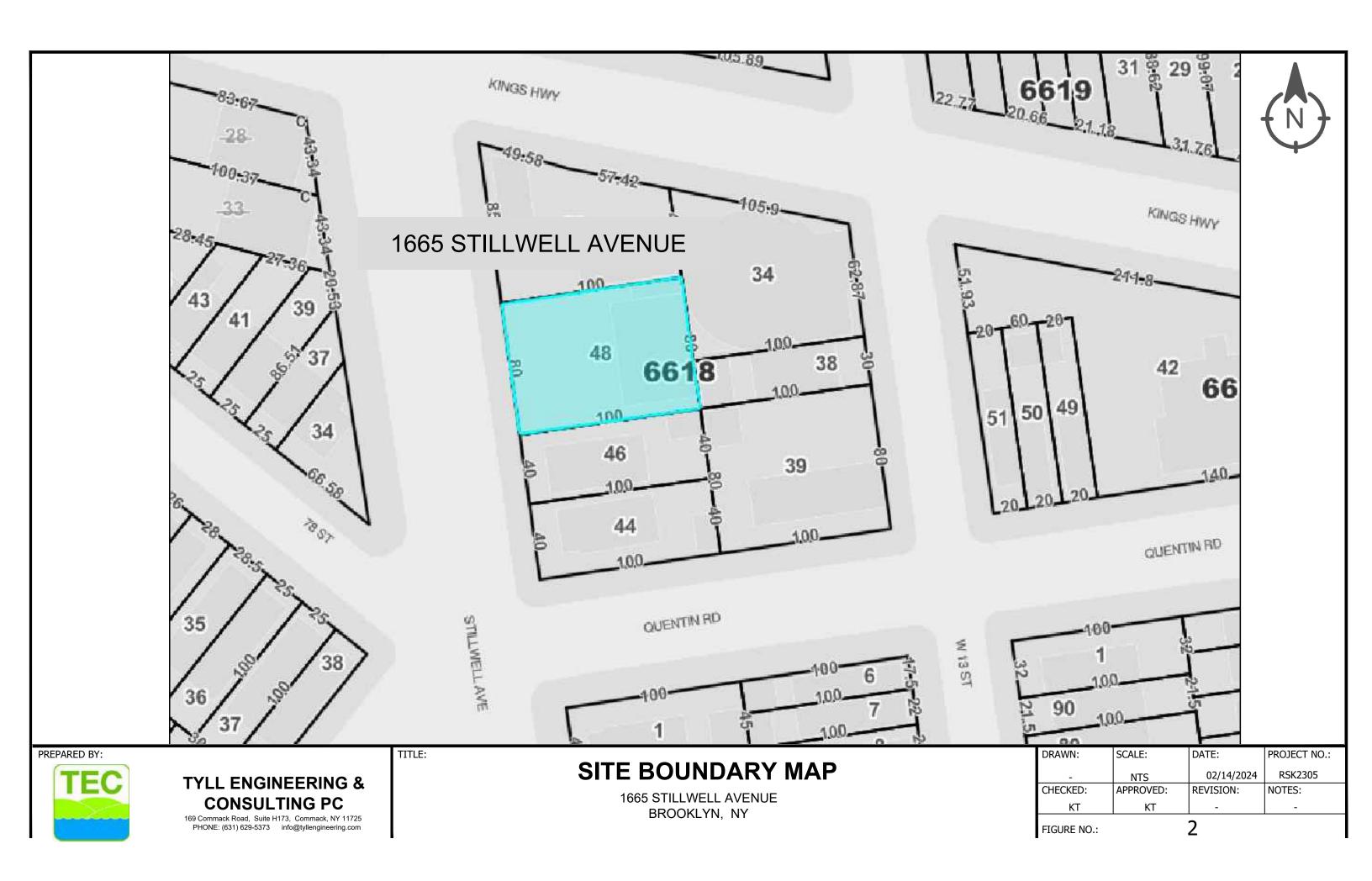


# TYLL ENGINEERING & CONSULTING PC

169 Commack Road, Suite H173, Commack, NY 11725 PHONE: (631) 629-5373 info@tyllengineering.com TITLE:

### **SITE LOCATION MAP**

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	02/14/2024	RSK2305
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:		_	
		1	







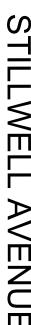


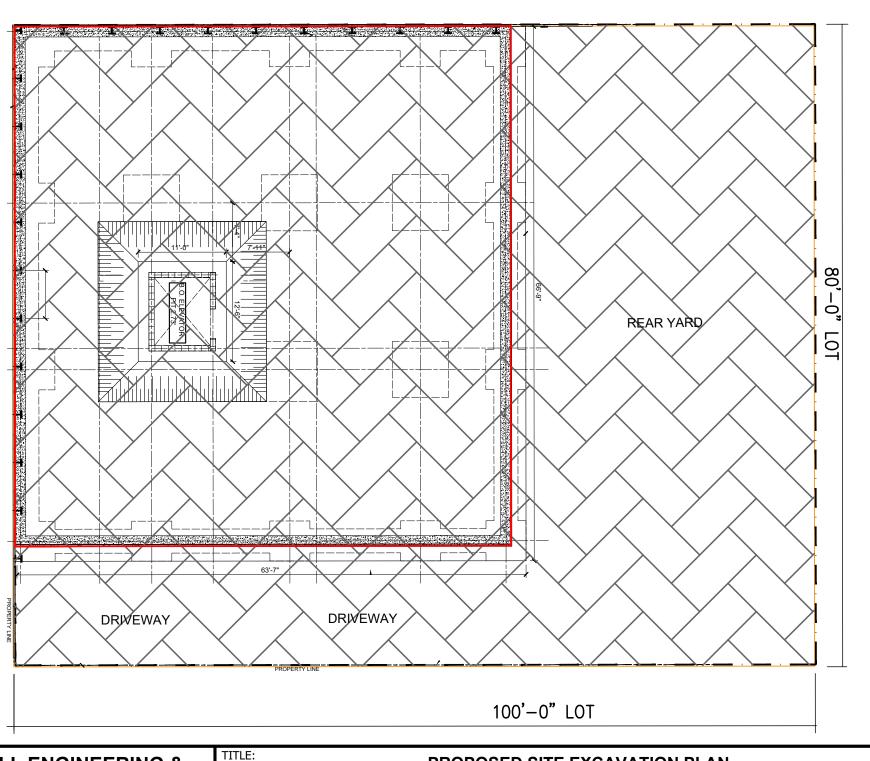
# TYLL ENGINEERING & CONSULTING PC

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### **SURROUNDING LAND USE MAP**

ı,	F			
	DRAWN:	SCALE:	DATE:	PROJECT NO.:
	-	NTS	02/14/2024	RSK2305
	CHECKED:	APPROVED:	REVISION:	NOTES:
	KT	KT	-	-
	FIGURE NO.:	•		
			5	







### **LEGEND**

### PROPOSED REMEDIAL EXCAVATION

-17' SITE-WIDE EXCAVATION (TRACK 1)

PROPOSED CELLAR/BUILDING LINE

\_\_\_\_ · \_\_\_\_ LOT LINE



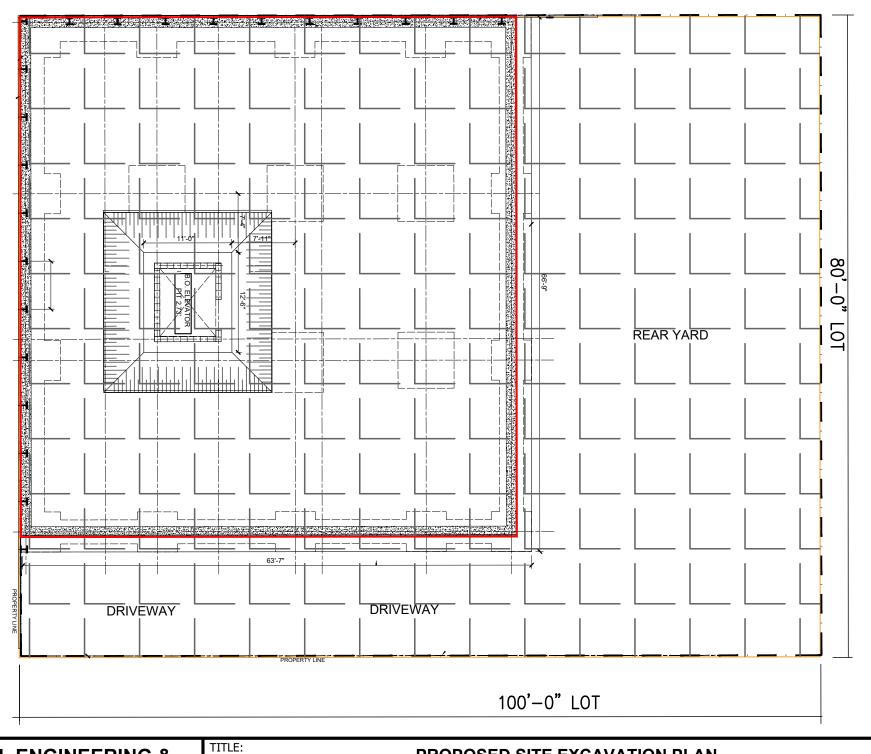
# TYLL ENGINEERING & CONSULTING PC

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# PROPOSED SITE EXCAVATION PLAN (Track 1)

DRAWN:	SCALE:	DATE:	PROJECT NO.:	
-	NTS	09/20/2024		
CHECKED:	APPROVED:	REVISION:	NOTES:	
KT	KT	-	-	
FIGURE NO.: 4.1				

# STILLWELL AVENUE





### **LEGEND**

### PROPOSED REMEDIAL EXCAVATION

-4' SITE-WIDE EXCAVATION (TRACK 2)

PROPOSED CELLAR/BUILDING LINE

— · — LOT LINE

PREPARED BY:



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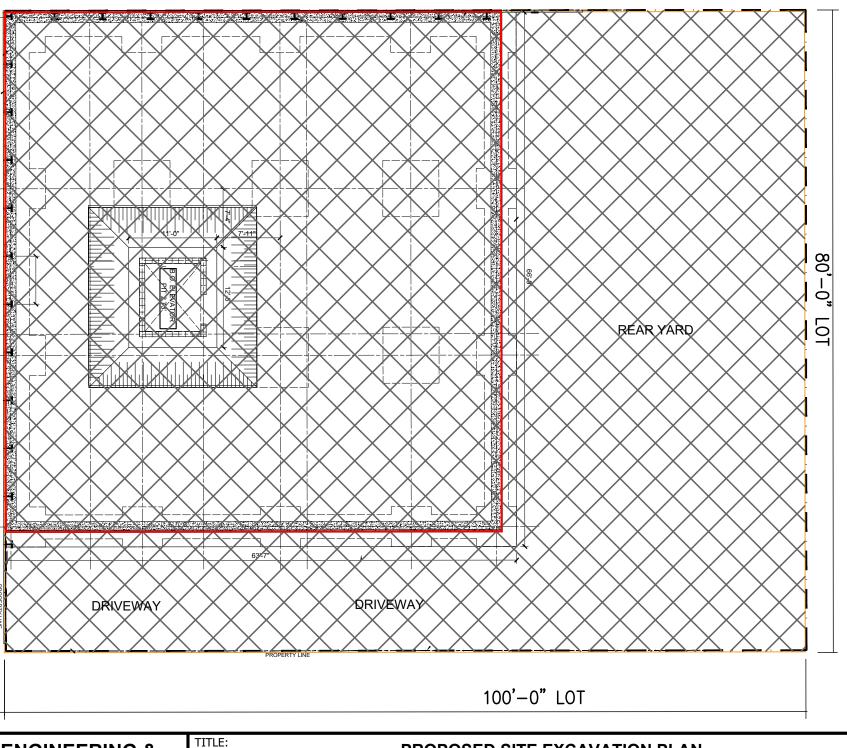
### PROPOSED SITE EXCAVATION PLAN (Track 2)

1665 STILLWELL AVENUE BROOKLYN, NY

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	09/20/2024	
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:			

4.2







### **LEGEND**

PROPOSED REMEDIAL EXCAVATION



-2' SITE-WIDE EXCAVATION (TRACK 4)



PROPOSED CELLAR/BUILDING LINE



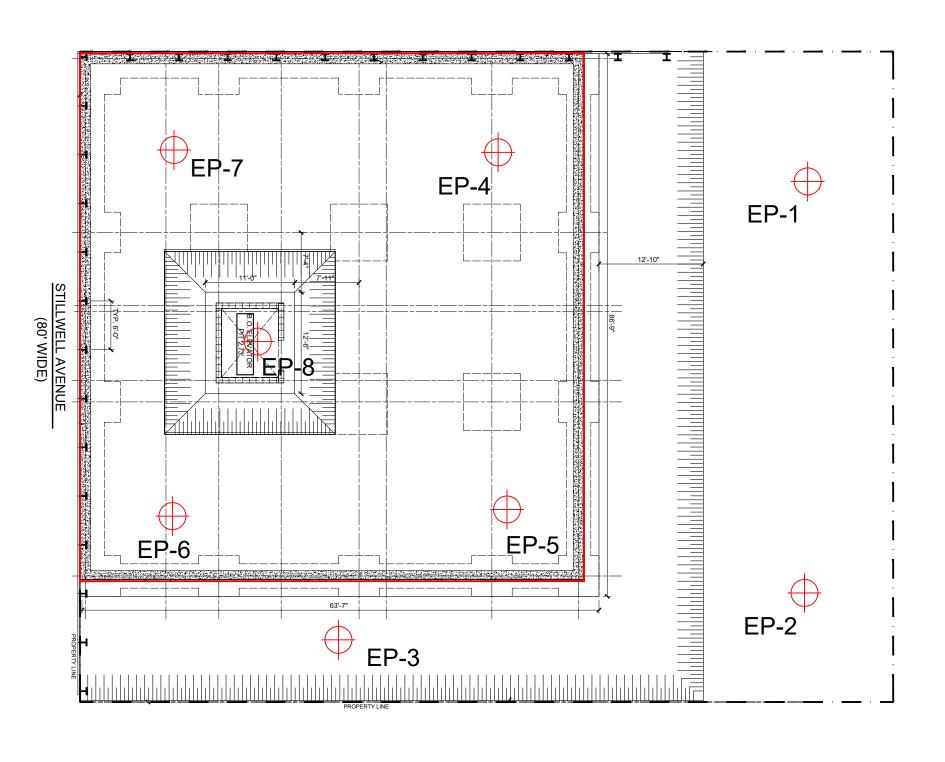
### **TYLL ENGINEERING & CONSULTING PC**

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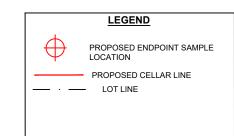
### PROPOSED SITE EXCAVATION PLAN (Track 4)

DRAWN:	SCALE:	DATE:	PROJECT NO.:	
-	NTS	09/20/2024		
CHECKED:	APPROVED:	REVISION:	NOTES:	
KT	KT	-	-	
FIGURE NO.: 4.3				













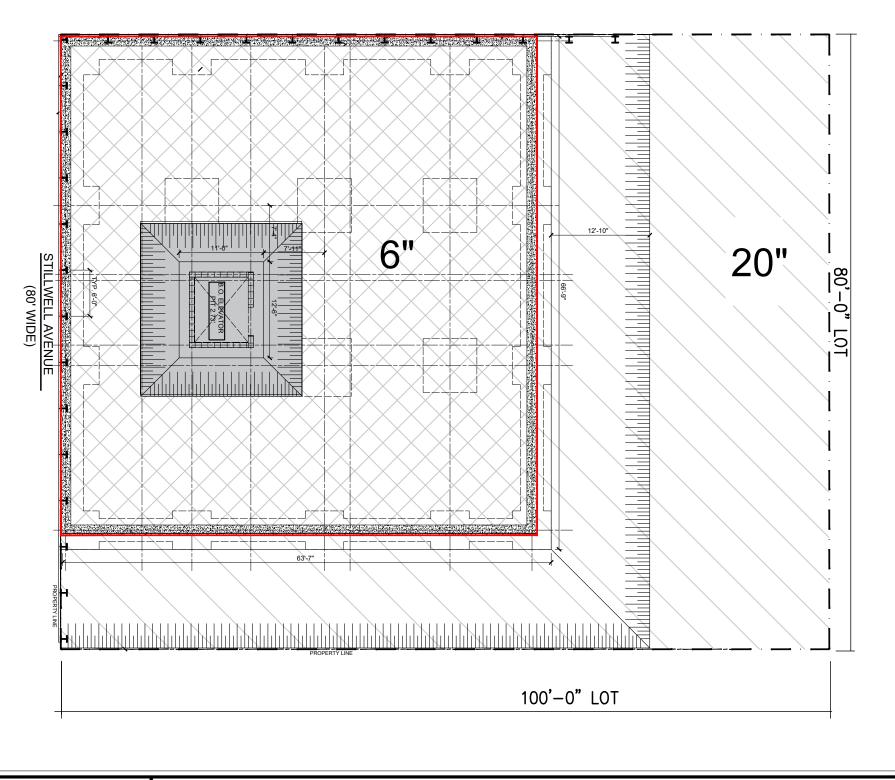
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TITLE:

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# PROPOSED ENDPOINT SAMPLE LOCATION MAP

DRAWN:	SCALE:	DATE:	PROJECT NO.:	
-	NTS	02/14/2024	RSK2305	
CHECKED:	APPROVED:	REVISION:	NOTES:	
KT	KT	-	-	
FIGURE NO.:	IGURE NO.:			





### **LEGEND**

PROPOSED 8" LAYER OF ¾" CRUSHED
BLUESTONES UNDERLAIN WITH 12"
C.C. FILL IN REAR YARD & DRIVEWAY

PROPOSED 6" LAYER OF \(^{\frac{3}{4}\)"

CRUSHED BLUESTONES IN CELLAR

AREA

PROPOSED CELLAR LINE

LOT LINE

PREPARED BY:

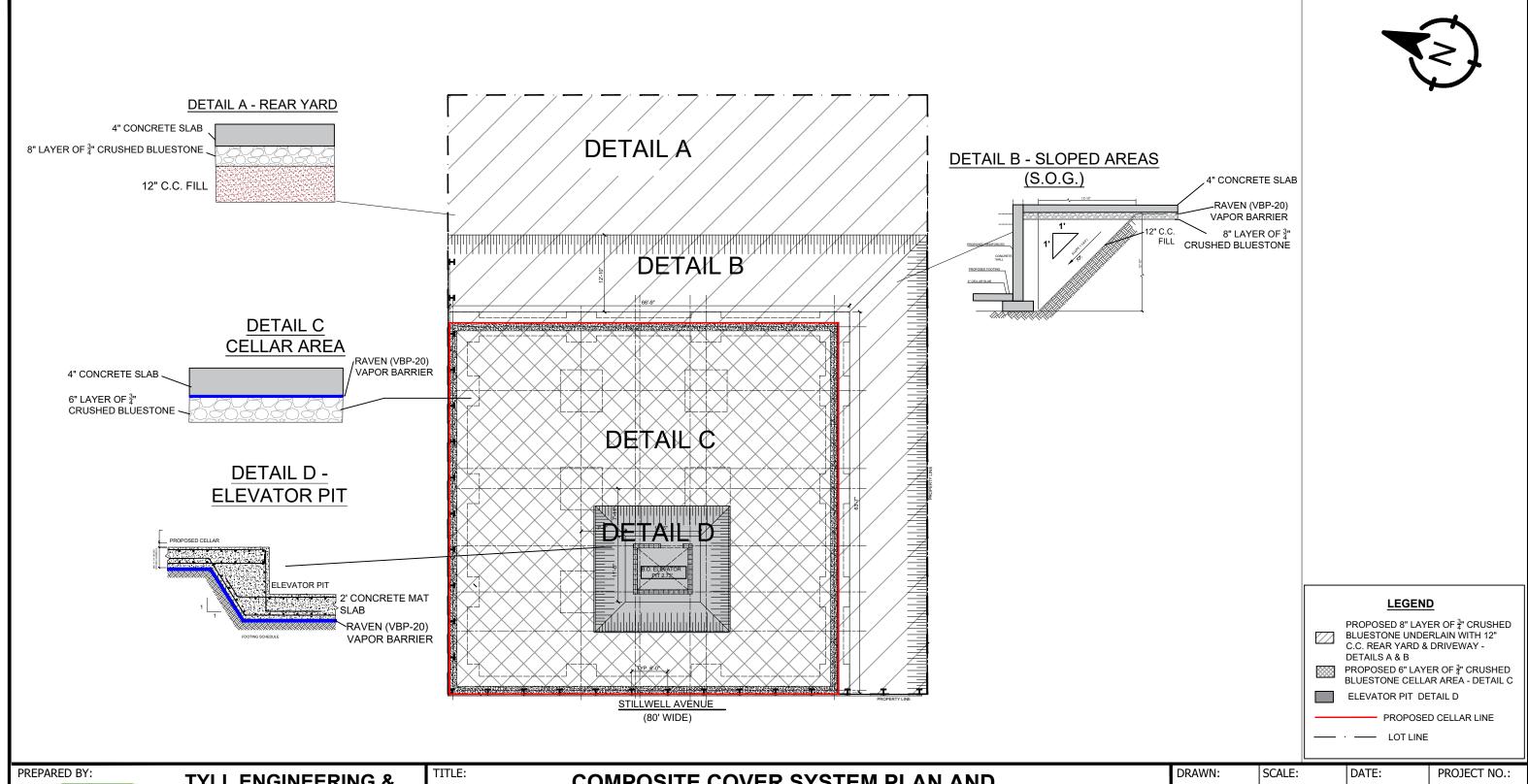


# TYLL ENGINEERING & CONSULTING PC

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### PROPOSED BACKFILL PLACEMENT MAP

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	02/14/2024	RSK2305
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:		7	





# TYLL ENGINEERING & CONSULTING PC

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COMPOSITE COVER SYSTEM PLAN AND DETAILS

DRAWN:	SCALE:	DATE:	PROJECT NO.:	
-	NTS	02/14/2024	RK2305	
CHECKED:	APPROVED:	REVISION:	NOTES:	
KT	KT	-	-	
FIGURE NO.:	NO.: 8			

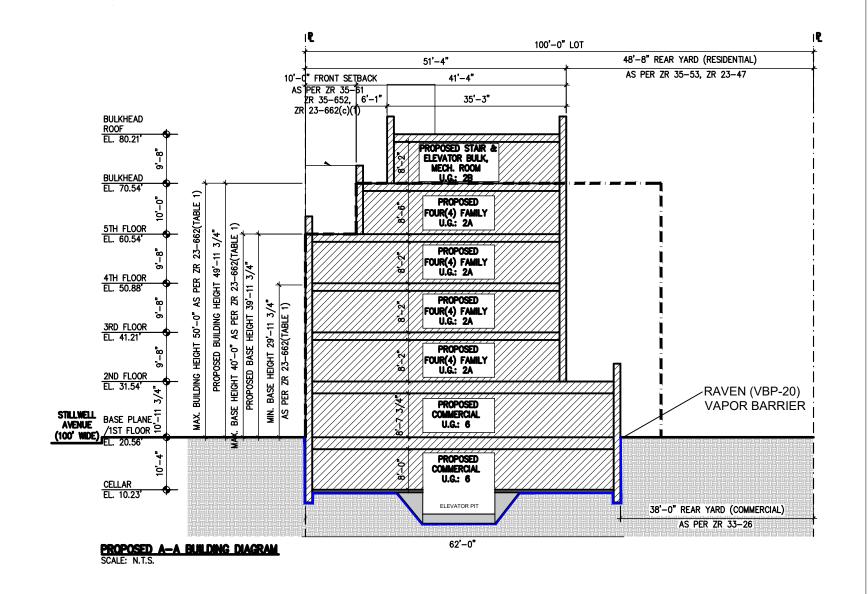


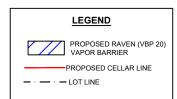
# **DETAIL A:** VAPOR BARRIER SITE-WIDE LAYOUT

# 

STILLWELL AVE

### **DETAIL B:** VAPOR BARRIER LAYOUT (SIDE VIEW)





### PREPARED BY:

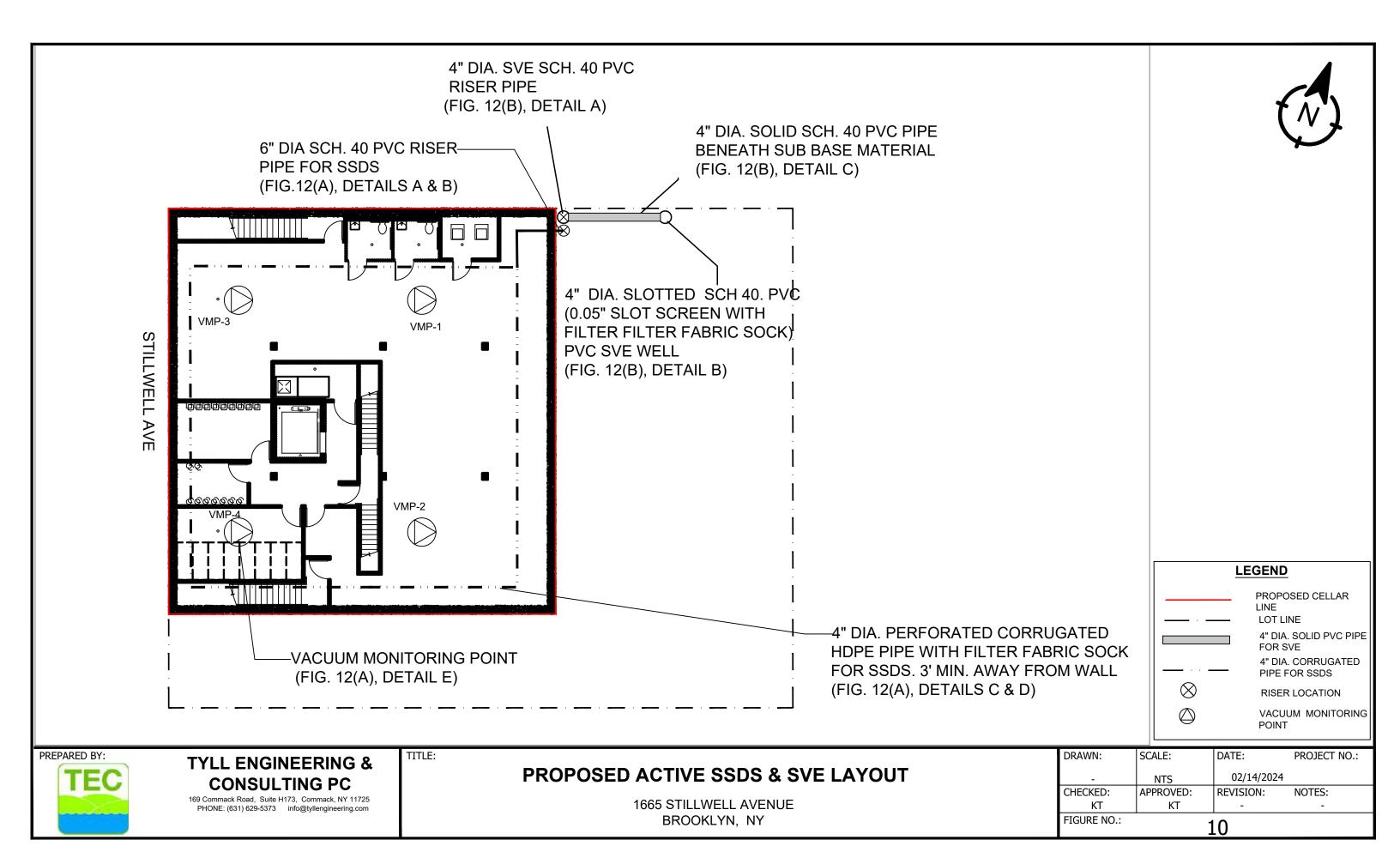


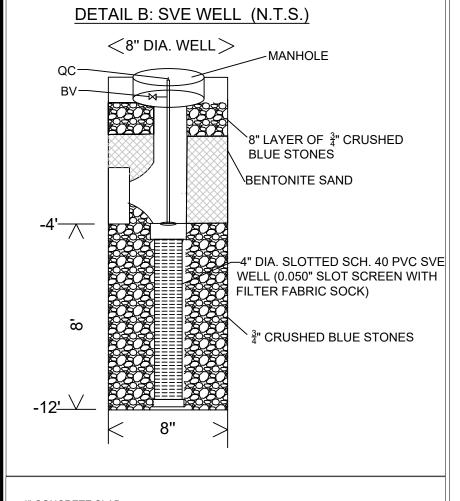
TYLL ENGINEERING & CONSULTING PC

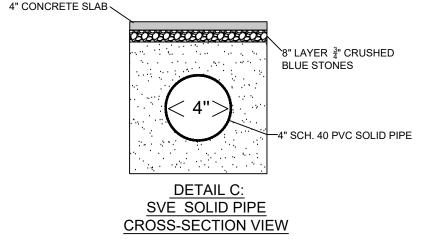
169 Commack Road, Suite H173, Commack, NY 11725 PHONE: (631) 629-5373 info@tyllengineering.com TITLE:

**VAPOR BARRIER SYSTEM LAYOUT** 

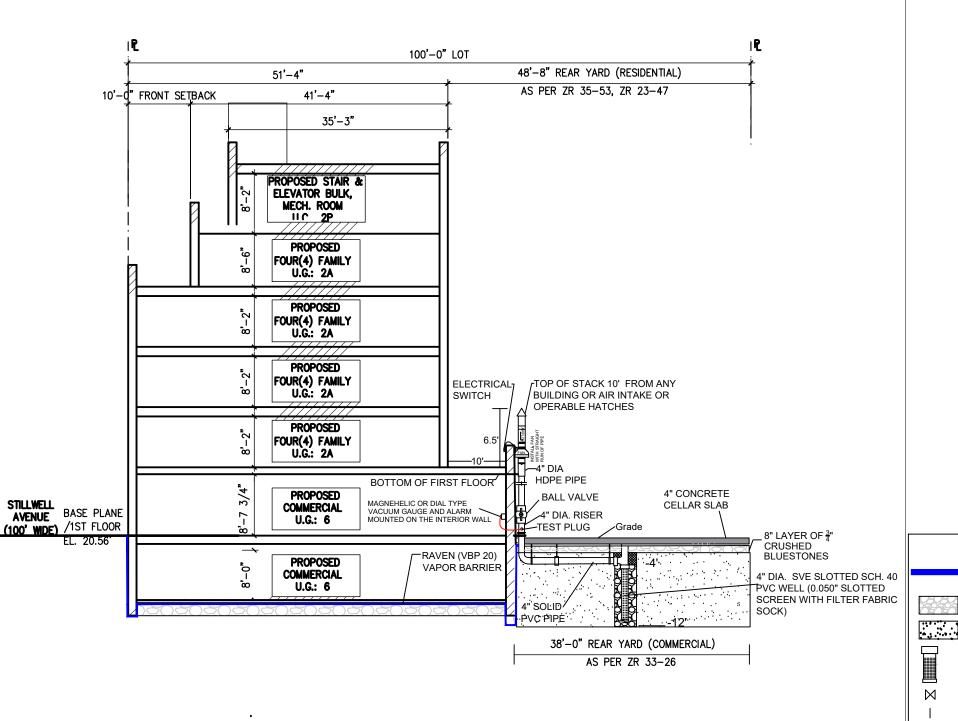
DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	02/14/2024	
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:		9	







### DETAIL A: SVE SYSTEM LAYOUT (SIDE VIEW)







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### **PROPOSED SVE DETAILS**

1665 STILLWELL AVENUE BROOKLYN, NY

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	02/14/2024	
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:	10	(A)	

**LEGEND** 

VAPOR BARRIER

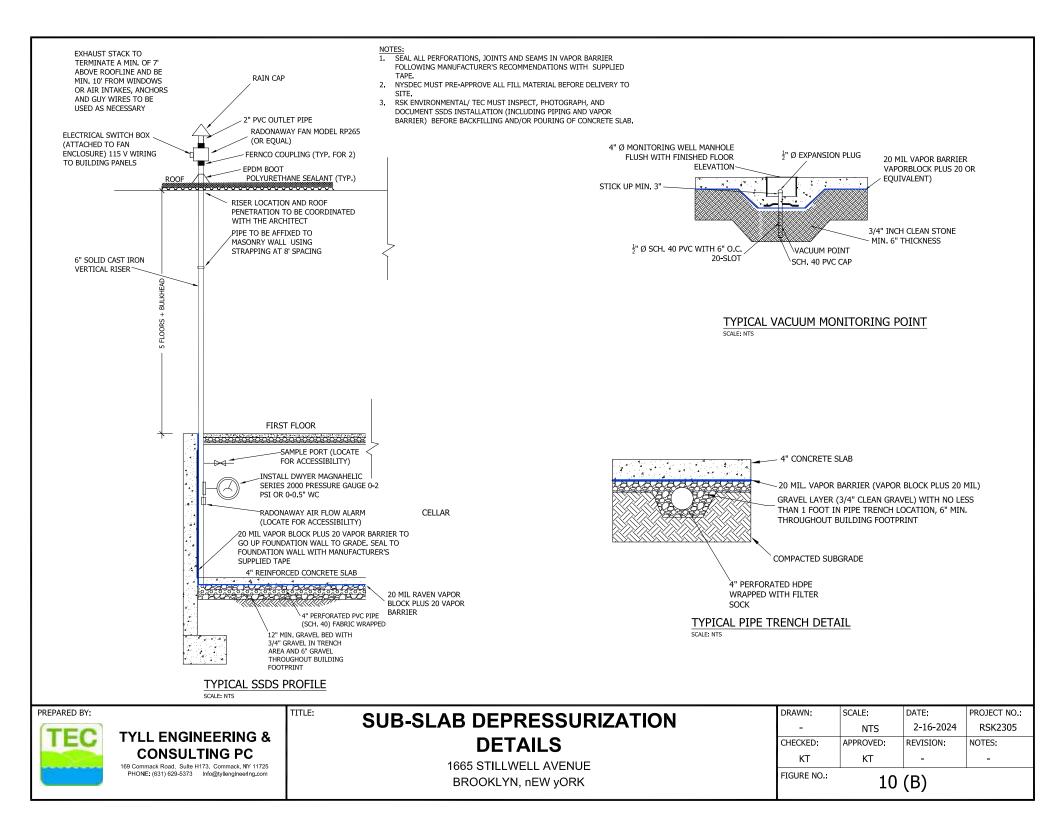
BALL VALVE
QUICK CONNECT

PROPOSED RAVEN (VBP 20)

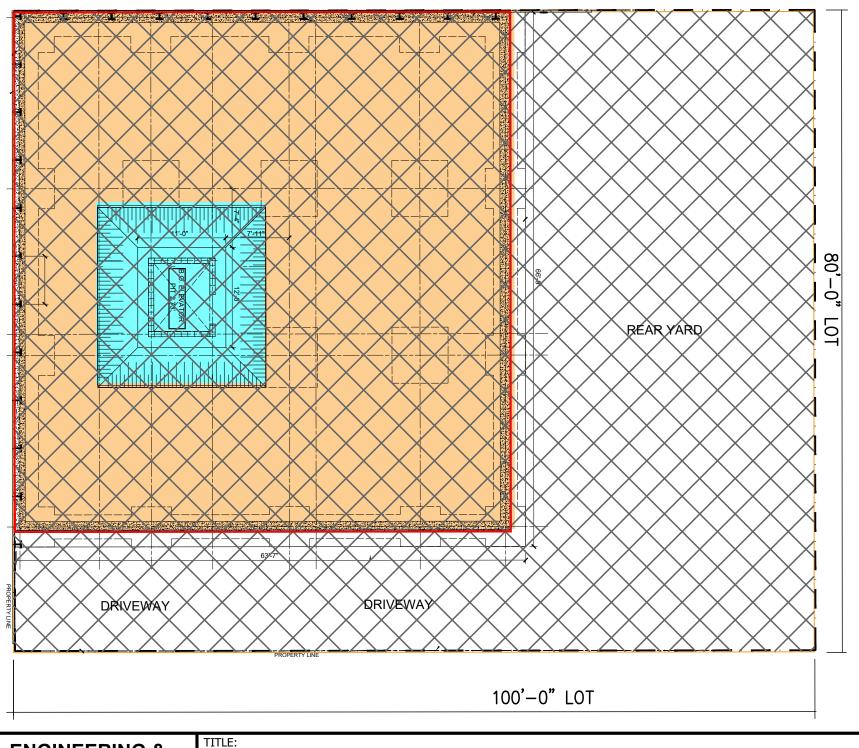
3" CRUSHED BLUE STONES

4" SVE PERFORATED SVE

IMPORTED CLEAN SOIL



# STILLWELL AVENUE





### **LEGEND**

### PROPOSED DEVELOPMENT EXCAVATIONS

-4' SITE-WIDE EXCAVATION

-12' NEW CELLAR EXCAVATION

-17' NEW ELEVATOR PIT EXCAVATION

PROPOSED CELLAR/BUILDING LINE

— · — LOT LINE

PREPARED BY:

### **TYLL ENGINEERING & CONSULTING PC**

169 Commack Road, Suite H173, Commack, NY 11725 PHONE: (631) 629-5373 info@tyllengineering.com

### PROPOSED REDEVELOPMENT EXCAVATION PLAN

DRAWN:	SCALE:	DATE:	PROJECT NO.:
-	NTS	09/20/2024	
CHECKED:	APPROVED:	REVISION:	NOTES:
KT	KT	-	-
FIGURE NO.:	1	1	



### ORGANIZATIONAL CHART FOR 1665 STILLWELL AVENUE BROOKLYN, NY DEC #

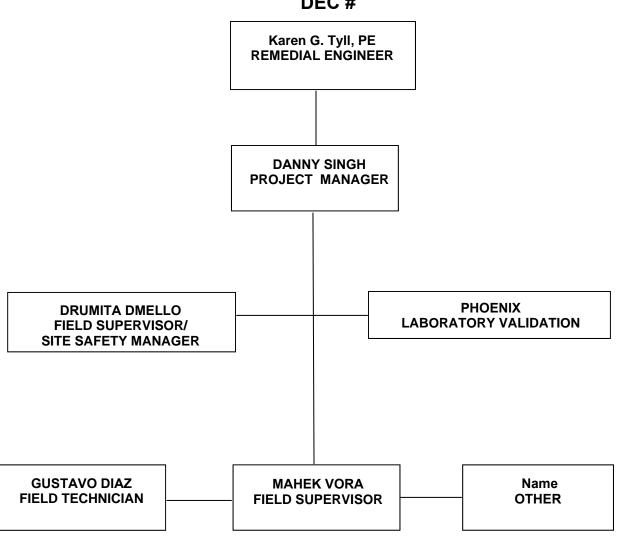


Figure 12

# Appendix A Proposed Development Plans



COMMERCIAL:

= 8,000.00 S.F.

R6B WITH C2-3 COMMERCIAL OVERLAY

SEE SURVEY 80.00'X100.00'

1665 STILLWELL AVENUE, BROOKLYN NY 11223

ZONE

MAP No.

ADDRESS

LOT AREA

FLOOR AREA SUMME	RY (COMMERCIAL U	<u>SE. U.G. 6)</u> ***PLEASE	SEE FLOOR AREA DIAG	RAMS AT Z-002.00***
		PROPOSED F.A.	DEDUCTION	TOTAL
CELLAR (NOT F.A.)	COM. U.G. 6	<del>-4,030.00 S.F.</del>	─ <del>0 S.F.</del>	<del>-4,030.00 S.F.</del>
1ST FLOOR	COM. U.G. 6	3,493.63 S.F.	69.10 S.F.	3,424.53 S.F.
TOTAL FLOOR AREA				3,424.53 S.F.

PROPOSED FLOOR AREA CAL	CULATION (COMMERCIAL U.G. 6)	
MAX ALLOWABLE F.A.R. R6B=2.0	$00 \mid (LOT AREA = 8,000.00 S.F.)X(MAX ALLOW)$	$V_{.} = 2.0$ )=16,000.00 S.F. (ZR 35-31,ZR 33-1
PROPOSED COM. F.A.		= 3,424.53 S.F. < 16,000.00 S.FOh
PROPOSED COM. F.A.R	3,424.53 S.F. / 8,000.00 S.F.	= 0.428   (0.428 < 2.00) OK

MAX COMMERCIAL COVERAGE	DICTATE BY YARD REQUIREMENT		
REQ. SIDE YARD	0' OR 8'		( ZR 33-25
PROPOSED SIDE YARD	PROPOSED SIDE YARD 14'-10"	= 14'-10"OK	( ZR 33-25
REQ. REAR YARD	20'-0"		( ZR 33-26
PROPOSED REAR YARD	PROPOSED REAR YARD 38'-0"	= 38'-0"OK	( ZR 33-26

PARKING REGULATION (COMM	IENCIAL U.G. O		
REQ'D COMMERCIAL PARKING	1 PER 400 S.F. (C2-3, GENERAL RET	AIL)	( ZR 36-21)
	= (4,030.00 + 3,424.53)/400 = 18.6	64 USE 19 REQ'D	
PROPOSED PARKING	WAIVED IF LESS THAN 25 REQ'D	= 0 PROPOSEDOK	( ZR 36-231)
BICYCLE PARKING REGULATION	ONS (COMMERCIAL U.G. 6)		

COMMERCIAL PARKING	REQ 1 PER 10,000 S.F. (4,030.00 +	3,424.53)/10,000 = 1 REQ'D	( ZR 36-711)
PROPOSED PARKING	WAIVED IF LESS THAN 3 REQ'D	= 0 PROPOSEDOK	( ZR 36-711(d))

### RESIDENTIAL:

FLOOR AREA SUMME	ERY (RESIDENTIAL U.G. 2	***PLEASE	SEE FLOOR AREA DIAG	RAMS AT Z-002.00***
		PROPOSED F.A.	DEDUCTION	TOTAL
1ST FLOOR	LOBBY, U.G. 2B	536.13 S.F.	<del>231.96 S.F.</del>	304.17 S.F.
2ND FLOOR	4 FAMILY, U.G. 2A	3,243.95 S.F.	<del>-143.20 S.F</del>	3,100.75 S.F.
3RD FLOOR	4 FAMILY, U.G. 2A	3,243.95 S.F.	<del>-143.20 S.F</del>	3,100.75 S.F.
4TH FLOOR	4 FAMILY, U.G. 2A	3,243.95 S.F.	<del>-143.20 S.F</del>	3,100.75 S.F.
5TH FLOOR	4 FAMILY, U.G. 2A	3,011.45 S.F.	<del>-129.80 S.F</del>	2,881.65 S.F.
BULKHEAD (NOT F.A.)	STAIR & ELEVATOR BULK, MECH. ROOM U.G. 2B	<del>1,319.25 S.F.</del>	— 0 S.F.	<del>-1,319.25 S.F.</del>
TOTAL FLOOR AREA		13,279.43 S.F.	791.36 S.F.	12,488.07 S.F.

MECH. ROOM U.G. 2B	,,515125 5111		","	
TOTAL FLOOR AREA	13,279.43 S.F.	791.36 S.F.	12,4	-88.07 S.F.
FLOOR AREA AND COVERAGE REGULATIONS (RESIDENTIAL U.G. 2)				
RESIDENTIAL MAX. F.A.R. R6B = 2.00				(ZR 35-31,
MAX ALLOWABLE F.A.R. = 2.00 (LOT AREA	= 8,000.00 S.F. X MAX AL	LOW = 2.00) = 16,000	0.00 S.F.	ZR 23-153)
PROPOSED RESIDENTIAL F.A.		=12,488.07 S.	F. < 16,000.	00 S.FOK
PROPOSED RESIDENTIAL F.A.R 12,488.07	S.F. / 8,000.00 S.F.	= 1.561 (	(1.561 < 2.00	)OK)

		,
RESIDENTIAL MAX. COVERAGE R6B		
MAX COVERAGE (IN PERCENT)	R6B = 60%	( ZR 23-153,
MAX COVERAGE	60% x 8,000.00 S.F. = 4,800.00 S.F. > 3,243.95OK	ZR 35-33,
PROPOSED COVERAGE	3,243.95 / 8,000.00 = 0.405 = 40.5% < 60%OK	ZR 35-34)
DENCITY OACH ATION (DECIDENT	AL II O O	·

DENSITY CACULATION (RESIDENTIAL U.G. 2)				
R6B = R6 F.A. PER DU. = 680	(16,000.00 - 3,424.53 COMMERCIAL)	/ 680 = 18.49 USE 18 DU ALLOW	(ZR 23-22,	
PROPOSED DU	PROPOSED 16 DU	= 16 < 18OK	ŽR 23–24,	
			ZR 35-40)	

		ZR 35-40)
MINIMUM LOT AREA AND WID	TH FOR RESIDENTIAL	
REQ'D SIZE OF LOT WIDTH	EXISTING LOT WIDTH 80'-0" > 18'-0'OK	( ZR 23-32)
REQ'D SIZE OF LOT AREA	EXISTING LOT AREA 8,000.00 > 1,700OK	( ZR 23-32)
YARD REGULATIONS		
REQ'D FRONT YARD	NONE REQUIRED	(ZR 35-51)
PROPOSED FRONT YARD	PROPOSED FRONT YARD = 0'OK	, ,
REQ'D SIDE YARD	= 0' OR 8'	(ZR 35-52,
PROPOSED SIDE YARD	PROPOSED SIDE YARD 14'-10" = 14'-10"OK	ZR 23-462(c)
REQ'D REAR YARD	MIN. 30'	(ZR 35-53,
PROPOSED REAR YARD	PROPOSED REAR YARD = 48'-8"OK = OK	ZR 23-47)
OTDEET WALL LOOATION (OF	F DIAGRAM AT 7 007 00)	

PROPOSED REAR YARD	PROPOSED REAR YARD = 48'-8"OK = OK	ZR 23-47)
STREET WALL LOCATION (SEE	DIAGRAM AT Z-003.00)	
REQ'D STREET WALL LOCATION	MIN. 70% OF THE AGGREGATE WIDTH OF STREET WALL SHALL BE LOCATED WITHIN 8'-0" OF STREET LINE, AND EXTEND TO AT LEAST MIN. BASE HEIGHT	(ZR 35-651(a))
PROPOSED STREET WALL LOCATION	N O' AND MAX. 5' FROM STREET LINE, AND EXTEND TO HIGHER THAN MIN. BASE HEIGHT	
HEIGHT AND SETRACK RECIT	ATIONS (SEE DIAGRAM AT 7-003 00)	·

TEIGHT AND SETBACK REGULATIONS (SEE DIAGRAM AT Z-003.00)				
REQ'D BASE HEIGHT	MIN BASE 30'-0", MAX BASE 40'-0"	(ZR 35-61,		
PROPOSED BASE HEIGHT	PROPOSED BASE HEIGHT 39'-11 3/4"OK	ZR 35-652(a),		
		ZR 23-662(TABLE 1))		
MAX. BUILDING HEIGHT	MAX. BUILDING HEIGHT 50'-0"	(ZR 35-61,		
PROPOSED BUILDING HEIGHT	PROPOSED BUILDING HEIGHT 49'-11 3/4"OK	ZR 35-652(a),		
		ZR 23-662(TABLE 1))		
REQ'D FRONT SETBACK	MIN 10'-0" FRONTING ON WIDE STREET	(ZR 35-61,		
		ZR 35-652,		
PROPOSED FRONT SETBACK	PROPOSED FRONT SETBACK 10'-0"OK	ZR 23-662(c)(1))		

THO OOLD DOILDING TILIOTT	I NOI OSED DOIEDING HEIGHT 43 -	11 J/4 UN	ZIV 33 032(u),
			ZR 23-662(TABLE 1)
REQ'D FRONT SETBACK	MIN 10'-0" FRONTING ON WIDE ST	REET	(ZR 35-61,
			ZR 35-652,
PROPOSED FRONT SETBACK	PROPOSED FRONT SETBACK 10'-C	"OK	ZR 23-662(c)(1))
MINIMUM DISTANCE BETWEEN L	EGALLY REQUIRED WINDOWS AI	ND WALLS OR LOT LINES	
MIN. REQ'D WINDOW DISTANCE	MIN. DISTANCE BETWEEN WINDOW	AND REAR LOT LINE = $30'-0"$	ZR 23-861
PROPOSED WINDOW DISTANCE	PROPOSED WINDOW DISTANCE = 4	48'-8" > 30'-0"OK	ZR 23-861
PARKING REGULATION (RESIDEN	NTIAL U.G. 2)		
REQ'D RESIDENTIAL PARKING	50% OF 16 DU = 8	=8 REQ'D	( ZR 25-23
PROPOSED PARKING	PROPOSED 8 PARKING	=8 PROPOSEDOK	( ZR 25-23
BICYCLE PARKING REGULATIONS	S (RESIDENTIAL U.G. 2)		
	•		

REQ 1 SPACE PER 2 DWELLING UNIT

PROPOSED 8 BICYCLE PARKING

( ZR 25-811)

( ZR 25-811)

= 8 REQ'D

= 8 PROPOSED ...OK

RESIDENTIAL PARKING

PROPOSED PARKING

COM. + RES

	<u> </u>	
TOTAL F.A.R. CALCULATION		
MAX ALLOWABLE F.A.R. = 2.00	(LOT AREA = 8,000.00 S.F. X MAX ALLOW = 2.00) = 16,000.00 S.F.	
TOTAL PROPOSED F.A.	3,424.53 + 12,488.07 = 15,912.60 S.F. < 16,000.00 S.FOK	
TOTAL ACTUAL F.A.R.	15,912.60 / 8,000.00 = 1.989 < 2.00OK	ZR 23-153)
STREET TREE		

REQ'D STREET TREE

ONE TREE PER 25'
80'-0 / 25'-0" = 3.2 USE 3 REQ'D

(ZR 26-41, ZR 23-03, ZR 33-03)

PROPOSED STREET TREE

= 3 ...OK

QUALITY HOUSING REQ. (ZR 28-00) REFUSE STORAGE OR DISPOSAL (ZR 28-12)				
REQUIREMENT	RESIDENTIAL STORAGE AND REMOVAL LOCATIONS SHALL BE PROVIDED AT THE RATE OF 2.9 CUBIC FEET PER DWELLING UNIT, PROPOSED 15 DWELLING UNITS, REQ'D STORAGE = 2.9X16 = 46.4 CUBIC FEET A REFUSE DISPOSAL ROOM OF NOT LESS THAN 12 SQUARE FEET WITH NO DIMENSION LESS THAN THREE FEET SHALL BE PROVIDED ON EACH STORY THAT HAS ENTRANCES TO DWELLING UNITS. (ZR 28-1)			
PROPOSED	REQ'D STOARGE AND REFUSE DISPOSAL ROOM ARE PROVIDED, SEE FLOOR PLAN			

	1124   010711102   1145   1121   002   2101   00712   110011   71112   1110   1122   022   120011	, .,		
DAYLIGHT IN CORRIDOR (ZR 28-14)				
REQUIREMENT	FIFTY PERCENT OF THE SQUARE FOOTAGE OF A CORRIDOR MAY BE EXCLUDED FROM THE DEFINITION OF FLOOR AREA IF A WINDOW WITH A CLEAR, NON-TINTED, GLAZED AREA OF AT LEAST 20 SQUARE FEET IS PROVIDED IN SUCH CORRIDOR	( ZR 28-14)		
PROPOSED	PROPOSED 20 SF. GLAZED AREA IN CORRIDOR AT 1ST FLOOR = OK TO DEDUCT 50% OF F.A.			

REQUIREMENT	RECREATION SPACE SHALL PROVIDE AT LEAST THE MINIMUM AMOUNT OF RECREATION SPACE AS SET FORTH IN THE TABLE IN THIS SECTION.  R6 = 3.3% OF RESIDENTIAL FLOOR AREA	
	REQ'D RECREATION SPACE = 12,488.07 X 3.3% = 412.11 S.F.	( ZR 28-21)
PROPOSED	PROVIDE RECREATION SPACE ON ROOF. TOTAL 616.50 S.F. > 412.11 S.F.	OK

PLANTING (ZR 20-25)		
REQUIREMENT	PROVIDE PLANTING BETWEEN STREET WALL AND STREET LINE	( ZR 28-23)
PROPOSED	= N/A, SEE PLOT PLAN	

QUALITY HOUSING REQ. (ZR 28-00) (CONTINUED)

PENSITY PER CORRIDOR (ZR 28—31)

REQUIREMENT

IF THE NUMBER OF DWELLING UNITS OR ROOMING UNITS SERVED BY A VERTICAL CIRCULATION CORE AND CORRIDOR ON EACH STORY DOES NOT EXCEED THE NUMBER SET FORTH IN THE FOLLOWING TABLE, 50 PERCENT OF THE SOLIARE FEET OF THE CORRIDOR SERVING SUCH DWELLING UNITS

VERTICAL CIRCULATION CORE AND CORRIDOR ON EACH STORY DOES NOT EXCEED THE NUMBER SET FORTH IN THE FOLLOWING TABLE, 50 PERCENT OF THE SQUARE FEET OF THE CORRIDOR SERVING SUCH DWELLING UNITS OR ROOMING UNITS ON SUCH STORY MAY BE EXCLUDED FROM THE DEFINITION OF FLOOR AREA. R6 = MAX. 11 DWELLING UNITS PER CORRIDOR ( ZR 28-31)

PROPOSED MAX. 4 DWELLING UNITS PER CORRIDOR = 0K TO DEDUCT 50% OF F.A.

### PARKING FOR QUALITY HOUSING (ZR 28-40)

80'-0" LOT

REQUIREMENT	ACCESSORY OFF-STREET PARKING SHIN THE APPLICABLE UNDERLYING DIST	•	( ZR 28-40)
REQUIREMENT	50% OF 16 (PROPOSED) D.U.	= 8 REQ'D	( ZR 25-23)
PROPOSED	PROPOSED 8 PARKING	= 8 PROPOSEDOK	( ZR 25-23)

ADOUGTEOT

CITY BUILDING NY ARCHITECT P.C. 802 64th Street, #3 Brooklyn, NY 11220 Tel.: (718) 836-1828 Fax.: (718) 836-1707 8361828@gmail.com

STRUCTURAL ENGINEER

PROJECT

**NEW BUILDING** 

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

**REVISIONS** 

SUBSEQUENT FILINGS UNDER JOB# 321904383:

- STRUCTURAL/SOE/FOUNDATION

MECHANICAL

PLUMBING

SPRINKLER

PROPOSED THREE(3) STREET TREE

BASE PLANE CALCULATION:

(20.48+20.64) / 2 = 20.56

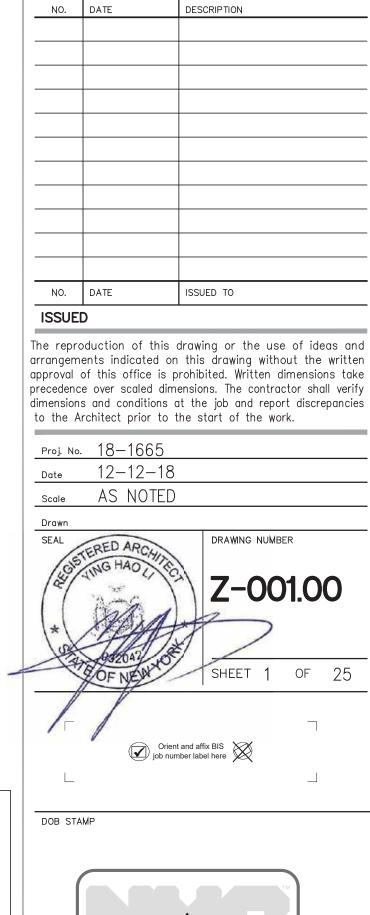
BASE PLANE: EL = 20.56

(OFF-SITE). LOCATION OF TREES PER

DPR GUIDÉ LINE. AS PER ZR 23-03

& ZR 26-41

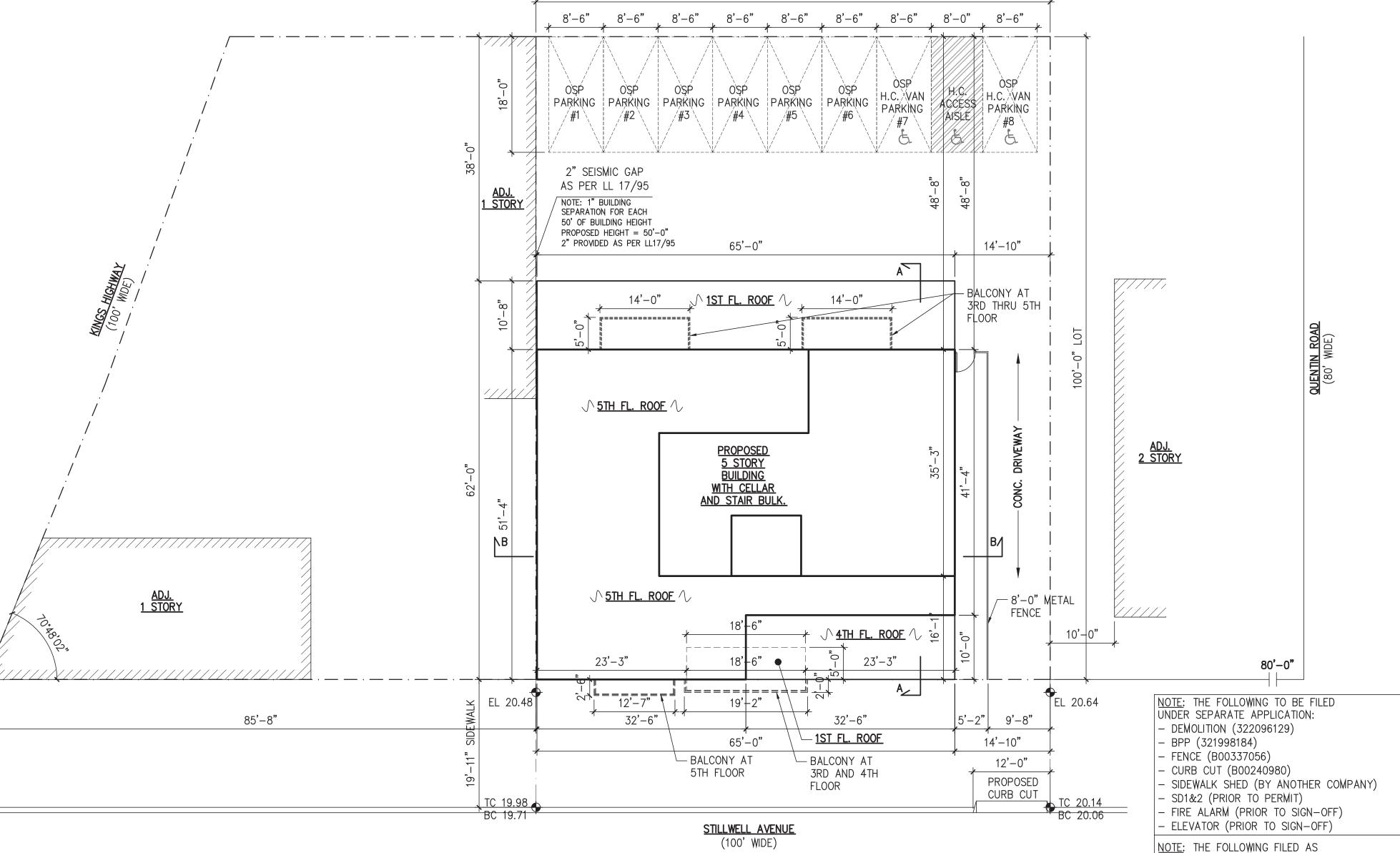
# ZONING ANALYSIS PLOT PLAN



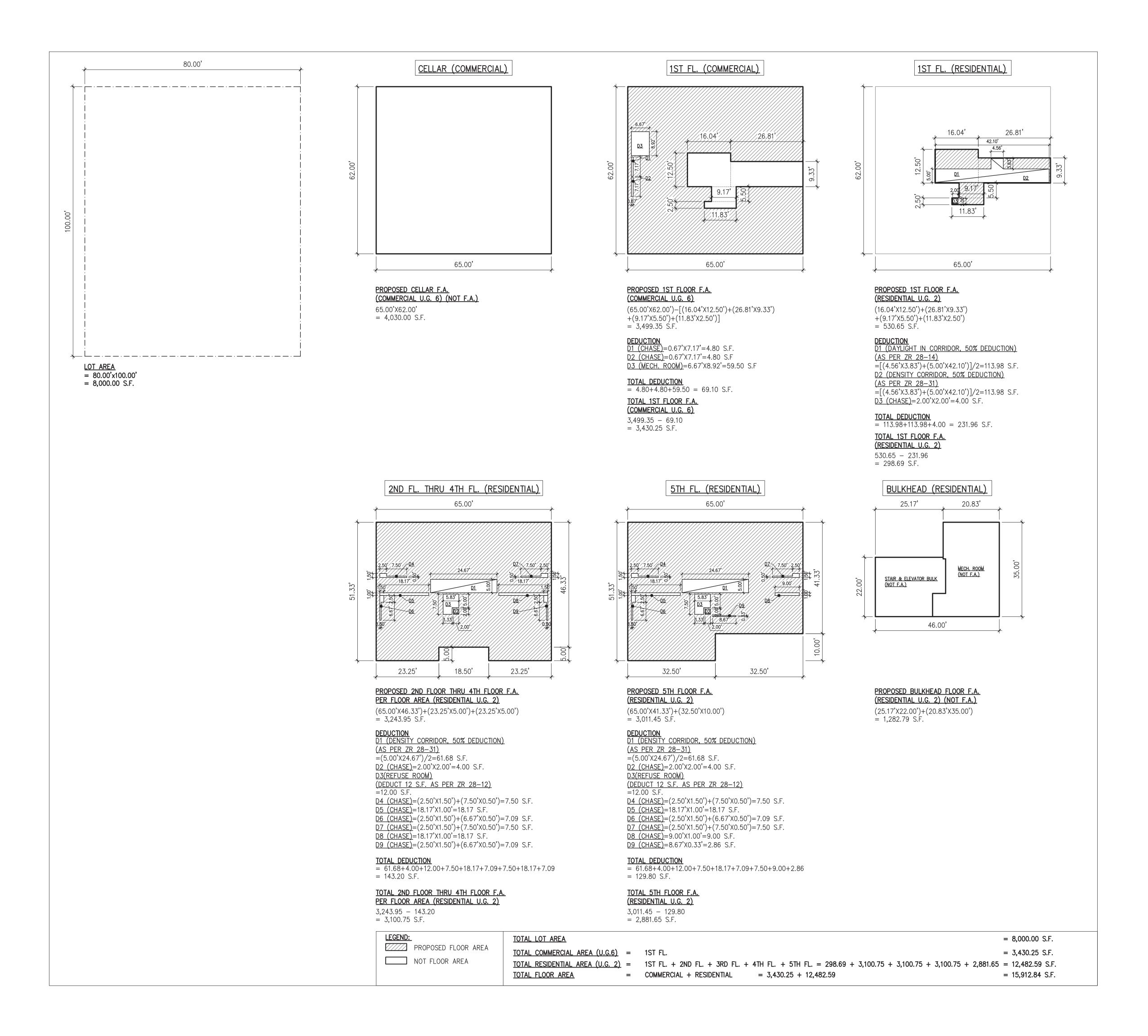
Krzysztof Bajda

APPROVED

Date: 09/01/2021



PROPOSED PLOT PLAN
SCALE: N.T.S.



### 

CITY DI

ARCHITECT

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STRUCTURAL ENGINEER

PROJECT

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITI

REVISIONS

# ZONING ANALYSIS BUILDING DIAGRAMS

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Proj. No	18–1665	
Date	12-12-18	
Scale	AS NOTED	
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* 3	TERED ARCHITECTURE HAO LINE HA	<b>Z-002.00</b> SHEET 2 OF 25

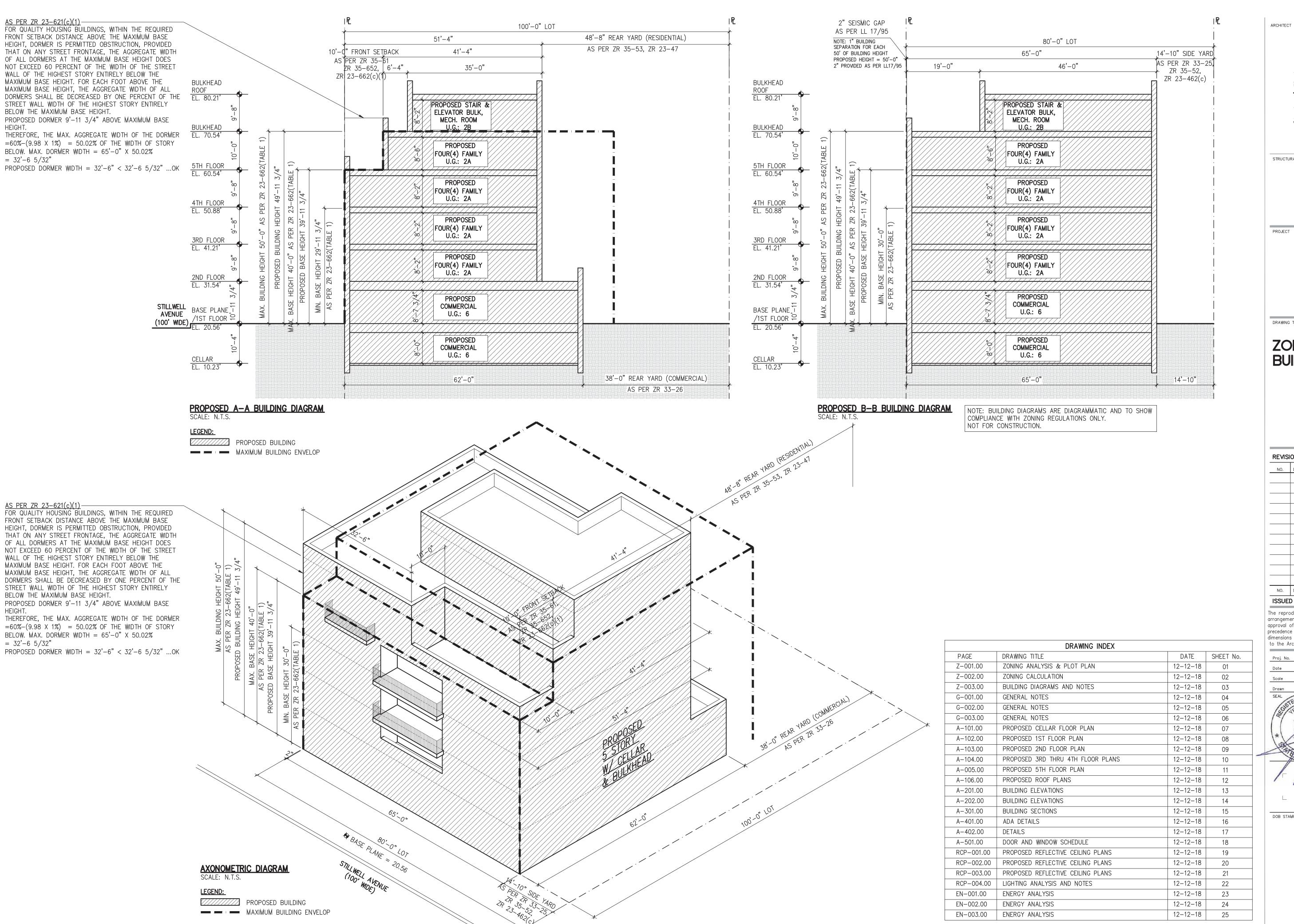
Orient and affix BIS job number label here

Krzysztof Bajda

Date: 09/01/2021

APPROVED

DOB STAMP



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STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

REVISIONS

# **ZONING ANALYSIS BUILDING DIAGRAMS**

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ecedence nensions	of this office is p e over scaled dime s and conditions o rchitect prior to t	ensio ıt th	ns. The contra e job and repo	ctor sho rt discre	ıll verify
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SEAL SEAL	ERED ARCHITEC	1/2	Z-OC		)()
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7	OF NEWY	/	SHEET 3	OF	25
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L	-				



DWELLING UNIT AS PER NYCECC C405.6



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NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

## PROPOSED FLOOR PLANS

REVISIONS		
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Proj. No. 18-1665

Date 12-18

scale AS NOTED

DRAWING NUMBER A-101.00

Orient and affix BIS job number label here

DOB STAMP



<u>LEGEND:</u> ---- PROPERTY LINE \_\_\_\_\_\_\_\_ INTERIOR WALL PARTITION (WALL TYPE A)

2HR RATED WALL (WALL TYPE B)

MASONRY WALL (WALL TYPE C)

EXIT SIGN, MAX. 5 WATTS PER SIDE — INDICATES FACE OF SIGN

EXTERIOR WALL WITH FACE BRICK (WALL TYPE D)

NYC APPROVED HARD-WIRED SMOKE/CARBON MONOXIDE DETECTOR

- INDICATES DIRECTION

NYC APPROVED HARD-WIRED SMOKE ALARM NOTE: AS PER BC 907.2.10.3: SMOKE ALARMS OR DETECTORS SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM OR DETECTOR WILL ACTIVATE ALL OF THE ALARMS OR DETECTORS IN DWELLING UNIT.

PROGRAMMABLE THERMOSTAT FOR HEATING AND COOLING AS PER C403.2.4.2.1 & C403.2.4.2.2 NOTE: THERMOSTATIC SHALL HAVE THE CAPABILITY TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F (13°C) OR UP TO 85°F (29°C).

NOTE: ALL FPSC DOOR SHALL BE 1 1/2 HOUR FIRE RATED

UNLESS OTHERWISE NOTED.

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STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

## PROPOSED FLOOR PLANS

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Proj. No. 18-1665 Date 12-12-18

scale AS NOTED



Orient and affix BIS job number label here

DOB STAMP

Krzysztof Bajda **APPROVED** Date: 09/01/2021

LEGEND:

---- PROPERTY LINE

2HR RATED WALL (WALL TYPE B)

MASONRY WALL (WALL TYPE C)

EXTERIOR WALL WITH FACE BRICK (WALL TYPE D) EXIT SIGN, MAX. 5 WATTS PER SIDE

- INDICATES DIRECTION NYC APPROVED HARD-WIRED SMOKE/CARBON MONOXIDE

 $\langle SC \rangle$ DETECTOR NYC APPROVED HARD-WIRED SMOKE ALARM

--- INDICATES FACE OF SIGN

NOTE: AS PER BC 907.2.10.3: SMOKE ALARMS OR DETECTORS SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM OR DETECTOR WILL ACTIVATE ALL OF THE ALARMS OR DETECTORS IN DWELLING UNIT.

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COOLING AS PER C403.2.4.2.1 & C403.2.4.2.2 NOTE: THERMOSTATIC SHALL HAVE THE CAPABILITY TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F (13°C) OR UP TO 85°F (29°C).

65'-0" - PROVIDE RESILIENT PAD AND VIBRATION ISOLATOR - 42" PARAPET WITH MIN. ISOLATION HVAC-C-1 1ST FLOOR EFFICIENCY OF 90% FOR ROOF TERRACE HVAC (TYP.) 42" PARAPET ─ AS PER MC 928.3.6 / 42" PARAPET 11'-2" 9'-1" 9'-1" 11'-2" \_10'-0" 10'-0" 6ºX6º GLASS 6ºX6º GLASS 5ºX5º WIN. 5ºX5º WIN. 5ºX5º WIN. 5ºX5º WIN. SLIDING DR. SLIDING DR. LIVING AREA F.A.: 199 S.F. BEDROOM F.A.: 99 S.F BEDROOM F.A.: 99 S.F. LIVING AREA F.A.: 199 S.F. L.A.: 28 S.F. L.A.: 25 S.F. L.A.: 28 S.F. L.A.: 25 S.F. V.A.: 25 S.F. V.A.: 24 S.F. V.A.: 25 S.F. V.A.: 24 S.F. F.A.: 110 S. L.A.: 25 S.F. PROPOSED <u>PROPOSED</u> L.A.: 25 S.F V.A.: 25 S.F. V.A.: 25 S.F. ONE FAMILY ONE FAMILY 5'-0" U.G.: 2A U.G.: 2A PROGRAMMABLE\_ PROGRAMMABLE 4<sup>0</sup>X6<sup>8</sup> DR. 4<sup>0</sup>X6<sup>8</sup> DR. 4<sup>0</sup>X6<sup>8</sup> DR. THERMOSTAT 8'-1"
FOR HEATING C403.2.4.2 ADA BATHROOM & C403.2.4.2.2 & C403.2.4.2.2 BATHROOM DISTANCE BETWEEN EXIT DOORS 21'-4" SPAÇE MIN. 15'-0" AS PER BC 1015.2.1.3, RANGE • TUB STRETCHER-SIZE ELEVATOR RANGE ADA <u>,BATHROOM</u> ARCH ABOVE 3'-4" REFUSE CHUTE → FOR HEATING 11'-3" AS PER NYCECC 9'-0" 4<sup>0</sup>X6<sup>8</sup> DR. & C403.2.4.2.2 & C403.2.4.2.2 <u>BEDROOM</u> F.A.: 103 S.F. F.A.: 103 S.F. F.A.: 107 S.F F.A.: 107 S.F ONE FAMILY ONE FAMILY L.A.: 25 S.F. L.A.: 25 S.F. CL. 0 0 10 V.A.: 25 S.F. L.A.: 25 S.F. L.A.: 25 S.F. V.A.: 25 S.F. U.G.: 2A U.G.: 2A V.A.: 25 S.F V.A.: 25 S.F. LIVING AREA LIVING AREA F.A.: 215 S.F F.A.: 215 S.F. L.A.: 25 S.F. L.A.: 25 S.F. V.A.: 25 S.F. V.A.: 25 S.F. 3<sup>0</sup>X6<sup>8</sup> DR.5<sup>0</sup>X5<sup>0</sup> WIN. 5ºX5º WN3ºX68 DR. 10'-0" 10'-0" <u>TERRACE</u> TERRACE / 42" RAILING / 42" RAILING 5ºX5º WIN. 5ºX5º WIN. 5ºX5º WIN. 5ºX5º WIN. 9'-0" 11'-3" 18'-6" 11'-3" 9'-0"

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

NOTE: ALL FPSC DOOR SHALL BE 1 1/2 HOUR FIRE RATED UNLESS OTHERWISE NOTED.

DEPT OF BLDGS321904383 Job Number

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STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

# PROPOSED FLOOR PLANS

REVISIONS		
NO.	DATE	DESCRIPTION
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ISSUED		

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Proj. No. 18—1665

Date 12—12—18

 Date
 12-12-18

 Scale
 AS NOTED



DOB STAMP



LEGEND:

---- PROPERTY LINE

\_\_\_\_\_\_\_ INTERIOR WALL PARTITION (WALL TYPE A)

2HR RATED WALL (WALL TYPE B)

MASONRY WALL (WALL TYPE C)

EXTERIOR WALL WITH FACE BRICK (WALL TYPE D)

EXIT SIGN, MAX. 5 WATTS PER SIDE

INDICATES FACE OF SIGN

INDICATES DIRECTION

NYC APPROVED HARD-WIRED SMOKE/CARBON MONOXIDE DETECTOR

NYC APPROVED HARD-WIRED SMOKE ALARM

NOTE: AS PER BC 907.2.10.3:

SMOKE ALARMS OR DETECTORS SHALL BE INTERCONNECTED
IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM
OR DETECTOR WILL ACTIVATE ALL OF THE ALARMS OR

DETECTORS IN DWELLING UNIT.

PROGRAMMABLE THERMOSTAT FOR HEATING AND COOLING AS PER C403.2.4.2.1 & C403.2.4.2.2 NOTE: THERMOSTATIC SHALL HAVE THE CAPABILITY TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F (13°C) OR UP TO 85°F (29°C).

NOTE: ALL FPSC DOOR SHALL BE 1 1/2 HOUR FIRE RATED

UNLESS OTHERWISE NOTED.

9'-0"

PROPOSED 3RD FLOOR THRU 4TH FLOOR PLAN

11'-3"

65'-0"

DEPT OF BLDGS321904383 Job Number

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STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

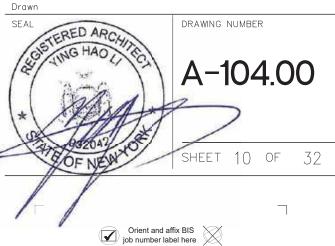
# PROPOSED FLOOR PLANS

REVISI	REVISIONS		
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Proj. No. 18-1665 Date 12-12-18

Scale AS NOTED



DOB STAMP



<u>LEGEND:</u>

---- PROPERTY LINE

\_\_\_\_\_\_\_\_\_INTERIOR WALL PARTITION (WALL TYPE A)

2HR RATED WALL (WALL TYPE B) MASONRY WALL (WALL TYPE C)

EXTERIOR WALL WITH FACE BRICK (WALL TYPE D)

9'-0"

EXIT SIGN, MAX. 5 WATTS PER SIDE --- INDICATES FACE OF SIGN - INDICATES DIRECTION

NYC APPROVED HARD-WIRED SMOKE/CARBON MONOXIDE DETECTOR

NYC APPROVED HARD-WIRED SMOKE ALARM NOTE: AS PER BC 907.2.10.3: SMOKE ALARMS OR DETECTORS SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM

OR DETECTOR WILL ACTIVATE ALL OF THE ALARMS OR DETECTORS IN DWELLING UNIT.

TS PROGRAMMABLE THERMOSTAT FOR HEATING AND COOLING AS PER C403.2.4.2.1 & C403.2.4.2.2 NOTE: THERMOSTATIC SHALL HAVE THE CAPABILITY TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F (13°C) OR UP TO 85°F (29°C).

NOTE: ALL FPSC DOOR SHALL BE 1 1/2 HOUR FIRE RATED

UNLESS OTHERWISE NOTED.

PROPOSED 5TH FLOOR PLAN

65'-0"

DEPT OF BLDGS321904383 Job Number

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STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

# PROPOSED FLOOR PLANS

REVISIONS		
NO.	DATE	DESCRIPTION
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Proj. No. 18-1665 Date 12-12-18

Scale AS NOTED

DRAWING NUMBER A-105.00



DOB STAMP



<u>LEGEND:</u> ---- PROPERTY LINE \_\_\_\_\_\_\_\_\_INTERIOR WALL PARTITION (WALL TYPE A) 2HR RATED WALL (WALL TYPE B) MASONRY WALL (WALL TYPE C) EXTERIOR WALL WITH FACE BRICK (WALL TYPE D) EXIT SIGN, MAX. 5 WATTS PER SIDE - INDICATES FACE OF SIGN - INDICATES DIRECTION NYC APPROVED HARD-WIRED SMOKE/CARBON MONOXIDE (SC) DETECTOR NYC APPROVED HARD-WIRED SMOKE ALARM NOTE: AS PER BC 907.2.10.3: SMOKE ALARMS OR DETECTORS SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM OR DETECTOR WILL ACTIVATE ALL OF THE ALARMS OR DETECTORS IN DWELLING UNIT.

TS PROGRAMMABLE THERMOSTAT FOR HEATING AND

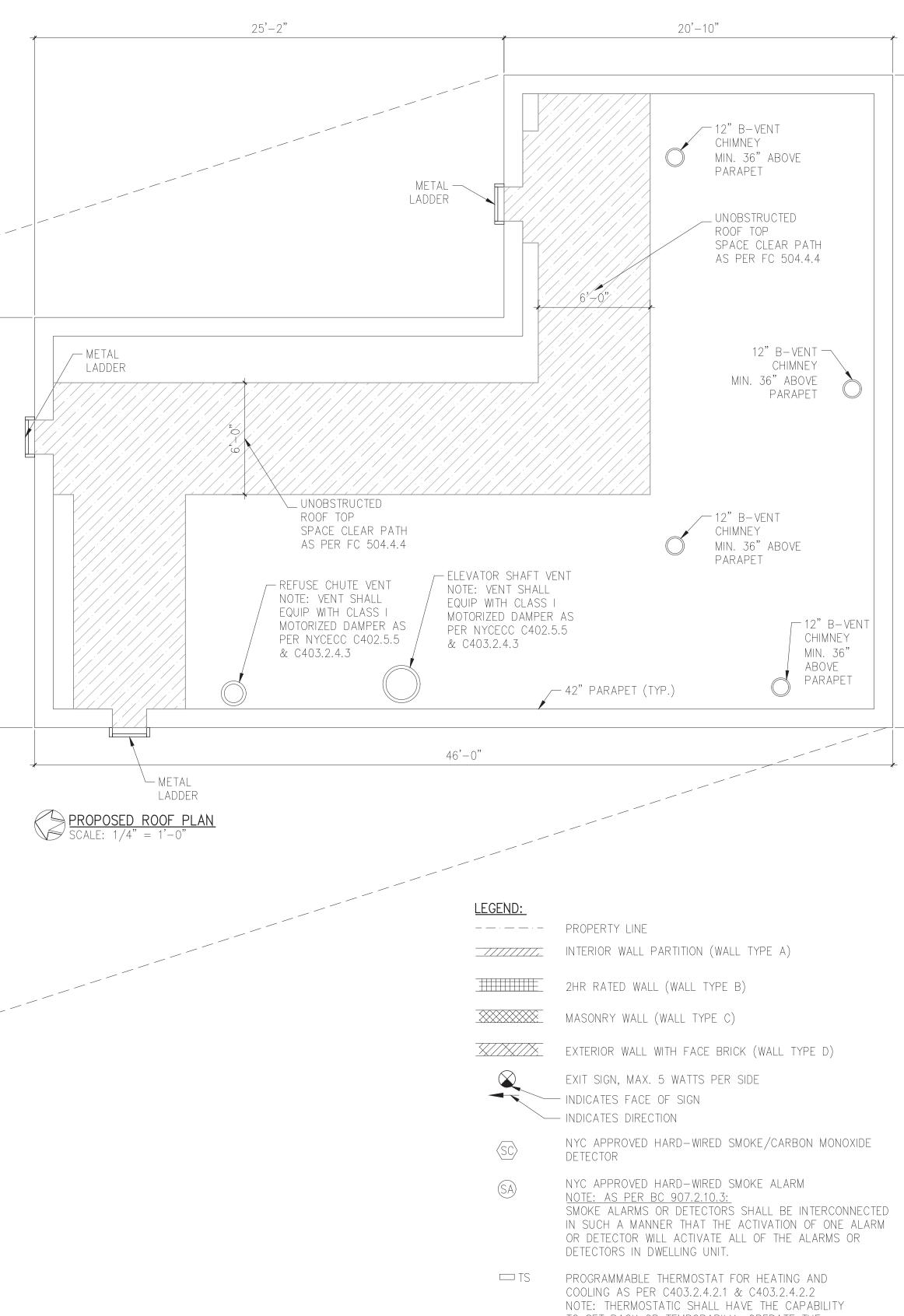
TO 55°F (13°C) OR UP TO 85°F (29°C).

COOLING AS PER C403.2.4.2.1 & C403.2.4.2.2

TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN

NOTE: THERMOSTATIC SHALL HAVE THE CAPABILITY

ARCHITECT



TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F (13°C) OR UP TO 85°F (29°C).

PROPOSED BULKHEAD FLOOR PLAN
SCALE: 1/4" = 1'-0"

NOTE: ALL FPSC DOOR SHALL BE 1 1/2 HOUR FIRE RATED UNLESS OTHERWISE NOTED.

						EQUIPMEN <sup>*</sup>	T SCHEDULE			
ITEN	ITEM	MANUFACTURER	MODEL NO.	CAPACITY .	CAPACITY BTUH		— ENERGY RATING	TESTING STANDARD	QUANTITY	REMARK
I I LIV	<i>'</i> 1				INPUT	OUTPUT	LINLING! IVATING		QUANTITI	I/FIAI/I/
HOT WATER HE	EATER (GAS)	A.O. SMITH	XCG-50	50 GALLON	40,000 BTU	N/A	60% EF	ANSI Z21.10.1/CSA 4.1-2014	16	WATER HEATER IS EQUIPED WITH BUILT—IN HEAT TRAP IN THE INLET AND OUTLET CONNECTIONS. WATER HEATER IS SERVING NON—CIRCULATING SYSTEM, NO CIRCULATION PUMP REQUIRED.
BOILER (GAS)		WEIL MCLAIN	CGA-3	N/A	70,000 BTU	59,000 BTU	84% AFUE	ANSI Z21.13-2013/ CSA 4.9-2013	16	

SMOKE VENT CALCULATION (BC 708.12.1.2)

VENT REQUIRED: 3.5% X 142 S.F. = 4.97 S.F.

5<sup>0</sup>X4<sup>2</sup> WIN.

- (16) EMERGENÇY

12" B−VENT —

∠ 42" PARAPET (TYP.)

32'-6"

 $-\sqrt{5^{\circ}}$ X1<sup>4</sup> FIXED

LOUVER ABOVE

VENT REQUIRED: 4.97 S.F. OR NO LESS THAN 72 SQ. IN. (0.5 S.F.)

AS PER MC 709.1 & FGC 304.10

587/60% = 979 SQ. IN.

PROPOSED VENT: (3'X5.5')/2 = 8.25 S.F. ...OK MORE THAN 4.97 S.F.

\_ F.A.I. CALCULATION (MC 703.1.2 & FGC 304.6.2 )

LOUVER SHALL HAVE A MIN. TOTAL AREA OF

20'-10"

18'-4"

TOTAL APPLIANCE INPUT = (40,000 + 70,000)X16 = 1,760,000 BTU

REQUIRED FREE OPENING AREA = 1,760,000 / 3,000 = 587 SQ. IN.

LOUVERS SHALL HAVE A MIN. TOTAL FREE AREA OF 587 SQ. IN. AS

SPECIFIED PER MANUFACTURER, IF MANUFACTURER NOT SPECIFIED,

PROPOSED LOUVER = (12"X26")X4 = 1,248 SQ. IN. >\_979 SQ. IN. ...OK

W/5ºX1⁴ FIXED

LOUVER ABOVE

HODE)

(HØDH)

(HØH)

HODE):

(HODH)

(HODH)

(HØH)

12" B-VENT (HOD)

B ABU, CHIMNEY

-12" B-VENT

CHIMNEY ABOVE

MAX. SHAFT AREA: 142 S.F.

1. WATER HEATING EQUIPMENT SHALL BE PROVIDED WITH CONTROLS TO ALLOW A SET POINT OF 110°F (43°C) FOR EQUIPMENT SERVING DWELLING UNITS.

32'-6"

\_\_\_3'-0" GATE

19'-0"

18'-0"

/10'-0"/HEKGHT/

WHRE FENCING

ROOFTOP RECREATION

<u>SPACE</u> 18'-0"X34'-0"

= 612 S.F.

/ 10'-0" HEIGHT

WIRE FENCING

AS PER BC 1509.8.1 R.D.

WIRE FENCING

- 42" PARAPET (TYP.)

AS PER BC 1509.8.1

/AS PER BC 1509,8,1

10'-0" HEIGHI-

WIRE FENCING

METAL, LADDER

AS PER BC 1509.8.1

IS PERMITTED

5'-11"

HUNG WW.

HALF ØPEN

3ºX6º

GLASS DR.

3ºX5º SINGLE

CONTROL ROOM

ZÚMOBSTRUĆTED

SPACÉ/CLEAR PATH

AS PER FC 504.4.4

/ROOF/ TOP//

AS PER FC 504.4.4.4

\_ UNOBSTRUCTED

SPACE CLEAR PATH

AS PER FC 504.4.4

ROOF TOP

25'-2"

MÉTÁL > LADDER

3ºX/5º SINGLE

 $\sqrt{3^{9}X6^{8}}$ 

46'-0"

HUNG WIN. HALF OPEN

WINDOW/AS/Z

AS PER

BC 708.12.1.1

X—42"/PARAPET (TYP.)

/-/WINDOW/AS/

AS PER

BC 708.12.1.1

DISTANCE BETWEEN EXIT DOORS 21'-4"

MIN. 15'-0" AS PER BC 1015.2.1.3

STRETCHER-SIZE

ELEVATOR

8'-4"

2. OPERATING AND MAINTENANCE MANUALS ARE TO BE PROVIDED TO THE BUILDING OWNER BY THE MECHANICAL CONTRACTOR WITHIN 90 DAYS OF ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.

NOTE: AS PER NYCECC C408.2 COMMISSIONING AND COMPLETION REQUIREMENT. COMMISSIONING IS REQUIRED FOR THE SERVICE WATER HEATING SYSTEM(INCLUDING BOILER).

OWNER/G.C. SHALL RETAIN APPROVED COMMISSIONING AGENCY TO PERFORM THE COMMISSIONING AS PER NYCECC C408.2, AND PREPARE THE REQUIRED REPORTS AND SUBMIT TO BUILDINGS DEPARTMENT AS REQUIRED.

SYSTEM BALANCING REPORT

- HVAC/SWH SYSTEMS ARE REQUIRED TO BE TESTED, ADJUSTED AND BALANCED IN ACCORDANCE WITH ASHRAE 111 OR OTHER APPROVED STANDARDS.

- SUBSEQUENTLY, WITHIN 90 DAYS OF THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY, THE SYSTEM BALANCING REPORT DESCRIBING THE COMPLETED ACTIVITIES AND MEASUREMENTS MUST BE PROVIDED TO THE BUILDING OWNER.

<u>FINAL COMMISSIONING REPORT</u>

- FINAL COMMISSIONING REPORT IS TO BE PROVIDED TO THE BUILDING OWNER, AND

- THE COMMISSIONING REPORT CERTIFICATION MUST BE SUBMITTED TO THE DEPARTMENT: • WITHIN 30 MONTHS OF THE ISSUANCE OF THE C/O OR LETTER OF COMPLETION FOR NEW BUILDINGS GREATER OR

EQUAL 500,000 S.F. IN CONDITIONED SPACE AREA, EXCLUDING R-2 OCCUPANCIES; AND

• WITHIN 18 MONTHS OF THE ISSUANCE OF THE C/O OR LETTER OF COMPLETION FOR ALL OTHER BUILDINGS.

Krzysztof Bajda APPROVED Date: 09/01/2021

**CITY BUILDING NY** ARCHITECT P.C. 802 64th Street, #3 Brooklyn, NY 11220 Tel.: (718) 836-1828 Fax.: (718) 836-1707

8361828@gmail.com

STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

## PROPOSED FLOOR PLANS

REVISIONS NO. DATE DESCRIPTION NO. DATE ISSUED TO ISSUED

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Proj. No. 18-1665

Date 12-12-18 Scale AS NOTED

DRAWING NUMBER SHEET 12 OF 32

Orient and affix BIS job number label here

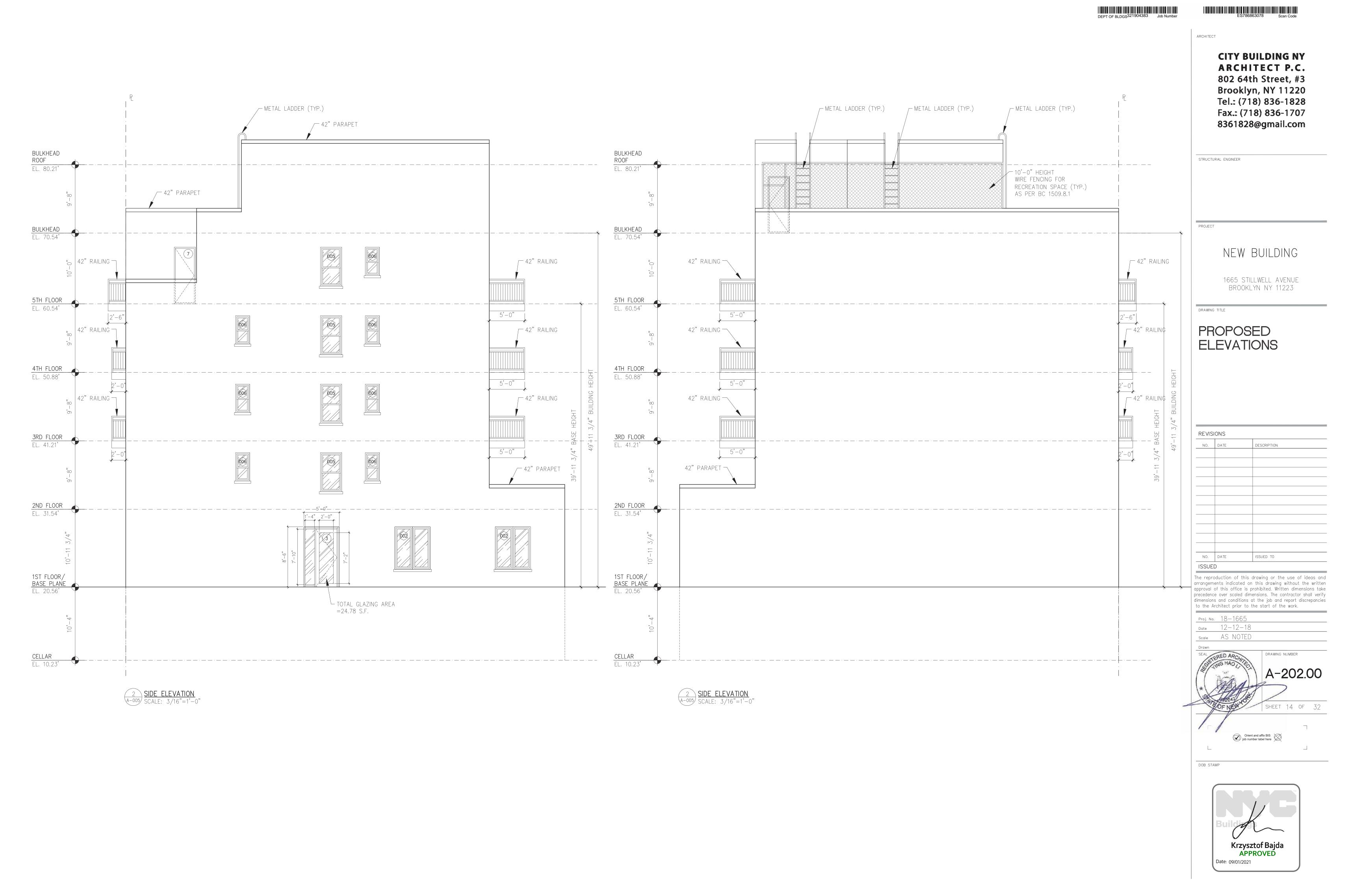
DOB STAMP

DOB STAMP

Krzysztof Bajda APPROVED

Date: 09/01/2021





ARCHITECT

**CITY BUILDING NY** ARCHITECT P.C. 802 64th Street, #3 Brooklyn, NY 11220 Tel.: (718) 836-1828 Fax.: (718) 836-1707 8361828@gmail.com

PROJECT

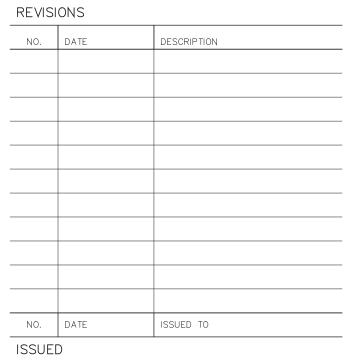
STRUCTURAL ENGINEER

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

## PROPOSED SECTIONS



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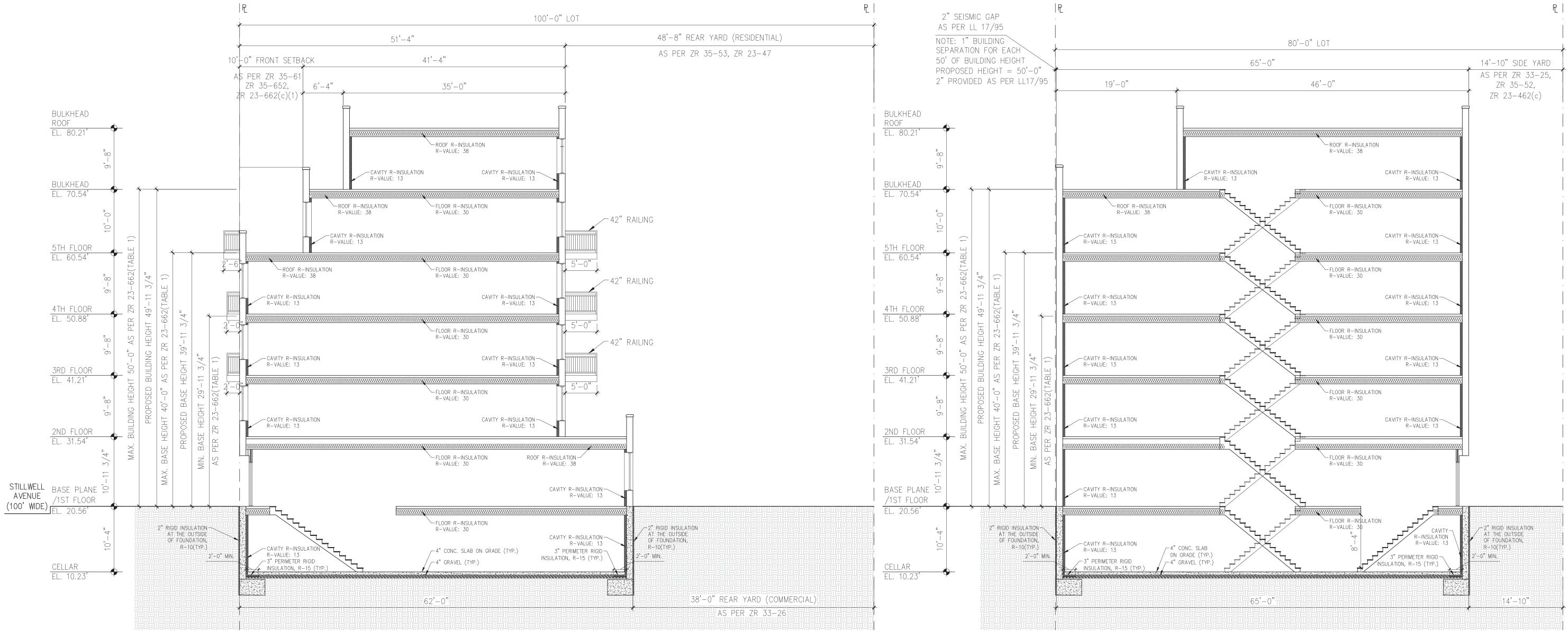
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Date 12-12-18 Scale AS NOTED

DRAWING NUMBER A-301.00 SHEET 15 OF 32 Orient and affix BIS job number label here

DOB STAMP

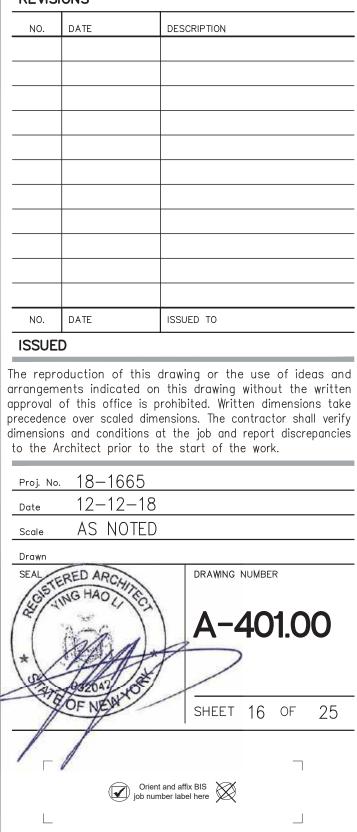




A LONG SECTION SCALE: 1/8"=1'-0"

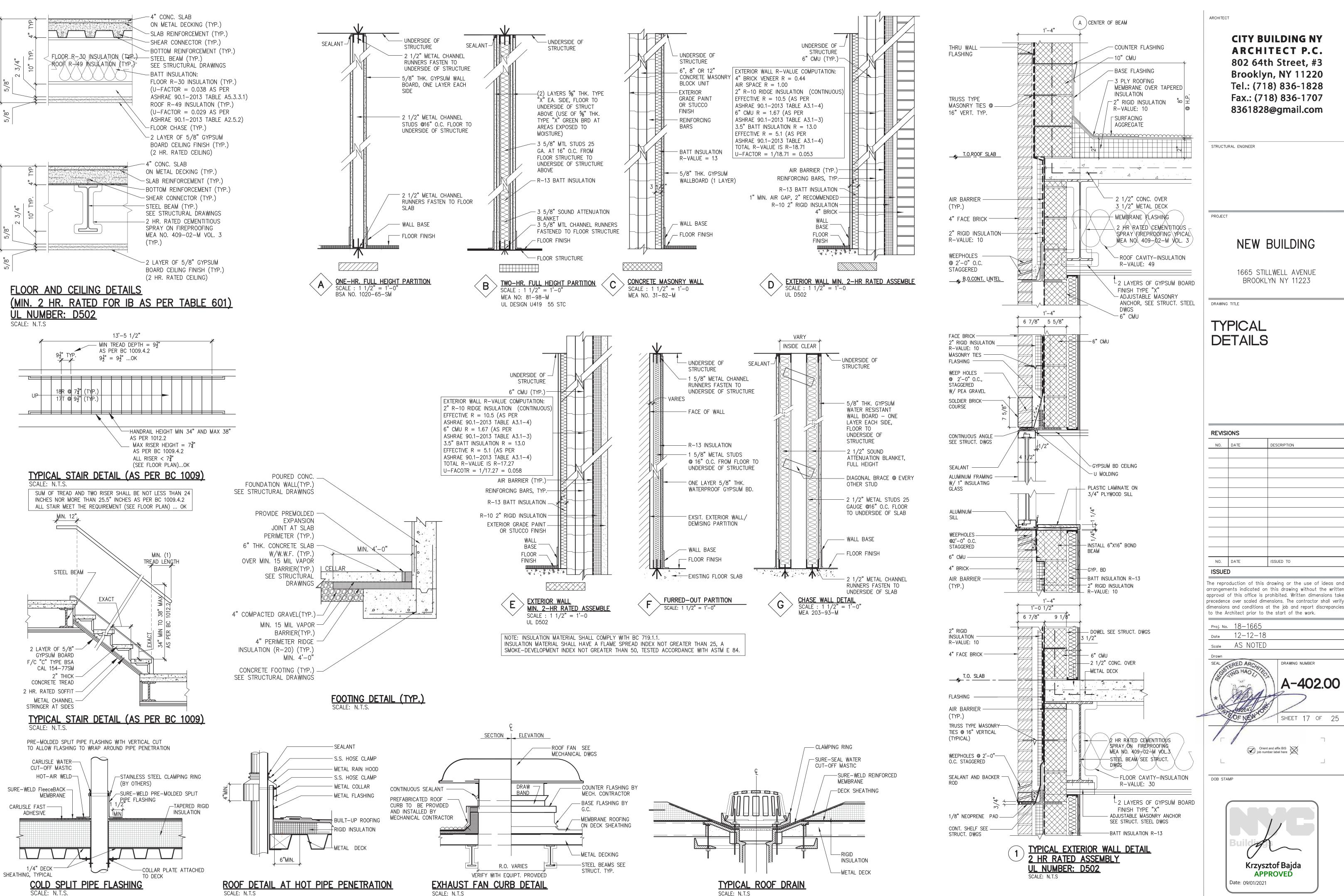
B CROSS SECTION SCALE: 1/8"=1'-0"

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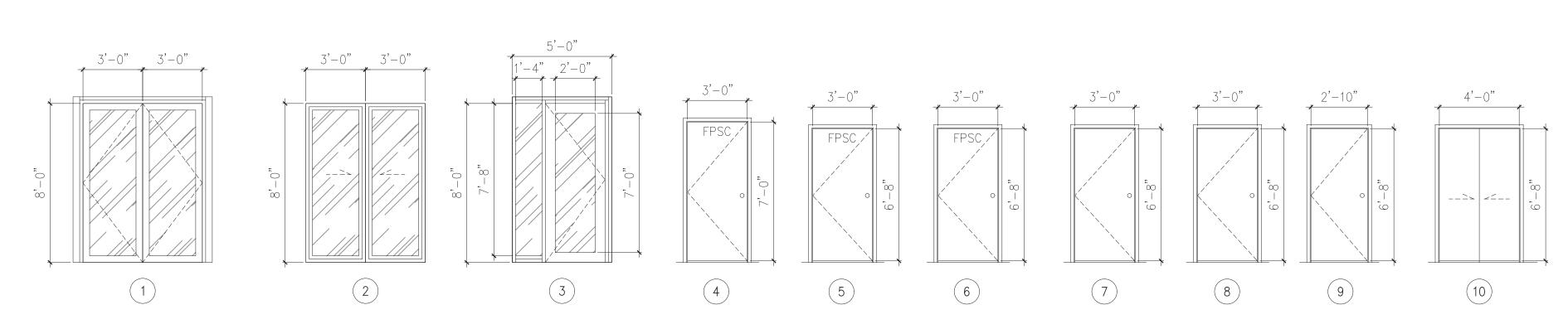
Krzysztof Bajda APPROVED

Date: 09/01/2021

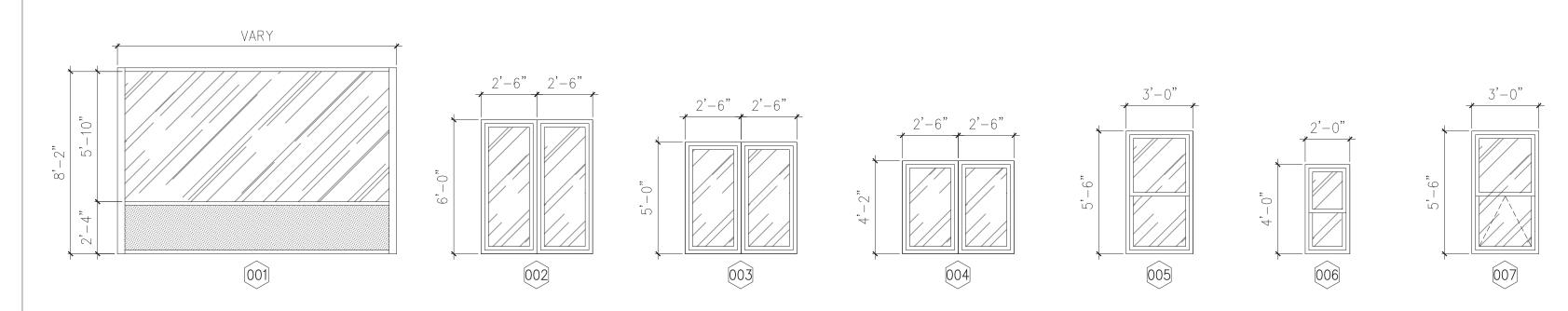


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							DOOR SCH	HEDULE	
Ο.	DOOR TYPE	WIDTH	SIZE HEIGHT	THK.	CONST.	FRAME CONST.	NYCECC U-FACTOR & SHGC TABLE C402.4	NYCECC AIR LEAKAGE TABLE C402.5.2	REMARKS
	DOUBLE HINGED	3'-0"X2	8'-0"	1.5"	GLASS	ALUM	U-FACTOR = 0.36, SHGC = 0.29	< 0.20 CFM/FT <sup>2</sup>	BUILDING ENTRANCE DOOR, PROVIDE SELF-CLOSING DEVICE
2	SLIDING	3'-0"X2	8'-0"	1.5"	GLASS	ALUM	U-FACTOR = 0.36, SHGC = 0.21	< 0.20 CFM/FT <sup>2</sup>	
3	SINGLE HINGED	3'-0"	8'-0"	1.5"	GLASS	ALUM	U-FACTOR = 0.36, SHGC = 0.21	< 0.20 CFM/FT <sup>2</sup>	BUILDING ENTRANCE DOOR WITH SIDE LITE, PROVIDE SELF-CLOSING DEVICE, MIN. TOTAL GLAZING AREA 20 S.F.
4	SINGLE HINGED	3'-0"	7'-0"	1.5"	STEEL	STEEL	U-FACTOR = 0.42	< 0.20 CFM/FT <sup>2</sup>	FPSC DOOR, 1 1/2 HOUR RATED
5	SINGLE HINGED	3'-0"	6'-8"	1.5"	STEEL	STEEL	U-FACTOR = 0.42	< 0.20 CFM/FT²	FPSC DOOR, 1 1/2 HOUR RATED
6	SINGLE HINGED	3'-0"	6'-8"	1.5"	STEEL	STEEL	U-FACTOR = 0.42	< 0.20 CFM/FT²	FPSC DOOR, 1 1/2 HOUR RATED, PROVIDE PEEPHOLE
7	SINGLE HINGED	3'-0"	6'-8"	1.5"	STEEL	STEEL	U-FACTOR = 0.42	< 0.20 CFM/FT²	
8	SINGLE HINGED	3'-0"	6'-8"	1.5"	WOOD	WOOD	U-FACTOR = 0.33	< 0.20 CFM/FT²	
9	SINGLE HINGED	2'-10"	6'-8"	1.5"	WOOD	WOOD	U-FACTOR = 0.33	< 0.20 CFM/FT²	
10	SLIDING	4'-0"	6'-8"	1.5"	WOOD	WOOD	U-FACTOR = 0.33	< 0.20 CFM/FT <sup>2</sup>	



10. V	WINDOW TYPE	SIZ WIDTH	ZE HEIGHT	CONST.	GLASS	FINISH	NYCECC U-FACTOR & SHGC TABLE C402.4	NYCECC AIR LEAKAGE TABLE C402.5.2	REMARKS	
)01 S7	TOREFRONT	VARY	8'-2"	ALUM	INSULATED	PAINT	U-FACTOR = 0.34, SHGC = 0.24	< 0.06 CFM/FT <sup>2</sup>	DOUBLE GLAZED INSULATED	
002 SL	LIDING	5'-0"	6'-0"	VINYL	INSULATED	PAINT	U-FACTOR = 0.29, SHGC = 0.28	< 0.20 CFM/FT²	DOUBLE GLAZED INSULATED	
003 CA	ASEMENT	5'-0"	5'-0"	VINYL	INSULATED	PAINT	U-FACTOR = 0.28, SHGC = 0.32	< 0.20 CFM/FT²	DOUBLE GLAZED INSULATED	
004 CA	ASEMENT	5'-0"	4'-2"	VINYL	INSULATED	PAINT	U-FACTOR = 0.28, SHGC = 0.32	< 0.20 CFM/FT <sup>2</sup>	DOUBLE GLAZED INSULATED	
005 D0	OUBLE HUNG	3'-0"	5'-6"	VINYL	INSULATED	PAINT	U-FACTOR = 0.28, SHGC = 0.32	< 0.20 CFM/FT <sup>2</sup>	DOUBLE GLAZED INSULATED	
006 D0	OUBLE HUNG	2'-0"	4'-0"	VINYL	INSULATED	PAINT	U-FACTOR = 0.28, SHGC = 0.32	< 0.20 CFM/FT²	DOUBLE GLAZED INSULATED	
007 SI	NGLE HUNG	3'-0"	5'-6"	VINYL	INSULATED	PAINT	U-FACTOR = 0.28, SHGC = 0.32	< 0.20 CFM/FT²	DOUBLE GLAZED INSULATED, SMOKE VENT TYPE	

NOTE

1. AIR LEAKAGE: PROVIDE FLASHING, WINDOW DAMNS AND SEALANT, CAULKING AT WINDOW TO CREATE AIR BARRIER

2 AIR LEAKAGE: WEATHER STRIPPING AND INSULATION FOR ROOF HATCH DOOR

- 3. USE MANUFACTURE DOOR AS NOTED IN THE DRAWING FOR PROPER AIR LEAKAGE RATING.
- 4. SEE MANUFACTURING DETAIL FOR PROPER WINDOW AND DOOR INSTALLATION

5.THE BUILDING OR DWELLING UNIT SHALL BE TESTED AND VERIFIED AS HAVING AN AIR LEAKAGE RATE NOT EXCEEDING THREE AIR CHANGES PER HOUR. TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM E 779 OR ASTM E 1827 AND REPORTED AT A PRESSURE OF 0.2 INCH W.G. (50 PASCALS). TESTING SHALL BE PERFORMED AT ANY TIME AFTER CREATION OF ALL PENETRATIONS OF THE BUILDING THERMAL ENVELOPE.

DEPT OF BLDGS321904383 Job Number

ES085733493 Scan Code

ARCHITECT

CITY BUILDING NY ARCHITECT P.C. 802 64th Street, #3 Brooklyn, NY 11220 Tel.: (718) 836-1828 Fax.: (718) 836-1707 8361828@gmail.com

STRUCTURAL ENGINEER

DDO IECT

NEW BUILDING

1665 STILLWELL AVENUE BROOKLYN NY 11223

DRAWING TITLE

PROPOSED
DOOR AND
WINDOW
SCHEDULES

NO.	DATE	DESCRIPTION
NO.	DATE	ISSUED TO

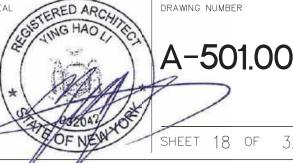
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Proj. No. 18-1665

Date 12-12-18

Scale AS NOTED

Drawn



Orient and affix BIS job number label here

DOB STAMP



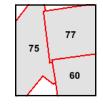
## Appendix B Historic Sanborn Maps











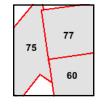
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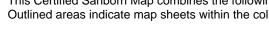


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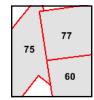




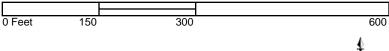






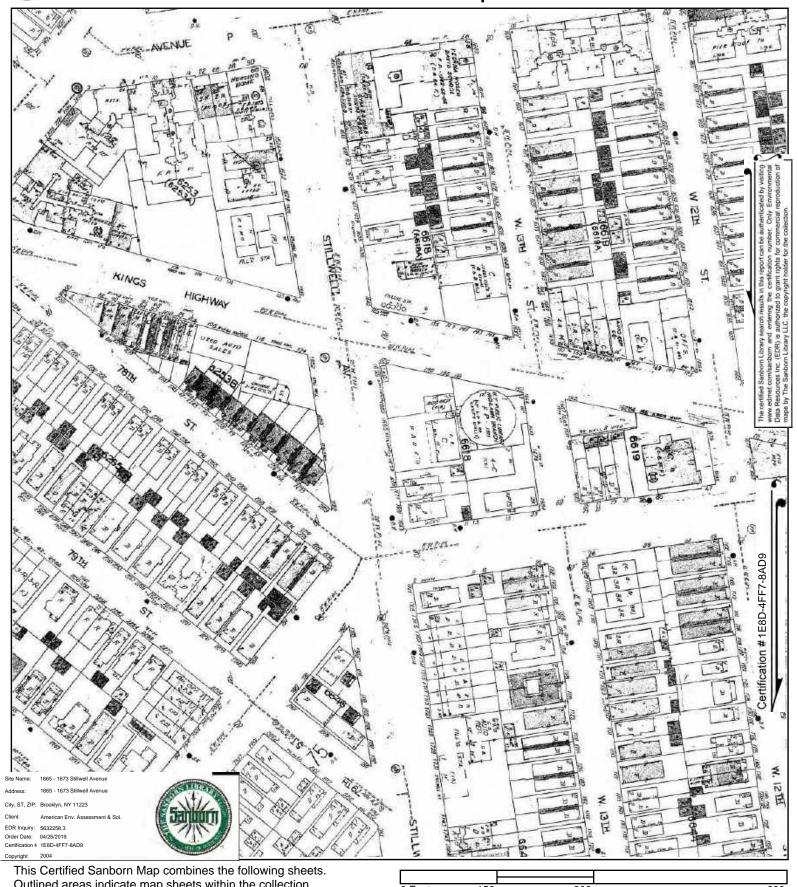


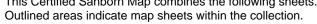
Volume 14, Sheet 60 Volume 13, Sheet 77 Volume 12, Sheet 75



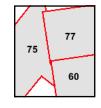




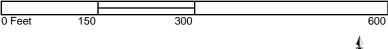








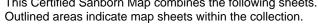
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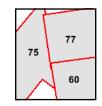




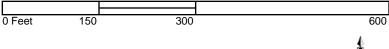








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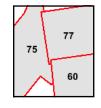




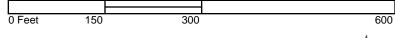








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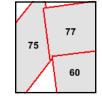












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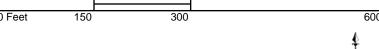














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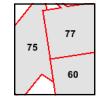




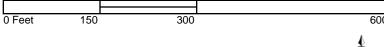








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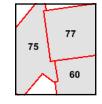




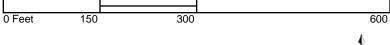








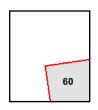
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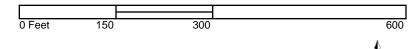


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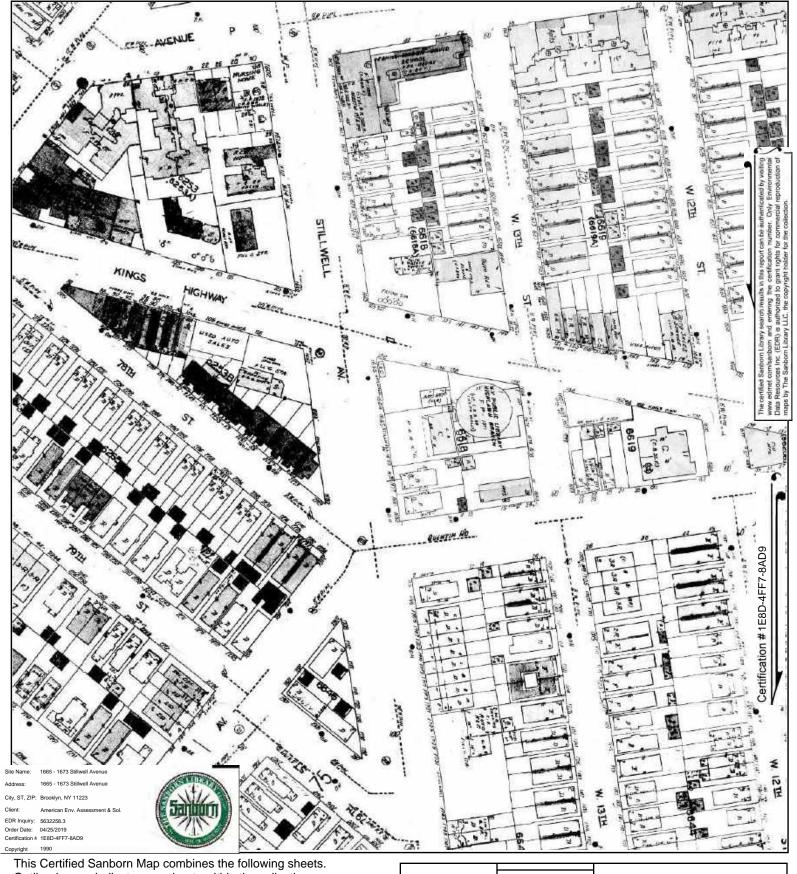
Volume 14, Sheet 60

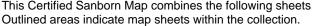




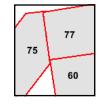




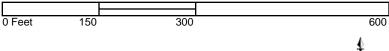








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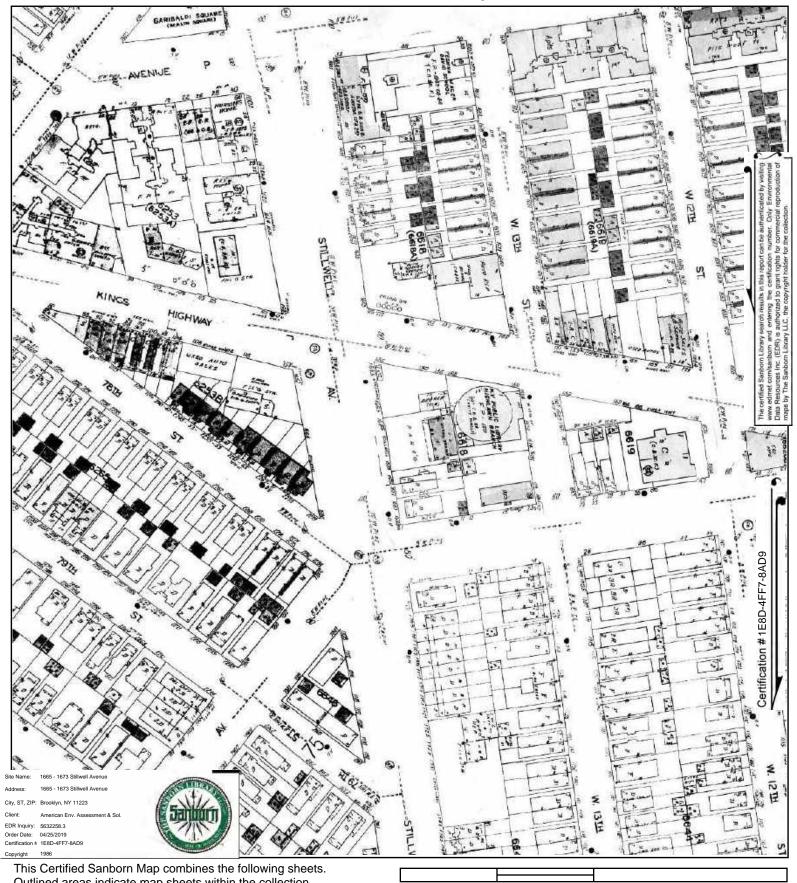




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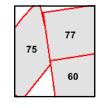




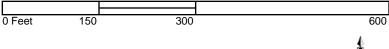


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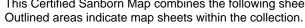
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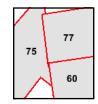




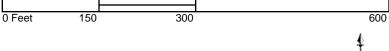








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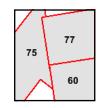




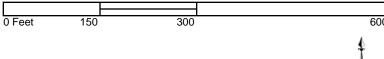








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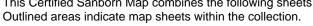


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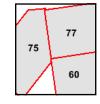
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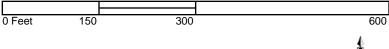








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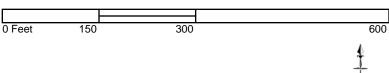


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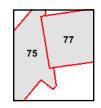




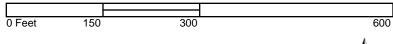


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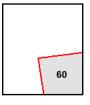


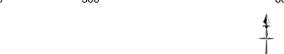
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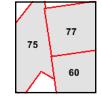








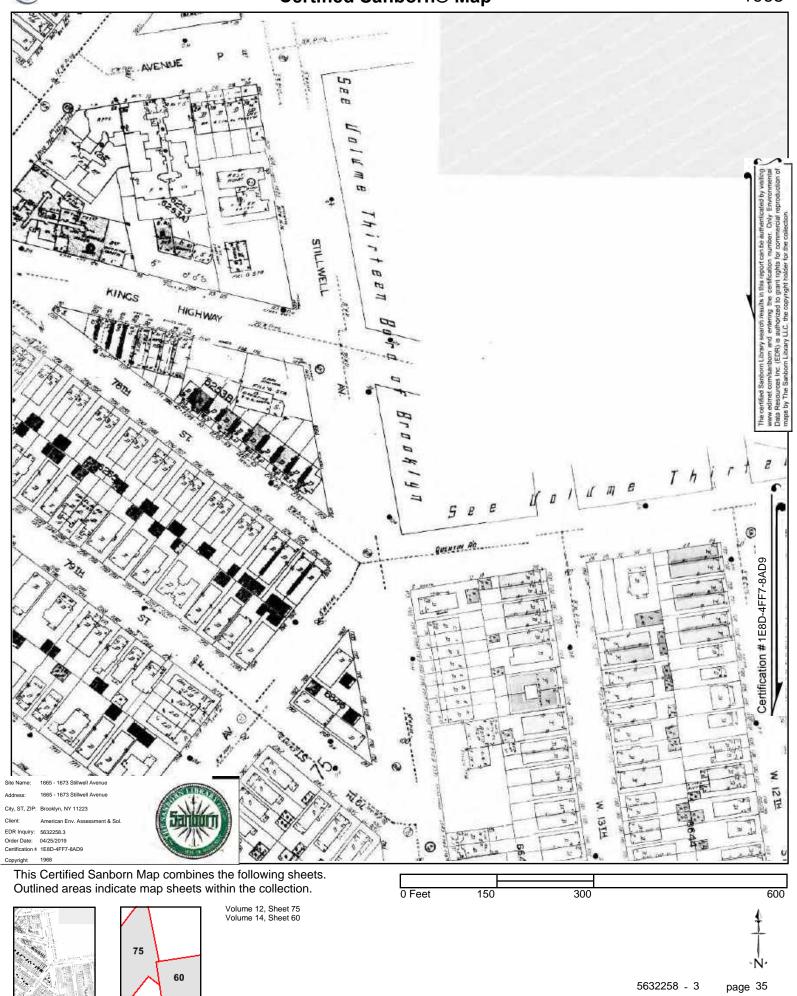




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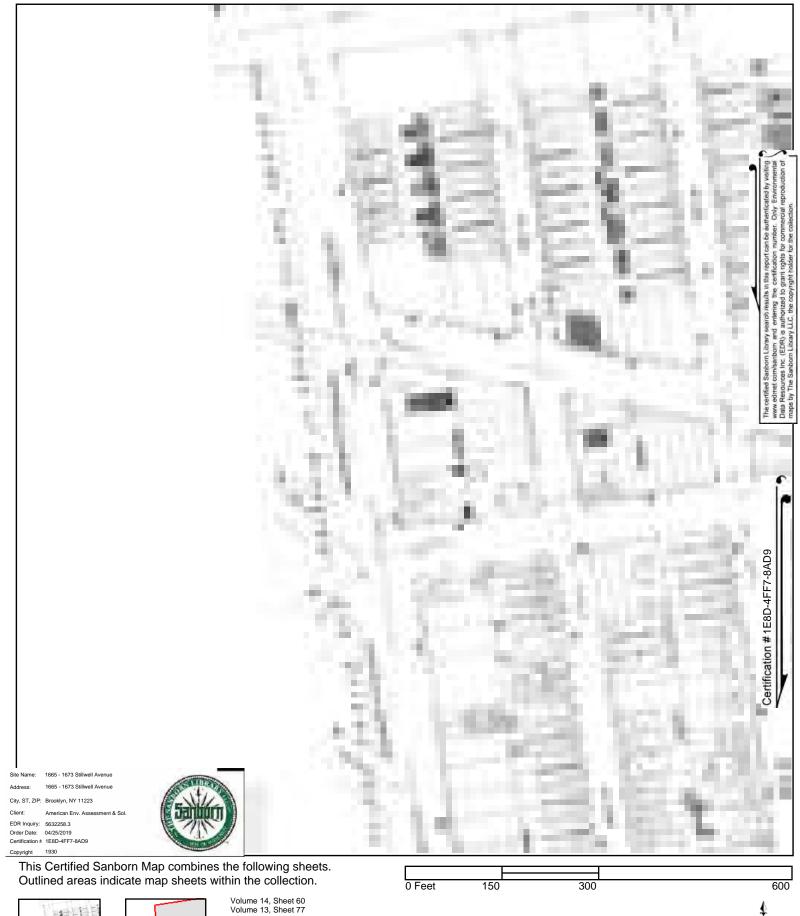


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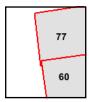


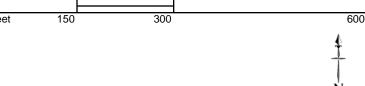
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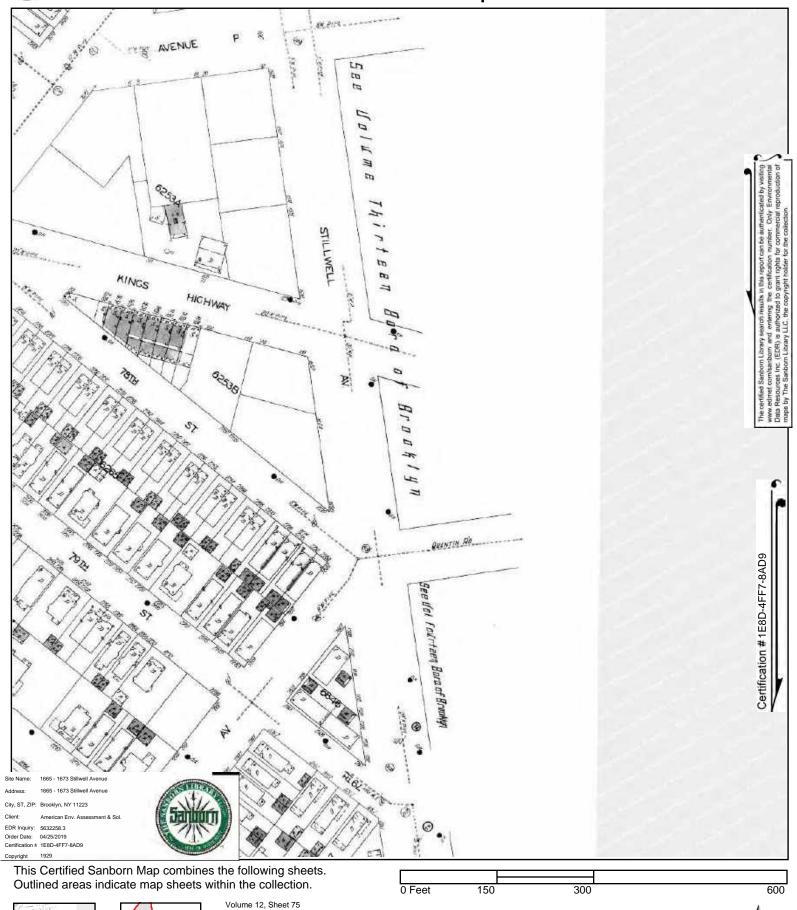






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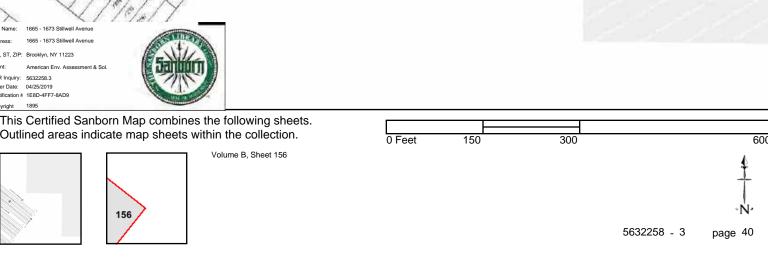
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## Appendix C Community Participation Plan



## **Brownfield Cleanup Program**

## **Citizen Participation Plan**

for

1665-1673 Stillwell Avenue Brooklyn, NY 11223

February 2024

NYCDEC Site No.: C224307 1665-1673 Stillwell Avenue Brooklyn Kings County, New York

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\* \* \* \* \*

**Note:** The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: Sai Truong D.b.a. Refulgence LLC

Site Name: 1665-1673 Stillwell Avenue, Brooklyn, NY 11223

Site Address: 1665-1673 Stillwell Avenue

Site County: **Kings County**Site Number: **C224307** 

#### 1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at: <a href="http://www.dec.ny.gov/chemical/8450.html">http://www.dec.ny.gov/chemical/8450.html</a> .

#### 2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment.
- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process.
- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process.
- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community.
- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

#### Project Contacts

**Appendix A** identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

#### Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in **Appendix A**. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

#### Site Contact List

**Appendix B** contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact

sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- chief executive officer and planning board chairperson of each county, city, town and village in which the site is located.
- residents, owners, and occupants of the site and properties adjacent to the site.
- the public water supplier which services the area in which the site is located.
- any person who has requested to be placed on the site contact list.
- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility.
- location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in **Appendix A**. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

**Note:** The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See <a href="http://www.dec.ny.gov/chemical/61092.html">http://www.dec.ny.gov/chemical/61092.html</a>.

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in **Appendix A** if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

#### CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in **Appendix D** shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities

through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- Notices and fact sheets help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.
- Public forums, comment periods and contact with project managers provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.
- **Document repository** allows the public to access and review project documents including investigation and cleanup work plans and final reports.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

#### Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site. As of the date the declaration (page 2) was signed by the NYSDEC project manager, it has been determined that the site does not pose a significant threat.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in **Appendix A.** 

For more information about TAGs, go online at <a href="http://www.dec.ny.gov/regulations/2590.html">http://www.dec.ny.gov/regulations/2590.html</a>

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)				
Application Process:					
<ul><li> Prepare site contact list</li><li> Establish document repository(ies)</li></ul>	At time of preparation of application to participate in the BCP.				
<ul> <li>Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period</li> <li>Publish above ENB content in local newspaper</li> <li>Mail above ENB content to site contact list</li> <li>Conduct 30-day public comment period</li> </ul>	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.				
After Execution of Brownfield	Site Cleanup Agreement (BCA):				
Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation  Note: Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.				
Before NYSDEC Approves Reme	dial Investigation (RI) Work Plan:				
<ul> <li>Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan</li> <li>Conduct 30-day public comment period</li> </ul>	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.				
After Applicant Complete	s Remedial Investigation:				
Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report				
Before NYSDEC Approves	Remedial Work Plan (RWP):				
<ul> <li>Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period</li> <li>Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager)</li> <li>Conduct 45-day public comment period</li> </ul>	Before NYSDEC approves RWP. 45-day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.				
Before Applicant Sta	rts Cleanup Action:				
Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.				
After Applicant Compl	After Applicant Completes Cleanup Action:				
<ul> <li>Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report</li> <li>Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and</li> </ul>	At the time the cleanup action has been completed. <b>Note:</b> The two fact sheets are combined when possible if there is not a delay in issuing the COC.				
issuance of Certificate of Completion (COC)					

#### 3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the Site. Additional major issues of public concern may be identified during the course of the Site's investigation and cleanup process.

The Site, located in Brooklyn Community Board #11, falls in one of the Environmental Justice (EJ) areas in New York City with pre-dominant population of Asian and Hispanic. So, the "Scoping Sheet for Major Issues of Public Concern" was referred to identify major issues of public concerns at and around the Site and further decide the course of action to address these concerns. The redevelopment plan for the Site includes construction of a new five (5) story mixed-use residential and commercial building. The major issues of concern to the public relate to potential impacts of nuisance odors and dust during the disturbance of historic fill soils at the Site. This includes concerns regarding excavation/handling and off-site disposal of the contaminated soil and more significantly, the potential generation of vapor/dust while the remedial action is taking place. In order to reduce these impacts, the remedial work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the Site and those on adjacent properties during construction. Onsite receptors are limited to contractors, trespassers, site representatives and visitors granted access to the Site. During construction, potential onsite receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers, and visitors. Potential off-site receptors within a 500-foot radius of the Site include the people working at and visiting the public library, school and the daycare facilities.

During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials Management Plan (SMMP), dust controls, and through the implementation of the Community Air-Monitoring Program (CAMP) and a Construction Health and Safety Plan (CHASP). These plans prepared as a part of the Remedial Action Work Plan (RAWP) and will be available for public review at the document repository. Implementation of these plans will be under the direct oversight of the NYSDEC. These plans will specify the following worker and community health and safety activities during the remedial activity at the Site:

- On-site air monitoring for worker protection.
- Perimeter air monitoring for community protection.
- Use of engineering controls such as vapor/dust barriers, temporary negative-pressure
  enclosures, or special ventilation devices are considered to prevent exposures related
  to the work activities and to control dust and odors.
- Implementation of planned activities during the hours when the potentially exposed population is at a minimum.

#### 4. Site Information

**Appendix C** contains a map identifying the location of the site.

Site Description

The Site is located at 1665-1674 Stillwell Avenue in the Bensonhurst neighborhood of Brooklyn in Kings County, NY 11223. The Site consists of a rectangular-shaped parcel, approximately 8,000-sq. ft. (0.184-acre) in size, and is bounded by Stillwell Avenue to the west, Kings Highway to the north, Quentin Road to the south, and W 13<sup>th</sup> Street to the east. The Site is zoned as R6B/C2-3, residential district with commercial overlays. The surrounding properties consist mainly of commercial, residential, and institutional site uses. The Site is currently vacant and was previously developed with a single-story concrete block building that was previously occupied by a drycleaner, thrift shop, and a dairy.

History of Site Use, Investigation, and Cleanup

The Site is currently vacant and was developed prior to 1969 with a one-story building, and a parking area in the western portion of the lot. It was initially used as an "ice cream dispensing stand" in 1955 and it was occupied for use as dairy in 1970. It was later occupied by a thrift shop in 1985 which was converted to a drycleaner in 1999.

A range of environmental issues associated with the past use of the property as a commercial laundry were identified during a subsurface investigation performed in June 2019. Several volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) associated with fuel oil and gasoline were reported above the standards in groundwater and indoor air. Chlorinated volatile organic compounds (CVOCs) typically associated with drycleaning solvents were reported above the standards in soil and indoor air. Moreover, elevated levels of metals such as Chromium, Copper, Lead, Mercury, Nickel, Zinc, Iron, Magnesium, Manganese and Sodium were also found exceeding the standards in soil and groundwater.

#### 5. Investigation and Cleanup Process

#### **Application**

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in the Application proposes that the site will be used for **restricted residential** purposes.

To achieve this goal, the Applicant will conduct **cleanup** activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC, and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

#### Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45-days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

#### or

The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

#### Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan, if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of

public health and the environment for the intended use of the site.

#### Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

#### Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

*Engineering control* is a physical barrier or method to manage contamination. Examples include caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

#### Appendix A -**Project Contacts and Locations of Reports and**

#### **Information Project Contacts**

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

#### **New York State Department of Environmental Conservation (NYSDEC):**

Meghan Medwid **Project Manager** NYSDEC Division of Environmental Remediation 625 Broadway, 12th Floor Albany NY 12233 518-402-8610

Adanna Roberts Citizen Participation Specialist NYSDEC Region 2 47-40 21st Street Long Island City, NY 11101

Phone: 718-482-4966

#### **New York State Department of Health (NYSDOH):**

**Anthony Perratta Project Manager** NYSDOH Corning Tower, Room 1787 Albany, NY 12210 518-402-7860

#### **Locations of Reports and Information**

Brooklyn Public Library – Highlawn Branch 1665 W. 13th Street at Kings Highway Brooklyn, NY 11223

Phone: 718-234-7208

#### Hours:

Sunday: Closed

Monday, Wednesday & Friday: 10am-6pm

Tuesday: 1pm-8pm Saturday: 10am-5pm

#### **Appendix B - Site Contact List**

#### **Local Government Contacts:**

Eric Adams Mayor of the City of New York City Hall, NY 10007 Phone: 212-788-3000

Antonio Reynoso Brooklyn Borough President 209 Joralemon Street Brooklyn, NY 11201 Phone: 718-802-3700

William Guarinello Chair Brooklyn Community Board 11 2214 Bath Avenue Brooklyn, NY 11214 Phone: 718-266-8800

Marnee Elias-Pavia District Manager 2214 Bath Avenue Brooklyn, NY 11214

Charles Barron New York City Council 42<sup>nd</sup> District 447 New Lots Avenue Brooklyn, NY 11207 Phone: 718-649-9495

Eric Gonzalez Kings County District Attorney 350 Jay Street Brooklyn, NY 11201 Phone: 718-250-3470

#### **Public Water Supplier:**

New York City Department of Environmental Protection Attn: Rohit T. Aggarwal 59-17 Junction Blvd Queens, NY 11368

#### **Schools and Daycare Facilities:**

PS/IS 686 Brooklyn School of Inquiry 50 Ave P Brooklyn, NY 11204 Phone: 718-621-5730

Public School 97 - The Highlawn School 1855 Stillwell Ave Brooklyn, NY 11223

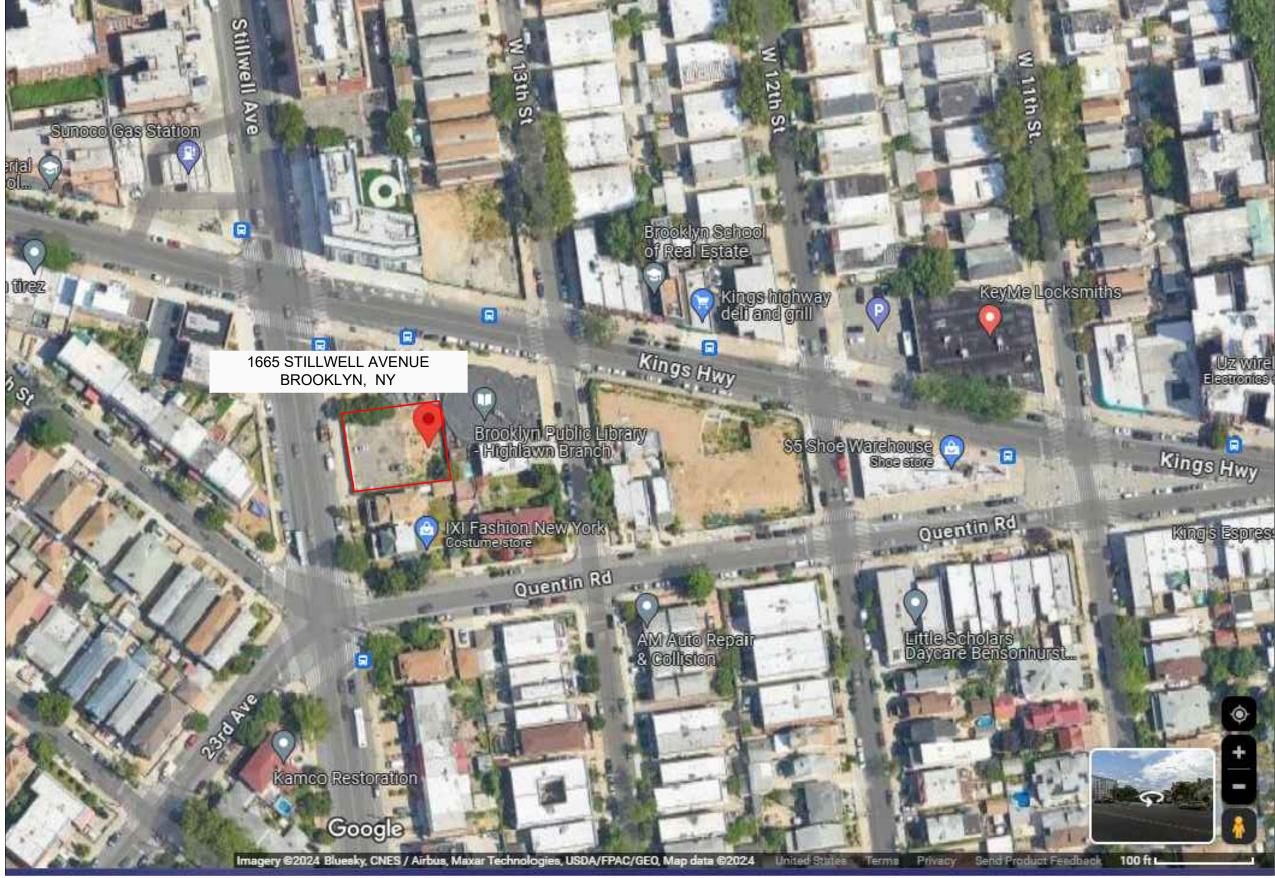
The Leaning Experience 412 Kings Hwy Brooklyn, NY 11223 Phone: 718-627-7340

Little Scholars Daycare Bensonhurst 52 Quentin Road Brooklyn, NY 11223 Phone: 917-475-0001

Happy Club Children's Center 125 Kings Hwy Brooklyn, NY 11223 Phone: 347-307-4833

Gold Material Montessori School 105 Kings Hwy Brooklyn, NY 11214 Phone: 718-253-2552

### **Appendix C - Site Location Map**



PREPARED BY:



## TYLL ENGINEERING & CONSULTING PC

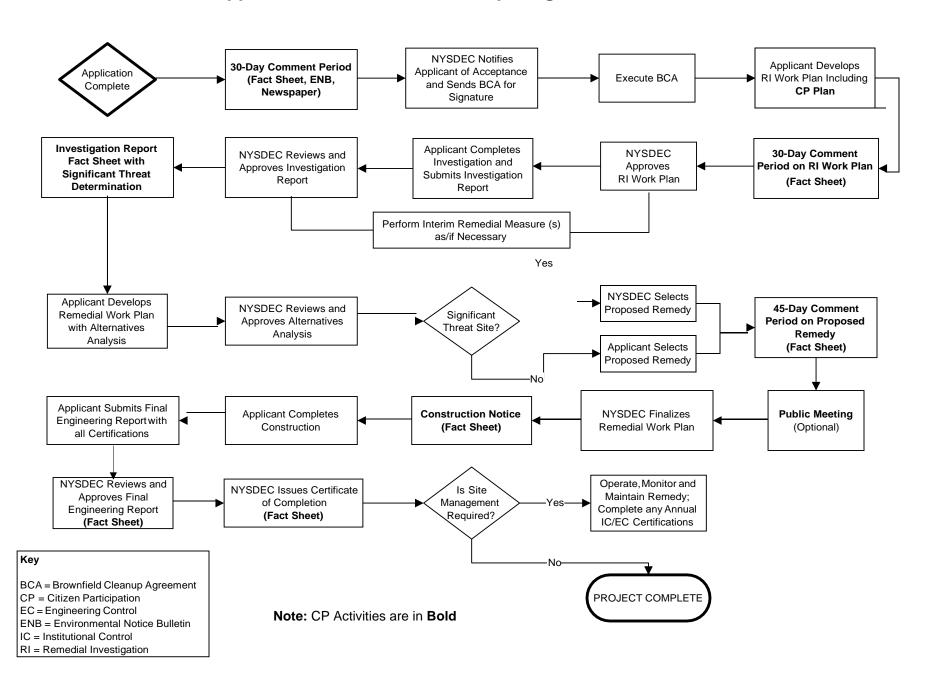
169 Commack Road, Suite H173, Commack, NY 11725 PHONE: (631) 629-5373 info@tyllengineering.com TITLE:

### **SITE LOCATION MAP**

1665 STILLWELL AVENUE BROOKLYN, NY

DRAWN:	SCALE:	DATE:	PROJECT NO.:	
-	NTS	02/14/2024	RSK2305	
CHECKED:	APPROVED:	REVISION:	NOTES:	
KT	KT	-	-	
FIGURE NO.:				
		1		

#### **Appendix D- Brownfield Cleanup Program Process**



# Appendix D Quality Assurance Project Plan



## QUALITY ASSURANCE PROJECT PLAN (QAPP)

1665 STILLWELL AVENUE BROOKLYN, NY 11223 NYSDEC SITE NO. C224307

#### SUBMITTED TO:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION, BUREAU B

625 BROADWAY, 12<sup>th</sup> FLOOR ALBANY, NEW
YORK 12233-7016

PREPARED FOR: REFULGENCE LLC 8738 20<sup>th</sup> AVENUE BROOKLYN, NY 11214

PREPARED BY:

Tyll Engineering and
Consulting PC
169 Commack Road, Suite
H173 Commack, NY 11725
631-629-5373

FEBRUARY 2024



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**APPENDIX A** RESUMES

**APPENDIX B** LABORATORY QUALS PACK & CERTIFICATIONS

#### 1.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

#### 1.1 Project Description & Objectives

This Quality Assurance Project Plan (QAPP) has been prepared by Tyll Engineering and Consulting, P.C (TES), on behalf of Refulgence LLC for the site located at 1665 Stillwell Avenue, Brooklyn, New York (NYSDEC BCP Site C224307). The QAPP presents data quality objectives (DQO), methods and QA/QC requirements associated with sample collection and laboratory analysis to be performed. This QAPP specifies analytical methods and procedures to be used to ensure that data collected during proposed remedial activities are precise, accurate, representative, comparable, complete and meet sensitivity requirements for the project.

The objective of the proposed sampling is to investigate and characterize the nature and extent of contamination on-site and possibly migrating off-site and to provide sufficient information to evaluate remedial alternatives. The QAPP was prepared in accordance with NYSDEC DER-10: Technical Guidance for Site Investigation and Remediation, Section 2.

#### 1.2 Project Organization Remedial

#### **Engineer**

The Remedial Engineer for this project will be Karen Tyll, P.E. of TES. The Remedial Engineer is a registered Professional Engineer licensed by the State of New York. The Remedial Engineer will be responsible for implementation of the Remedial Action and future remedial program for the site. The Remedial Engineer will certify in the Final Engineering Report that remedial action was observed by qualified environmental professionals as well as that the remedial action was performed in accordance with the NYSDEC approved RAWP.

#### **Project Manager**

RSK Project Manager (Danny Singh) will be responsible for the day-to-day project management, task leadership, and project engineering support and for the planning and implementation of RI activities and providing oversight of all field work performed. The Project Manager is responsible for ensuring that the requirements of the RAWP are implemented. Drumita Dmello will act as the Site-specific Construction Health and Safety Officer (HSO). Resumes for project staff are included in Appendix A.

#### **Analytical Laboratory**

Phoenix Environmental Laboratories, Inc. (Phoenix) of Manchester, Connecticut, A NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory (ELAP Number 11301) will be contracted to perform required analyses and reporting, including Analytical Services Protocol (ASP) Category B Deliverables, which will allow for data validation. Phoenix will be responsible for sample container preparation, sample custody in the laboratory and completion of the required analysis. The Laboratory Director will ensure that laboratory QA procedures are followed and an acceptable laboratory report is prepared and submitted. Laboratory qualifications, standard operating procedures (SOPs) and certificates are included in Appendix B.

#### **Data Validation**

Koan Government Solutions, LLC (KGS) of Exton, Pennsylvania, will serve as the independent thirdparty data validator for the project. (KGS) will be contracted to perform data validation and to provide Data Usability Summary Reports (DUSRs) for all analytical data obtained during the remedial investigation.

#### 2.0 FIELD SAMPLING PROCEDURES

Soil and groundwater sampling will be conducted in accordance with the protocols established in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation dated May 2010. Soil vapor sampling will be performed in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006, updated May 2017).

#### 2.1 Soil Samples

Soil samples will be visually classified and screened using a PID to assess potential impacts from VOCs. Soil samples to be analyzed for VOCs will be collected using Terra Core samplers. Samples to be analyzed for parameters other than VOCs will be placed into glass jars provided by the laboratory using decontaminated stainless-steel trowels or sterile sampling scoops. After sampling, all sample jars will be capped and securely tightened and placed in coolers with ice and maintained at 4°C until they are transported to the laboratory.

#### 2.2 Field Equipment Calibration

Field equipment will be calibrated daily prior to use. Equipment will be calibrated in accordance with manufacturers' specifications. Equipment calibrations will be recorded in the field logbook.

#### 2.3 Decontamination Procedures

Sampling equipment that will be reused during the remedial activities will be decontaminated prior to each use. The following decontamination procedures will be performed:

- Use laboratory grade glassware detergent and tap water scrub to remove visual contamination
- Generous tap water rinse
- Distilled water rinse

#### 3.0 SAMPLE HANDLING AND ANALYSIS

To ensure quality data acquisition and collection of representative samples, procedures will be implemented to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and quality assurance/quality control.

All information relating to field sampling must be recorded in a bound logbook designated to this project with numbered pages. This will include data transcribed on sample labels and COC forms as a check on sample identification. The following entries will be made in the logbook: daily weather conditions, general observations, preservation, sample collector's name, date, time, sample code, sample type, sample treatment and a description of the sampling location. Site photographs to document field sampling events.

#### 3.1 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable).

Each individual collecting a sample is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The following information will be shown on labels:

- Sample number
- Name of collector
- Date and time of collection
- Place of collection
- Preservation method
- Type of analysis

The COC form will be completed by field personnel and accompany every sample shipment to document sample possession from the time of collection until the sample has been received by the

laboratory. The COC form includes the following information:

- Laboratory that will perform the analysis;
- Names of the samplers;
- Sample I.D. No.;
- Date and time of sample collection;
- Sample matrix or source, i.e., soil;
- Sample location or method;
- Whether the sample has been filtered, fixed or preserved;
- Number of sample containers;
- Type of analysis including EPA method number, where appropriate;
- Project name and number;
- Name of the person to whom the results should be addressed;
- Name of the person/company to whom the invoice will be addressed;
- Signature(s) of the samples;
- Signature(s) of anyone who had custody of the samples, i.e., delivered the samples;
- Date and time that sample custody was relinquished by RSK and the sample was received by the laboratory.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person and/or to/from a secure storage area and/or to the shipper, and/or to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

#### 3.2 Sample Shipment

Soil and groundwater sample containers will be placed in coolers. Ice stored in sealed bags will be placed around sample containers and cushioning material will be placed around the containers if necessary. Coolers will be taped closed. All samples will be picked up by a Phoenix Environmental Laboratory courier within 24 hours of collection and transported to their Manchester, Connecticut lab in a cooler packed with ice in order to maintain samples at a temperature of 4° C.

#### 3.3 Laboratory Analysis

Requirements for sample containers, preservation and holding times are summarized in tables shown below. Phoenix Environmental Laboratories (NYSDOH ELAP # 11301) is proposed to perform analysis of samples collected during the remedial action.

#### **SOIL ANALYTICAL METHODS**

Analyte/Analyte Group	Matrix	Method/SOP	Container(s) (number, size & type per sample)	Preservation	Holding Time	Estimated Number of Samples to be Collected
TAL Metals (and Mercury)	Soil	USEPA 6010D	1x8 oz, glass	Cool ≤ 4°C	180 days	8
TCL VOCs	Soil	USEPA 8260C	3 x 40 ml VOA, glass vial	1 x Methanol 3 x DI H₂0 Cool ≤ 4°C	14 days	8
TCL SVOCs	Soil	USEPA 8270D	1x8 oz, glass	Cool ≤ 4°C	40 days	8
PCBs and Pesticides	Soil	USEPA 8082A	1x8 oz, glass	Cool ≤ 4°C	40 days	8

#### 3.4 Field/Laboratory Quality Assurance/Quality Control

The primary DQO of the remedial investigation soil sampling, soil vapor and groundwater sampling are that data be accurate and precise and, hence, representative of the actual site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Potential field and/or laboratory contamination is assessed through use of trip blanks, method blanks, and equipment rinse blanks (also called "field blanks").

#### • Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP 07/2005).

#### • Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hours by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The

calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

#### Method Blanks

Method blank or preparation blank is prepared from an analyte free matrix which includes the same reagents, internal standards and surrogate standards as me related samples. It is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12-hr. period during the analysis of samples for volatiles. An acceptable method blank will contain less than two (2) times the CRQL of methylene chloride, acetone and 2-butanone. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10 percent of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

#### • Trip Blanks.

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized. laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure.) A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

#### Surrogate Spike Analysis

For organic analyses, all samples and blanks will be spiked with surrogate compounds before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NY5DEC ASP protocols for samples falling within the quantification limits without dilution.

#### Matrix Spike / Matrix Spike Duplicate / Matrix Spike Blank (MS/MSDIMSB) Analysis

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS / MSD / MSB samples will be analyzed for each group of samples of a similar matrix at a rate of 5% (one for every 20 field samples). The RPD will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD. 10% of the samples of each matrix should be sampled and analyzed as Duplicates.

All analyses will be performed in accordance with the July 2005 NYSDEC ASP using USEPA SW-846 methods. All remedial investigation analytical data will be reported in NYSDEC ASP Category B

deliverables.

#### 4.0 QA/QC OBJECTIVES FOR DATA MEASUREMENT

In cases where NYSDOH ELAP Certification exists for a specific group or category of parameters, the laboratories performing analysis in connection with this project will have appropriate NYSDOH ELAP Certification. Analytical Service Protocol (ASP, June 2000) Category B deliverables are required for all samples.

Detection limits set by NYSDEC-ASP will be used for all sample analyses unless otherwise noted. If NYSDEC-ASP-dictated detection limits prove insufficient to assess project goals (i.e., comparison to drinking water standards or attainment of Applicable or Relevant and Appropriate Requirements [ARARs]), then ASP Special Analytical Services (SAS) or other appropriate methods will be utilized.

The quality assurance/quality control objectives for all measurement data include completeness, representativeness, comparability, precision and accuracy.

#### 4.1 Completeness

The analyses performed must be appropriate and inclusive. The parameters selected for analysis are chosen to meet the objectives of the study.

Completeness of the analyses will be assessed by comparing the number of parameters intended to be analyzed with the number of parameters successfully determined and validated. Data must meet QC acceptance criteria for 100 percent or more of requested determinations.

#### 4.2 Representativeness

Samples must be taken of the population and, where appropriate, the population will be characterized statistically to express the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process, or environmental condition.

Non-dedicated sampling devices will be cleaned between sampling points by washing and rinsing with pesticide-grade methanol, followed by a thorough rinse with distilled water. Two types of blank samples will accompany each sample set where Target Compound List (TCL) volatiles are to be analyzed (water matrix only). A trip blank, consisting of a 40 ml VOA vial of organic-free water prepared by the laboratory, will accompany each set of sample bottles from the laboratory to the field and back. This bottle will remain sealed throughout the shipment and sampling process. This blank will be analyzed for TCL volatile organic

compounds along with the groundwater samples to ensure that contamination with TCL volatile compounds has not occurred during the bottle preparation, shipment and sampling phase of the project. In order to check for contaminant carryover when non-dedicated sampling equipment is used, a rinsate blank will be submitted to the laboratory. This blank will also be analyzed for TCL volatile organic compounds.

The TCL compounds are identified in the United States Environmental Protection Agency (USEPA) Contract Laboratory Program dated 10/2016 or as periodically updated.

The analysis results obtained from the determination of identical parameters in field duplicate samples can be used to further assess the representativeness of the sample data.

#### 4.3 Comparability

Consistency in the acquisition, preparation, handling and analysis of samples is necessary in order for the results to be compared where appropriate. Additionally, the results obtained from analyses of the samples will be compared with the results obtained in previous studies, if available.

To ensure the comparability of analytical results with those obtained in previous or future testing, all samples will be analyzed by NYSDEC-approved methods. The NYSDEC-ASP mandated holding times for various analyses will be strictly adhered to.

#### 4.4 Precision and Accuracy

The validity of the data produced will be assessed for precision and accuracy. Analytical methods which will be used include gas chromatography/mass spectrometry (GC/MS), gas chromatography (GC), colorimetry, atomic spectroscopy, gravimetric and titrimetric techniques. The following outlines the procedures for evaluating precision and accuracy, routine monitoring procedures, and corrective actions to maintain analytical quality control. All data evaluations will be consistent with NYSDEC-ASP procedures (June 2000). Data will be 100 percent compliant with NYSDEC-ASP requirements.

The number of duplicate, spiked and blank samples analyzed will a minimum of 1 duplicate for every 20 samples per each medium of groundwater and soil. The inclusion and frequency of analysis of field blanks will be on the order of one per every 20 samples (soil) for the aqueous matrix field blanks will be collected at a frequency of one per day. Samples to be analyzed for volatile organic compounds will be accompanied by a trip blank for each shipment and field blanks (water matrix) or field blanks (soil).

Quality assurance audit samples will be prepared and submitted by the laboratory QA manager for each analytical procedure used. The degree of accuracy and the recovery of analyte to be expected for the analysis of QA samples and spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined.

The concentration of the analyte relative to the detection limit is also a major factor in

determining the accuracy of the measurement.

The lower end of the analytical range for most analyses is generally accepted to be five times the detection limit. At or above this level, the determination and spike recoveries for metals in water samples will be expected to range from 75 to 125 percent. The recovery of organic surrogate compounds and matrix spiking compounds determined by GC/MS will be compared to the guidelines for recovery of individual compounds as established by the United States Environmental Protection Agency (USEPA) Contract Laboratory Program dated 7/85 or as periodically updated. The quality of results obtained for inorganic ion and demand parameters will be assessed by comparison of QC data with laboratory control charts for each test.

#### 5.0 DATA USABILITY AND VALIDATION

The main purpose of the data is for use in defining the extent of contamination at the site, to allow for evaluation of potential human health and ecological exposure assessments and to support remedial action decisions. In order to achieve this, data usability will be performed as described below.

#### **Data Usability and Validation Requirements**

Data usability and validation are performed on analytical data sets primarily to confirm that sampling and chain-of-custody documentation are complete, sample IDs may be tied to specific sampling locations, samples were analyzed within required holding times and analyses are reported in conformance with NYSDEC, Category B data deliverable requirements as applicable to the methods utilized.

Independent third-party data validation will be performed on 5% of the sample data or on one sample from each sample delivery group (SDG) whichever is greater. KGS of Exton, PA, will serve as the independent third-party data validator for the project.

#### Review of Field Data Package

The field data package will be reviewed by the project QA officer and Project Manager for completeness and accuracy. The RSK Project Manager will check field logbooks weekly to ensure that they are properly maintained and updated. If not, corrective action will be taken immediately. Data validation checklists will be used as guides in evaluating sample collection, field records and analytical performance. The field data package will include all field records and measurements developed by the sampling team. The field data package validation procedure will consist of:

- A review of field data contained in sampling logs for completeness.
- A verification that equipment blanks and field blanks were properly prepared, identified and analyzed.
- A check on field measured parameters to ensure proper equipment calibration.
- A review of COC forms for proper completion, signatures of field personnel and the laboratory sample custodian dates.

#### 6.0 CORRECTIVE ACTION

Review and implementation of systems and procedures may result in recommendations for corrective action. Any deviations from the specified procedures within approved project plans due to unexpected site-specific conditions shall warrant corrective action. All errors, deficiencies, or other problems shall be brought to the immediate attention of the RSK PM, who in turn shall contact the Quality Assurance/Data Quality Manager or his designee (if applicable).

Procedures have been established to ensure that conditions adverse to data quality are promptly investigated, evaluated and corrected. These procedures for review and implementation of a change are as follows:

- Define the problem.
- Investigate the cause of the problem.
- Develop a corrective action to eliminate the problem, in consultation with the personnel who defined the problem and who will implement the change.
- Complete the required form describing the change and its rationale (see below for form requirements).
- Obtain all required written approvals.
- Implement the corrective action.
- Verify that the change has eliminated the problem.

During the field investigation, all changes to the sampling program will be documented in field logs/sheets and the RSK PM advised.

If any problems occur with the laboratory or analyses, the laboratory must immediately notify the PM, who will consult with other project staff. All approved corrective actions shall be controlled and documented.

All corrective action documentation shall include an explanation of the problem and a proposed solution which will be maintained in the project file or associated logs. Each report must be approved by the necessary personnel (e.g., the PM) before implementation of the change occurs. The PM shall be responsible for controlling, tracking, implementing and distributing identified changes.

### Appendix A – Resumes

# Dhanraj D. Singh

251 Vincent Drive | East Meadow, NY 11554 | 347-728-0768 | dhanrajdsingh@gmail.com

### Objective

To find a challenging career in an established organization so that I may grow professionally, while earning a good reputation amongst my peers.

### PROFESSIONAL EXPERIENCE

DC Environmental Services, Inc. (Brooklyn, NY)

2004 - 2015

- Managed the operations and productivity of the division of environmental remediation
- Performed and prepare Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight/implementation of Site-Specific Health and Safety Plans with job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings

### BSD Environmental Group (*Brooklyn*, NY)

2015 - 2018

D.b.a. RSK Environmental Group (Brooklyn, NY)

2018 - present

- Managed the operations and productivity
- Perform Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight and implementation of Site-Specific Health and Safety Plans; job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings
- Perform Lead-based paint survey.

### **EDUCATION**

NYC College of Technology (Brooklyn, NY)

2008

St. Georges College & School of Business and Computer Science (Trinidad, W.I.)

1990 - 1999

2005 - 2022

### Certification and Training

- 62 Hour SST Supervisor approved by New York City Department of Buildings
- 30 Hour OSHA Construction Safety and Health 29 CFR 1926
- 40 Hour plus annual refresher OSHA HAZWOPER 29 CFR 1910.120
- 8 Hour plus annual refresher OSHA HAZWOPER Site Supervisor 29 CFR 1910.120(e)(4)
- NYSDOL Asbestos Inspector
- OSHA Confined Space Awareness 29 CFR 1910.146
- 4-Hour Supported Scaffolding Safety 29 CFR 1926.451
- Mold Inspection and Assessment
- Lead-based Paint Inspector EPA TSCA Section 402/40 CFR Part 745.226
- EPA Lead Safe Certified Renovator
- NYSDEC Class A/B Operator 6 NYCRR 613.25 & 6 NYCRR 598.12
- Mt. Vernon Fire Department Supervise and/or install oil burner equipment
- Yonkers Fire Department Tank Pump Installer Permit
- NCDOH Certificate of Fitness Article 12, Section 1.9(j) Tank Installer/Remover

# DRUMITA GABRIEL DMELLO

dgdmello389@gmail.com | +1(646)249-6129 | www.linkedin.com/in/drumita-dmello/

A proficient Environmental Consultant reflecting skillful individuality in solo and team projects, and dedication to a career with an ability to adapt to new situations and grasp new software/techniques. 3+ years of experience in the capacity of an Environmental Consultant within a dynamic workspace. Directly led several NYS & NYC projects assigned in Voluntary Cleanup Program (VCP) and Brownfield Cleanup Program (BCP) from the initial stage of Phase-I Site Assessment to the final stage (Phase-III) of Remedial Cleanup and reporting.

### **EDUCATION**

University of New Haven, West Haven, CT

May 2020

Master of Science, Environmental Science

GPA: 3.73/4

**Concentration: Geographical Information Systems (GIS)** 

St. Xavier's College, Ahmedabad, Gujarat **Bachelor of Science, Chemistry** 

April 2017 GPA: 7/10

### WORK EXPERIENCE

# RSK Environmental Group LLC: Environmental Consultant

October 2020 – Present

- Experience in preparation of Environmental Assessment Reports (Phase 1, 2, 3) in compliance with NYS & NYC Environmental Rules & Regulations (NYSDEC Part 375 and DER-10).
- Management of cost estimation, and budgeting during the initiation of a project along with efficient client organization and sub-contractor communication and oversight during field activities.
- Implementing project work plans and on-site health and safety monitoring during site activities.
- Reading engineering plans and creating remedial investigation and remedial action diagrams utilizing AutoCAD 2022.
- Organizing staff briefing, and safety procedure run-through prior to field activities.
- Oversight and handling of soil samples, collection of samples utilizing spoons/macro-core liners in labprovided glassware; groundwater collection utilizing grab sample technique/low-flow pumps and air sample collection utilizing 2 and 8-hour flow controllers.
- Participation in NY state and city staff meetings, project planning, and conflict resolution.
- Planning and compiling technical reports (Phase-I Reports, Remedial Investigation work plans and reports (RIWP, RIR), Remedial Action Work plans and reports (RAWP, RAR), Site Characterization Report (SCR), Tank Closure Reports (TCR) and Spill Closure Reports for local clients, city, and state projects.

# Walkspan, Inc.: GIS and Data Specialist

August 2020 – July 2021

- Collected and projected GIS data according to a particular coordinate system in ArcGIS Pro, QGIS and ArcGIS Map Products & Online for map-making and feasibility analysis.
- Analyzed the GIS data for Urban mapping of three (3) US cities, namely New York City, Seattle, and Phoenix.
- Designed ArcGIS Story Map for the city of Seattle to showcase the importance and reach of sidewalks.
- Designed web viewing applications utilizing ArcGIS Online to outline the overall idea of Walkability for New York City.

# City of West Haven, Mayor's Office: Sustainability Intern

June 2019 – August 2019

- Achieved "Bronze" certification of sustainable town for West Haven awarded by Sustainable CT and worked with the municipal team to plan and analyze the city management and zoning documents.
- Created outlined professional GIS Web Maps for the City of West Haven as inventories for Open Spaces, Brownfield Sites, and Natural Resources using Web GIS and ArcGIS.
- Exercised remote work to gain knowledge about the city's demographics, Natural Diversity, present Environmental Protection Laws, and city placemaking projects and ideas.

# **ADDITIONAL**

- Technical Expertise: Environmental Impact Site Assessments and reports, OSHA, USEPA RCRA, CERCLA, NYSDEC Rules and Regulation, NYC Rules and Regulations, Environmental Pollution Dynamics, Toxicology, and Chemistry.
- **Certification**: Associate Project Management, 8-hour OSHA HAZWOPER Refresher, 8-hour OSHA Supervisor Initial.

# Appendix B – Laboratory Package



Expires 12:01 AM April 01, 2024 Issued April 01, 2022 Revised March 30, 2023

NY Lab Id No: 11301

### CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES POTABLE WATER All approved analytes are listed below:

#### **Bacteriology**

Coliform, Total / E. coli (Qualitative) SM 21, 23 9222A,B,C

SM 20, 21-23 9223B (-04) (Colilert)

E. coli (Enumeration) SM 21, 23 9222A,B,C

SM 20, 21-23 9223B (-04) (Colilert)

Enterococci SM 23 9230D (Enterolert)

Heterotrophic Plate Count SM 20, 21-23 9215B (-04)

#### **Chlorinated Acids**

2,4,5-TP (Silvex)	EPA 515.3	
2,4-D	EPA 515.3	
Dalapon	EPA 515.3	
Dicamba	EPA 515.3	
Dinoseb	EPA 515.3	
Pentachlorophenol	EPA 515.3	
Picloram	EPA 515.3	

### **Disinfection By-products**

Bromochloroacetic acid	EPA 552.2
Dibromoacetic acid	EPA 552.2
Dichloroacetic acid	EPA 552.2
Monobromoacetic acid	EPA 552.2
Monochloroacetic acid	EPA 552.2
Trichloroacetic acid	EPA 552.2

#### **Fuel Additives**

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

### Metals I

Arsenic, Total SM 19, 21-23 3113B (-04,-10)

# Serial No.: 66334





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#### Metals I

Arsenic, Total EPA 200.9 Rev. 2.2 EPA 200.8 Rev. 5.4 EPA 200.7 Rev. 4.4 Barium, Total EPA 200.8 Rev. 5.4 Cadmium, Total EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 Chromium, Total EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 Copper, Total EPA 200.5 EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 Iron, Total EPA 200.7 Rev. 4.4

Lead, Total EPA 200.5

SM 19, 21-23 3113B (-04,-10)

EPA 200.9 Rev. 2.2 EPA 200.8 Rev. 5.4 EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4

EPA 245.1 Rev. 3.0

Selenium, Total SM 19, 21-23 3113B (-04,-10)

EPA 200.9 Rev. 2.2 EPA 200.8 Rev. 5.4 EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

Serial No.: 66334

Manganese, Total

Mercury, Total

Silver, Total

Zinc, Total





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#### Metals II

Aluminum, Total EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

Antimony, Total SM 19, 21-23 3113B (-04,-10)

EPA 200.9 Rev. 2.2

EPA 200.8 Rev. 5.4

Beryllium, Total EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

Molybdenum, Total EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

Nickel, Total EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

Thallium, Total SM 19, 21-23 3113B (-04,-10)

EPA 200.9 Rev. 2.2

EPA 200.8 Rev. 5.4

Vanadium, Total EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

#### Metals III

 Boron, Total
 EPA 200.7 Rev. 4.4

 Calcium, Total
 EPA 200.7 Rev. 4.4

 Magnesium, Total
 EPA 200.7 Rev. 4.4

 Potassium, Total
 EPA 200.7 Rev. 4.4

 Sodium, Total
 EPA 200.7 Rev. 4.4

 Uranium (Mass)
 EPA 200.8 Rev. 5.4

# **Methylcarbamate Pesticides**

3-Hydroxy Carbofuran EPA 531.2 Aldicarb EPA 531.2

Serial No.: 66334





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#### **Methylcarbamate Pesticides**

Aldicarb Sulfone	EPA 531.2
Aldicarb Sulfoxide	EPA 531.2
Carbaryl	EPA 531.2
Carbofuran	EPA 531.2
Methomyl	EPA 531.2
Oxamyl	EPA 531.2

#### **Microextractables**

1,2,3-Trichloropropane, Low Level	EPA 504.1
1,2-Dibromo-3-chloropropane, Low Le	EPA 504.1
1,2-Dibromoethane, Low Level	EPA 504.1

#### Miscellaneous

1,4-Dioxane	EPA 522
Benzo(a)pyrene	EPA 525.3
Bis(2-ethylhexyl) phthalate	EPA 525.3
Di (2-ethylhexyl) adipate	EPA 525.3
Diquat	EPA 549.2
Glyphosate	EPA 547
Hexachlorobenzene	EPA 525.3
Hexachlorocyclopentadiene	EPA 525.3

 Odor
 SM 21-23 2150 B (-97)

 Organic Carbon, Dissolved
 SM 21-23 5310B (-00)

 Organic Carbon, Total
 SM 21-23 5310B (-00)

 Surfactant (MBAS)
 SM 21-23 5540C (-00)

 Turbidity
 SM 21-23 2130 B (-01)

 UV 254
 SM 21-23 5910B (-00,-11)

Serial No.: 66334





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#### Non-Metals

Chloride

Alkalinity SM 21-23 2320B (-97)

Calcium Hardness EPA 200.7 Rev. 4.4

SM 18-22 2340B (-97)

EPA 300.0 Rev. 2.1

SM 21-22 4500-Cl- E (-97)

 Color
 SM 21-23 2120B (-01)

 Cyanide
 EPA 335.4 Rev. 1.0

 Fluoride, Total
 EPA 300.0 Rev. 2.1

SM 21-23 4500-F C (-97)

Nitrate (as N) EPA 353.2 Rev. 2.0

EPA 300.0 Rev. 2.1

Nitrite (as N) EPA 353.2 Rev. 2.0

EPA 300.0 Rev. 2.1

Orthophosphate (as P) SM 19, 21-23 4500-P F (-99)

SM 19, 21-23 4500-P E (-99)

Solids, Total Dissolved SM 21-23 2540C (-97)
Specific Conductance SM 21-23 2510B (-97)
Sulfate (as SO4) EPA 300.0 Rev. 2.1

SM 19, 21-23 4500-SO4 D (-97)

### **Organohalide Pesticides**

 Alachlor
 EPA 525.3

 Aldrin
 EPA 525.3

 Atrazine
 EPA 525.3

 Butachlor
 EPA 525.3

 Chlordane Total
 EPA 525.3

 Dieldrin
 EPA 525.3

 Endrin
 EPA 525.3

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#### **Organohalide Pesticides**

Heptachlor	EPA 525.3
Heptachlor epoxide	EPA 525.3
Lindane	EPA 525.3
Methoxychlor	EPA 525.3
Metolachlor	EPA 525.3
Metribuzin	EPA 525.3
Propachlor	EPA 525.3
Simazine	EPA 525.3
Toxaphene	EPA 525.3

# **Polychlorinated Biphenyls**

PCB Screen EPA 508

### **Trihalomethanes**

Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2

### **Volatile Aromatics**

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2

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#### **Volatile Aromatics**

4-Chlorotoluene	EPA 524.2	
Benzene	EPA 524.2	
Bromobenzene	EPA 524.2	
Chlorobenzene	EPA 524.2	
Ethyl benzene	EPA 524.2	
Hexachlorobutadiene	EPA 524.2	
Isopropylbenzene	EPA 524.2	
n-Butylbenzene	EPA 524.2	
n-Propylbenzene	EPA 524.2	
p-Isopropyltoluene (P-Cymene)	EPA 524.2	
sec-Butylbenzene	EPA 524.2	
Styrene	EPA 524.2	
tert-Butylbenzene	EPA 524.2	
Toluene	EPA 524.2	
Total Xylenes	EPA 524.2	
Volatile Halocarbons		
1,1,1,2-Tetrachloroethane	EPA 524.2	

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2

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### **Volatile Halocarbons**

2,2-Dichloropropane	EPA 524.2	
Bromochloromethane	EPA 524.2	
Bromomethane	EPA 524.2	
Carbon tetrachloride	EPA 524.2	
Chloroethane	EPA 524.2	
Chloromethane	EPA 524.2	
cis-1,2-Dichloroethene	EPA 524.2	
cis-1,3-Dichloropropene	EPA 524.2	
Dibromomethane	EPA 524.2	
Dichlorodifluoromethane	EPA 524.2	
Methylene chloride	EPA 524.2	
Tetrachloroethene	EPA 524.2	
trans-1,2-Dichloroethene	EPA 524.2	
trans-1,3-Dichloropropene	EPA 524.2	
Trichloroethene	EPA 524.2	
Trichlorofluoromethane	EPA 524.2	
Vinyl chloride	EPA 524.2	

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EPA 8260D

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### **Acrylates**

Acrolein (Propenal)

Acrylonitrile	EPA 8260C EPA 624.1 EPA 8260D EPA 8260C EPA 624.1	
Amines		
1,2-Diphenylhydrazine	EPA 625.1 EPA 8270D EPA 8270E	
2-Nitroaniline	EPA 8270D EPA 8270E	
3-Nitroaniline	EPA 8270D EPA 8270E	
4-Chloroaniline	EPA 8270D EPA 8270E	
4-Nitroaniline	EPA 8270D EPA 8270E	
Aniline	EPA 625.1 EPA 8270D	
Carbazole	EPA 8270E EPA 625.1 EPA 8270D	
Pyridine	EPA 8270E EPA 625.1	
	EPA 8270D EPA 8270E	

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#### **Bacteriology**

Coliform, Fecal SM 9222D-2015

Colilert-18

Coliform, Total SM 9222B-2015
E. coli (Enumeration) m-Coliblue24

Colilert-24 SM 9223B-2016 Colilert-18

Enterococci SM 9230D-2013 (Enterolert)

Heterotrophic Plate Count SM 18-21 9215B

**Benzidines** 

3,3'-Dichlorobenzidine EPA 625.1

EPA 8270D

**EPA 8270E** 

Benzidine EPA 625.1

EPA 8270D

EPA 8270E

### **Chlorinated Hydrocarbon Pesticides**

4,4'-DDD EPA 8081B

EPA 608.3

4,4'-DDE EPA 8081B

EPA 608.3

4,4'-DDT EPA 8081B

EPA 608.3

Aldrin EPA 8081B

EPA 608.3

alpha-BHC EPA 8081B

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#### **Chlorinated Hydrocarbon Pesticides**

Omormated Hydrocarbon i est	iciacs	
alpha-BHC	EPA 608.3	
alpha-Chlordane	EPA 8081B	
beta-BHC	EPA 8081B	
	EPA 608.3	
Chlordane Total	EPA 8081B	
	EPA 608.3	
delta-BHC	EPA 8081B	
	EPA 608.3	
Dieldrin	EPA 8081B	
	EPA 608.3	
Endosulfan I	EPA 8081B	
	EPA 608.3	
Endosulfan II	EPA 8081B	
	EPA 608.3	
Endosulfan sulfate	EPA 8081B	
	EPA 608.3	
Endrin	EPA 8081B	
	EPA 608.3	
Endrin aldehyde	EPA 8081B	
	EPA 608.3	
Endrin Ketone	EPA 8081B	
gamma-Chlordane	EPA 8081B	
Heptachlor	EPA 8081B	
	EPA 608.3	
Heptachlor epoxide	EPA 8081B	
	EPA 608.3	
Lindane	EPA 8081B	

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#### **Chlorinated Hydrocarbon Pesticides**

Lindane	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
PCNB	EPA 8270D
	EPA 8270E
Toxaphene	EPA 8081B
	EPA 608.3

	EPA 608.3	
Chlorinated Hydrocarbons		
1,2,3-Trichlorobenzene	EPA 8260D	
	EPA 8260C	
1,2,4,5-Tetrachlorobenzene	EPA 8270D	
	EPA 8270E	
1,2,4-Trichlorobenzene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2-Chloronaphthalene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Hexachlorobenzene	EPA 8081B	
	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Hexachlorobutadiene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Hexachlorocyclopentadiene	EPA 625.1	
	EPA 8270D	

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#### **Chlorinated Hydrocarbons**

Hexachlorocyclopentadiene EPA 8270E
Hexachloroethane EPA 625.1
EPA 8270D
EPA 8270E

### **Chlorophenoxy Acid Pesticides**

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
Pentachlorophenol	EPA 8151A

### **Demand**

Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
Chemical Oxygen Demand	SM 5220D-2011

### **Fuel Oxygenates**

Di-isopropyl ether	EPA 8260D
	EPA 8260C
Ethanol	EPA 8260D
	EPA 8260C
	EPA 8015D
Methyl tert-butyl ether	EPA 8260D
	EPA 8260C

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### **Fuel Oxygenates**

Methyl tert-butyl ether	EPA 624.1	
tert-amyl alcohol	EPA 8260D	
	EPA 8260C	
tert-amyl methyl ether (TAME)	EPA 8260D	
	EPA 8260C	
tert-butyl alcohol	EPA 8260D	
	EPA 8260C	
tert-butyl ethyl ether (ETBE)	EPA 8260D	
	EPA 8260C	
Haloethers		
2,2'-Oxybis(1-chloropropane)	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
4-Bromophenylphenyl ether	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
4-Chlorophenylphenyl ether	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Bis(2-chloroethoxy)methane	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Bis(2-chloroethyl)ether	EPA 625.1	
	EPA 8270D	

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EPA 8270E





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#### Low Level Halocarbons

1,2,3-Trichloropropane, Low Level EPA 8011
1,2-Dibromo-3-chloropropane, Low Le EPA 8011
1,2-Dibromoethane, Low Level EPA 8011

### Low Level Polynuclear Aromatics

Low Level Polynuclear Aromatics		
Acenaphthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Acenaphthylene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Anthracene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(a)anthracene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(a)pyrene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(b)fluoranthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(k)fluoranthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Chrysene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Fluoranthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	

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**EPA 8270D SIM** 





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#### **Low Level Polynuclear Aromatics**

Fluorene Low Level EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level EPA 8270D SIM
EPA 8270E SIM

Naphthalene Low Level EPA 8270D SIM EPA 8270E SIM

Phenanthrene Low Level EPA 8270D SIM

EPA 8270E SIM

Pyrene Low Level EPA 8270D SIM

**EPA 8270E SIM** 

Metals I

Barium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Cadmium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B EPA 7010

SM 3113B-2010

EPA 200.8, Rev. 5.4 (1994)
Calcium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

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#### Metals I

Chromium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Copper, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Iron, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D

EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Lead, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B EPA 7010

SM 3113B-2010

EPA 200.8, Rev. 5.4 (1994)

Magnesium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

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#### Metals I

Manganese, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Nickel, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Potassium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D

EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Silver, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B EPA 7010

SM 3113B-2010

EPA 200.8, Rev. 5.4 (1994)

Sodium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

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Metals I

Strontium, Total EPA 200.7, Rev. 4.4 (1994)

> **EPA 6010C EPA 6010D**

EPA 200.8, Rev. 5.4 (1994)

Metals II

Aluminum, Total EPA 200.7, Rev. 4.4 (1994)

> **EPA 6010C EPA 6010D EPA 6020B**

EPA 200.8, Rev. 5.4 (1994)

EPA 200.7, Rev. 4.4 (1994)

Antimony, Total

**EPA 6010D EPA 6020B** EPA 7010

**EPA 6010C** 

SM 3113B-2010

EPA 200.8, Rev. 5.4 (1994)

Arsenic. Total EPA 200.7, Rev. 4.4 (1994)

> **EPA 6010C** EPA 6010D **EPA 6020B** EPA 7010 SM 3113B-2010

EPA 200.8, Rev. 5.4 (1994)

Beryllium, Total EPA 200.7, Rev. 4.4 (1994)

> EPA 6010C **EPA 6010D**

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#### Metals II

Beryllium, Total EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Chromium VI EPA 7196A

SM 3500-Cr B-2011

Mercury, Total EPA 245.1, Rev. 3.0 (1994)

EPA 7470A

Selenium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B EPA 7010

SM 3113B-2010

EPA 200.8, Rev. 5.4 (1994)

Vanadium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Zinc, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Metals III

Cobalt, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D

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#### Metals III

Cobalt, Total EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Gold, Total EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Molybdenum, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Thallium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 7010 SM 3113B-2010

EPA 200.9 Rev. 2.2 (1994) EPA 200.8, Rev. 5.4 (1994)

Tin, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C

EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

Titanium, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C EPA 6010D EPA 6020B

EPA 200.8, Rev. 5.4 (1994)

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MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER All approved analytes are listed below:

#### Mineral

 Acidity
 SM 2310B-2011

 Alkalinity
 SM 2320B-2011

 Calcium Hardness
 SM 2340B-2011

Chloride EPA 300.0, Rev. 2.1 (1993)

SM 4500-CI- E-2011

Hardness, Total SM 2340B-2011

Sulfate (as SO4) EPA 300.0, Rev. 2.1 (1993)

SM 4500-SO4 D-2011

Miscellaneous

Boron, Total EPA 200.7, Rev. 4.4 (1994)

EPA 6010C

EPA 6010D

Bromide EPA 300.0, Rev. 2.1 (1993)

Color SM 2120B-2011

Cyanide, Total EPA 335.4, Rev. 1.0 (1993)

EPA 9012B

Formaldehyde EPA 8315A
non-Polar Extractable Material (TPH) EPA 1664A
Oil and Grease Total Recoverable EPA 1664B
EPA 1664B

EPA 9070A (Solvent:Hexane)

Organic Carbon, Total SM 5310B-2014

Phenols EPA 420.4, Rev. 1.0 (1993)

 Specific Conductance
 SM 2510B-2011

 Sulfide (as S)
 SM 4500-S2- D-2011

 Surfactant (MBAS)
 SM 5540C-2011

 Turbidity
 SM 2130 B-2011

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#### Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2,6-Dinitrotoluene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Isophorone	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Nitrobenzene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Nitrosoamines		
N-Nitrosodimethylamine	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
N-Nitrosodi-n-propylamine	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
N-Nitrosodiphenylamine	EPA 625.1	
	EPA 8270D	

#### **Nutrient**

 Ammonia (as N)
 EPA 350.1, Rev. 2.0 (1993)

 Kjeldahl Nitrogen, Total
 EPA 351.1 (Rev. 1978)

 Nitrate (as N)
 EPA 353.2, Rev. 2.0 (1993)

EPA 8270E

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#### Nutrient

Nitrate (as N) EPA 300.0, Rev. 2.1 (1993)

Nitrate-Nitrite (as N) EPA 353.2, Rev. 2.0 (1993)

EPA 300.0, Rev. 2.1 (1993)

Nitrite (as N) EPA 353.2, Rev. 2.0 (1993)

EPA 300.0, Rev. 2.1 (1993)

Corthophosphate (as P) SM 4500-P E-2011

SM 4500-P F-2011 or G-2011 EPA 200.7, Rev. 4.4 (1994)

EPA 8141B

SM 4500-P E-2011

### **Organophosphate Pesticides**

Phosphorus, Total

Atrazine EPA 8141B EPA 8270D EPA 8270E

Azinphos methyl EPA 8141B
Diazinon EPA 8141B
Disulfoton EPA 8141B
Malathion EPA 8141B
Parathion ethyl EPA 8270D
EPA 8270E

#### **Petroleum Hydrocarbons**

Diesel Range Organics EPA 8015D
Gasoline Range Organics EPA 8015D

#### **Phthalate Esters**

Simazine

Benzyl butyl phthalate EPA 625.1 EPA 8270D

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### **Phthalate Esters**

Benzyl butyl phthalate	EPA 8270E	
Bis(2-ethylhexyl) phthalate	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Diethyl phthalate	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Dimethyl phthalate	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Di-n-butyl phthalate	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Di-n-octyl phthalate	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Polychlorinated Biphenyls		
Aroclor 1016 (PCB-1016)	EPA 8082A	
	EPA 608.3	
Aroclor 1221 (PCB-1221)	EPA 8082A	
	EPA 608.3	
Aroclor 1232 (PCB-1232)	EPA 8082A	
	EPA 608.3	
Aroclor 1242 (PCB-1242)	EPA 8082A	

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Aroclor 1248 (PCB-1248)

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EPA 608.3

EPA 8082A EPA 608.3





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#### **Polychlorinated Biphenyls**

Aroclor 1254 (PCB-1254)	EPA 8082A	
	EPA 608.3	
Aroclor 1260 (PCB-1260)	EPA 8082A	
	EPA 608.3	
Aroclor 1262 (PCB-1262)	EPA 8082A	
Aroclor 1268 (PCB-1268)	EPA 8082A	
PCB 101	EPA 8082A	
PCB 105	EPA 8082A	
PCB 118	EPA 8082A	
PCB 128	EPA 8082A	
PCB 138	EPA 8082A	
PCB 153	EPA 8082A	
PCB 170	EPA 8082A	
PCB 18	EPA 8082A	
PCB 180	EPA 8082A	
PCB 183	EPA 8082A	
PCB 184	EPA 8082A	
PCB 187	EPA 8082A	
PCB 195	EPA 8082A	
PCB 206	EPA 8082A	
PCB 209	EPA 8082A	
PCB 28	EPA 8082A	
PCB 44	EPA 8082A	
PCB 49	EPA 8082A	
PCB 52	EPA 8082A	
PCB 66	EPA 8082A	
PCB 8	EPA 8082A	

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#### **Polychlorinated Biphenyls**

PCB 87	EPA 8082A	
PCB Congeners, Total	EPA 8082A	
Polynuclear Aromatics		
Acenaphthene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Acenaphthylene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Anthracene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Benzo(a)anthracene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Benzo(a)pyrene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Benzo(b)fluoranthene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Benzo(g,h,i)perylene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Benzo(k)fluoranthene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	

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### **Polynuclear Aromatics**

i orymadical / li omalico		
Chrysene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Dibenzo(a,h)anthracene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Fluoranthene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Fluorene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Indeno(1,2,3-cd)pyrene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Naphthalene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Phenanthrene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Pyrene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Priority Pollutant PhenoIs		
2,3,4,6 Tetrachlorophenol	EPA 8270D	
	EPA 8270E	

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### **Priority Pollutant Phenols**

2,4,5-Trichlorophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2,4,6-Trichlorophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2,4-Dichlorophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2,4-Dimethylphenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2,4-Dinitrophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2,6-Dichlorophenol	EPA 8270D	
	EPA 8270E	
2-Chlorophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2-Methyl-4,6-dinitrophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2-Methylphenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
2-Nitrophenol	EPA 625.1	

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#### **Priority Pollutant Phenols**

Friority Foliutant Friendis		
2-Nitrophenol	EPA 8270D	
	EPA 8270E	
3-Methylphenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
4-Chloro-3-methylphenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
4-Methylphenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
4-Nitrophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Cresols, Total	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Pentachlorophenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Phenol	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Residue		

# Solids, Total Dissolved Serial No.: 66335

Settleable Solids

Solids, Total

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SM 2540 F-2015

SM 2540 B-2015 SM 2540 C-2015





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#### Residue

Solids, Total Suspended	SM 2540 D-2015
Solids, Volatile	SM 2540 E-2015

# Semi-Volatile Organics

Semi-Volatile Organics		
1,1'-Biphenyl	EPA 8270D	
	EPA 8270E	
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D	
	EPA 8270E	
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D	
	EPA 8270E	
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D	
	EPA 8270E	
2-Methylnaphthalene	EPA 625.1	
	EPA 8270D	
	EPA 8270E	
Acetophenone	EPA 8270D	
	EPA 8270E	
alpha-Terpineol	EPA 625.1	
Benzaldehyde	EPA 8270D	
	EPA 8270E	
Benzoic Acid	EPA 8270D	
	EPA 8270E	
Benzyl alcohol	EPA 8270D	
	EPA 8270E	
Caprolactam	EPA 8270D	
	EPA 8270E	
Dibenzofuran	EPA 8270D	

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**EPA 8270E** 





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### **Volatile Aromatics**

1,2,4-Trichlorobenzene, Volatile	EPA 8260D	
	EPA 8260C	
1,2,4-Trimethylbenzene	EPA 8260D	
	EPA 8260C	
1,2-Dichlorobenzene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
1,3,5-Trimethylbenzene	EPA 8260D	
	EPA 8260C	
1,3-Dichlorobenzene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
1,4-Dichlorobenzene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
2-Chlorotoluene	EPA 8260D	
	EPA 8260C	
4-Chlorotoluene	EPA 8260D	
	EPA 8260C	
Benzene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Bromobenzene	EPA 8260D	
	EPA 8260C	
Chlorobenzene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	

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#### **Volatile Aromatics**

Ethyl benzene	EPA 8260C	
Isopropylbenzene	EPA 624.1 EPA 8260D	
	EPA 8260C	
m/p-Xylenes	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Naphthalene, Volatile	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
n-Butylbenzene	EPA 8260D	
	EPA 8260C	
n-Propylbenzene	EPA 8260D	
	EPA 8260C	
o-Xylene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
p-Isopropyltoluene (P-Cymene)	EPA 8260D	
	EPA 8260C	
sec-Butylbenzene	EPA 8260D	
	EPA 8260C	
Styrene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
tert-Butylbenzene	EPA 8260D	
	EPA 8260C	

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EPA 8260D

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#### **Volatile Aromatics**

Toluene

Total Xylenes	EPA 8260C EPA 624.1 EPA 8260D EPA 8260C EPA 624.1	
Volatile Halocarbons		
1,1,1,2-Tetrachloroethane	EPA 8260D EPA 8260C	
1,1,1-Trichloroethane	EPA 8260D EPA 8260C	
1,1,2,2-Tetrachloroethane	EPA 624.1 EPA 8260D EPA 8260C	
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 624.1 EPA 8260D	
1,1,2 Monore 1,2,2 Minusicethane	EPA 8260C EPA 624.1	
1,1,2-Trichloroethane	EPA 8260D EPA 8260C	
1,1-Dichloroethane	EPA 624.1 EPA 8260D	
	EPA 8260C EPA 624.1	
1,1-Dichloroethene	EPA 8260D EPA 8260C	
	EPA 624.1	

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#### **Volatile Halocarbons**

1,1-Dichloropropene	EPA 8260D	
	EPA 8260C	
1,2,3-Trichloropropane	EPA 8260D	
	EPA 8260C	
1,2-Dibromo-3-chloropropane	EPA 8260D	
	EPA 8260C	
1,2-Dibromoethane	EPA 8260D	
	EPA 8260C	
1,2-Dichloroethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
1,2-Dichloropropane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
1,3-Dichloropropane	EPA 8260D	
	EPA 8260C	
2,2-Dichloropropane	EPA 8260D	
	EPA 8260C	
2-Chloroethylvinyl ether	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Bromochloromethane	EPA 8260D	
	EPA 8260C	
Bromodichloromethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Bromoform	EPA 8260D	

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#### **Volatile Halocarbons**

Bromoform	EPA 8260C	
	EPA 624.1	
Bromomethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Carbon tetrachloride	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Chloroethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Chloroform	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Chloromethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
cis-1,2-Dichloroethene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
cis-1,3-Dichloropropene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Dibromochloromethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Dibromomethane	EPA 8260D	

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MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

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#### **Volatile Halocarbons**

Dibromomethane	EPA 8260C	
Dichlorodifluoromethane	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Hexachlorobutadiene, Volatile	EPA 8260D	
	EPA 8260C	
Methyl iodide	EPA 8260D	
	EPA 8260C	
Methylene chloride	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Tetrachloroethene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
trans-1,2-Dichloroethene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
trans-1,3-Dichloropropene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
trans-1,4-Dichloro-2-butene	EPA 8260D	
	EPA 8260C	
Trichloroethene	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Trichlorofluoromethane	EPA 8260D	
	EPA 8260C	

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#### **Volatile Halocarbons**

Trichlorofluoromethane	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 8260C
	EPA 624.1

	EPA 624.1	
Volatiles Organics		
1,4-Dioxane	EPA 8260D	
	EPA 8260C	
	EPA 8270D	
	EPA 8270D SIM	
	EPA 8270E	
	EPA 8270E SIM	
2-Butanone (Methylethyl ketone)	EPA 8260D	
	EPA 8260C	
2-Hexanone	EPA 8260D	
	EPA 8260C	
2-Nitropropane	EPA 8260D	
	EPA 8260C	
4-Methyl-2-Pentanone	EPA 8260D	
	EPA 8260C	
Acetone	EPA 8260D	
	EPA 8260C	
	EPA 624.1	
Carbon Disulfide	EPA 8260D	

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EPA 8260C

**EPA 8260D** EPA 8260C

EPA 8260D



Cyclohexane

Di-ethyl ether



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#### **Volatiles Organics**

Di-ethyl ether	EPA 8260C
Ethylene Glycol	EPA 8015D
Isobutyl alcohol	EPA 8015D
Methyl acetate	EPA 8260D
	EPA 8260C
Methyl cyclohexane	EPA 8260D
	EPA 8260C
Propylene Glycol	EPA 8015D
Vinyl acetate	EPA 8260D

#### **Sample Preparation Methods**

SM 4500-P B(5)-2011

EPA 5030C

**EPA 8260C** 

SM 4500-CN B-2016 and C-2016

EPA 3010A EPA 3005A EPA 3510C EPA 3520C EPA 3020A EPA 9010C

SM 4500-S2- B,C-2011

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#### **Acrylates**

Acrolein (Propenal) EPA 8260D
EPA 8260C
Acrylonitrile EPA 8260D
EPA 8260C

Amines

1,2-Diphenylhydrazine EPA 8270D
EPA 8270E
2-Nitroaniline EPA 8270D
EPA 8270E

Carbazole EPA 8270D EPA 8270E

Benzidines

3,3'-Dichlorobenzidine EPA 8270D
EPA 8270E
Benzidine EPA 8270D
EPA 8270E

**Characteristic Testing** 

Corrosivity (pH) EPA 9045D

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#### **Characteristic Testing**

Free Liquids EPA 9095B
Ignitability EPA 1010B
EPA 1010A
Synthetic Precipitation Leaching Proc. EPA 1312
TCLP EPA 1311

#### **Chlorinated Hydrocarbon Pesticides**

4,4'-DDD **EPA 8081B** 4,4'-DDE **EPA 8081B** 4,4'-DDT EPA 8081B EPA 8081B Aldrin alpha-BHC **EPA 8081B** alpha-Chlordane **EPA 8081B** Atrazine **EPA 8270D EPA 8270E** beta-BHC EPA 8081B EPA 8081B Chlordane Total delta-BHC **EPA 8081B** Dieldrin EPA 8081B **EPA 8081B** Endosulfan I Endosulfan II EPA 8081B Endosulfan sulfate EPA 8081B Endrin **EPA 8081B** EPA 8081B Endrin aldehyde EPA 8081B **Endrin Ketone** gamma-Chlordane **EPA 8081B** EPA 8081B Heptachlor EPA 8081B Heptachlor epoxide

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All approved analytes are listed below:

#### **Chlorinated Hydrocarbon Pesticides**

Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
	EPA 8270E
Simazine	EPA 8141B
Toxaphene	EPA 8081B

2.7.000.2	
EPA 8260D	
EPA 8260C	
EPA 8270D	
EPA 8270E	
EPA 8270D	
EPA 8270E	
EPA 8270D	
EPA 8270E	
EPA 8270D	
EPA 8270E	
EPA 8270D	
EPA 8270E	
EPA 8270D	
EPA 8270E	
	EPA 8260C EPA 8270D EPA 8270E EPA 8270D EPA 8270E EPA 8270D EPA 8270D EPA 8270D EPA 8270D EPA 8270D EPA 8270D EPA 8270E EPA 8270D EPA 8270D EPA 8270D

EPA 8270D EPA 8270E

#### **Chlorophenoxy Acid Pesticides**

2,4,5-T EPA 8151A

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Hexachloroethane





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#### **Chlorophenoxy Acid Pesticides**

2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A
Pentachlorophenol	EPA 8151A

Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 8270D
	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270D
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270D
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270D
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270D
	EPA 8270E

#### Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270D SIM
	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270D SIM
	EPA 8270E SIM

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#### Low Level Polynuclear Aromatic Hydrocarbons

Low Level Polyhuciear Aromatic H	yurocarbons	
Anthracene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(a)anthracene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(a)pyrene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(b)fluoranthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(g,h,i)perylene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Benzo(k)fluoranthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Chrysene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Fluoranthene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Fluorene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Naphthalene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Phenanthrene Low Level	EPA 8270D SIM	
	EPA 8270E SIM	
Pyrene Low Level	EPA 8270D SIM	

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All approved analytes are listed below:

#### Low Level Polynuclear Aromatic Hydrocarbons

Pyrene Low Level	EPA 8270E SIM	
Metals I		
Barium, Total	EPA 6010C	
	EPA 6010D	
Cadmium, Total	EPA 6010C	
	EPA 6010D	
Calcium, Total	EPA 6010C	
	EPA 6010D	
Chromium, Total	EPA 6010C	
	EPA 6010D	
Copper, Total	EPA 6010C	
	EPA 6010D	
Iron, Total	EPA 6010C	
	EPA 6010D	
Lead, Total	EPA 6010C	
	EPA 6010D	
Magnesium, Total	EPA 6010C	
	EPA 6010D	
Manganese, Total	EPA 6010C	
	EPA 6010D	
Nickel, Total	EPA 6010C	
	EPA 6010D	
Potassium, Total	EPA 6010C	
	EPA 6010D	
Silver, Total	EPA 6010C	
	EPA 6010D	
Sodium, Total	EPA 6010C	

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#### Metals I

Sodium, Total

Strontium, Total	EPA 6010C	
	EPA 6010D	
Metals II		
Aluminum, Total	EPA 6010C	
	EPA 6010D	
Antimony, Total	EPA 6010C	
	EPA 6010D	
Arsenic, Total	EPA 6010C	

EPA 6010D

Ti Scriic, Total	LIAGOTOC
	EPA 6010E
Beryllium, Total	EPA 60100
	EPA 6010E
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471E

Selenium, Total	EPA 6010C
	EPA 6010D
Vanadium, Total	EPA 6010C
	EPA 6010D

Zinc, Total	EPA 6010C
	EPA 6010D

#### **Metals III**

Cobalt, Total	EPA 6010C
	EPA 6010D
Molybdenum, Total	EPA 6010C
	EPA 6010D
Thallium, Total	FPA 6010C

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#### Metals III

**Minerals** 

 Thallium, Total
 EPA 6010D

 Tin, Total
 EPA 6010C

 EPA 6010D
 EPA 6010C

 Titanium, Total
 EPA 6010C

Bromide EPA 9056A
Chloride EPA 9056A
Fluoride, Total EPA 9056A
Sulfate (as SO4) EPA 9056A

Miscellaneous

Boron, Total EPA 6010C EPA 6010D

Cyanide, Total EPA 9012B Formaldehyde EPA 8315A

Organic Carbon, Total Lloyd Kahn Method

EPA 9060A

**EPA 6010D** 

Phenols EPA 9066
Specific Conductance EPA 9050A
Sulfide (as S) EPA 9034

#### Nitroaromatics and Isophorone

2,4-Dinitrotoluene EPA 8270D

**EPA 8270E** 

2,6-Dinitrotoluene EPA 8270D

**EPA 8270E** 

Isophorone EPA 8270D

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#### Nitroaromatics and Isophorone

Isophorone **EPA 8270E** Nitrobenzene **EPA 8270D EPA 8270E** Pyridine EPA 8270D **EPA 8270E** 

**Nitrosoamines** 

N-Nitrosodimethylamine **EPA 8270D EPA 8270E** 

**EPA 8270D** 

N-Nitrosodi-n-propylamine

EPA 8270E

N-Nitrosodiphenylamine **EPA 8270D** 

**EPA 8270E** 

**Nutrients** 

Nitrite (as N) **EPA 9056A** 

#### **Organophosphate Pesticides**

FPA 8141B Azinphos methyl **EPA 8141B** Diazinon Disulfoton EPA 8141B Malathion EPA 8141B Parathion ethyl **EPA 8270D** EPA 8270E

#### **Petroleum Hydrocarbons**

**EPA 8015D Diesel Range Organics** Gasoline Range Organics EPA 8015D

Oil and Grease Total Recoverable EPA 9071B (Solvent:Hexane)

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#### **Phthalate Esters**

· ··················		
Benzyl butyl phthalate	EPA 8270D	
	EPA 8270E	
Bis(2-ethylhexyl) phthalate	EPA 8270D	
	EPA 8270E	
Diethyl phthalate	EPA 8270D	
	EPA 8270E	
Dimethyl phthalate	EPA 8270D	
	EPA 8270E	
Di-n-butyl phthalate	EPA 8270D	
	EPA 8270E	
Di-n-octyl phthalate	EPA 8270D	
	EPA 8270E	
Polychlorinated Biphenyls		

EPA 8082A

## Polychlorinated Biphenyls Aroclor 1016 (PCB-1016)

/ co.co co.co ( co.co.)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A

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#### **Polychlorinated Biphenyls**

Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A
PCB 87	EPA 8082A
PCB Congeners, Total	EPA 8082A

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#### **Polynuclear Aromatic Hydrocarbons**

	<del>_</del>		
Acer	naphthene	EPA 8270D	
		EPA 8270E	
Acer	naphthylene	EPA 8270D	
		EPA 8270E	
Anth	racene	EPA 8270D	
		EPA 8270E	
Benz	zo(a)anthracene	EPA 8270D	
		EPA 8270E	
Benz	zo(a)pyrene	EPA 8270D	
		EPA 8270E	
Benz	zo(b)fluoranthene	EPA 8270D	
		EPA 8270E	
Benz	zo(g,h,i)perylene	EPA 8270D	
		EPA 8270E	
Benz	zo(k)fluoranthene	EPA 8270D	
		EPA 8270E	
Chry	rsene	EPA 8270D	
		EPA 8270E	
Dibe	nzo(a,h)anthracene	EPA 8270D	
		EPA 8270E	
Fluor	ranthene	EPA 8270D	
		EPA 8270E	
Fluor	rene	EPA 8270D	
		EPA 8270E	
Inde	no(1,2,3-cd)pyrene	EPA 8270D	
		EPA 8270E	
Naph	nthalene	EPA 8270D	

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EPA 8270E

EPA 8270E EPA 8270D

EPA 8270E

EPA 8270D EPA 8270E

EPA 8270D EPA 8270E EPA 8270D

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#### **Polynuclear Aromatic Hydrocarbons**

Naphthalene

•		
Phenanthrene	EPA 8270D	
	EPA 8270E	
Pyrene	EPA 8270D	
	EPA 8270E	
Priority Pollutant Phenols		
2,3,4,6 Tetrachlorophenol	EPA 8270D	
	EPA 8270E	
2,4,5-Trichlorophenol	EPA 8270D	
	EPA 8270E	
2,4,6-Trichlorophenol	EPA 8270D	
	EPA 8270E	
2,4-Dichlorophenol	EPA 8270D	
	EPA 8270E	
2,4-Dimethylphenol	EPA 8270D	
	EPA 8270E	
2,4-Dinitrophenol	EPA 8270D	
	EPA 8270E	
2,6-Dichlorophenol	EPA 8270D	

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2-Methyl-4,6-dinitrophenol

2-Chlorophenol

2-Methylphenol

2-Nitrophenol





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#### **Priority Pollutant Phenols**

i monty i onutant i nonoio		
2-Nitrophenol	EPA 8270E	
3-Methylphenol	EPA 8270D	
	EPA 8270E	
4-Chloro-3-methylphenol	EPA 8270D	
	EPA 8270E	
4-Methylphenol	EPA 8270D	
	EPA 8270E	
4-Nitrophenol	EPA 8270D	
	EPA 8270E	
Pentachlorophenol	EPA 8270D	
	EPA 8270E	
Phenol	EPA 8270D	
	EPA 8270E	
Cami Valatila Omnaniaa		

#### **Semi-Volatile Organics**

1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
Benzaldehyde	EPA 8270D

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#### **Semi-Volatile Organics**

Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260D

EPA 8260C EPA 8260D

EPA 8260C

EPA 8260D EPA 8260C EPA 8260D

EPA 8260C EPA 8260D

**EPA 8260C** 

EPA 8260C

2-Chlorotoluene EPA 8260D
EPA 8260C
4-Chlorotoluene EPA 8260D

Benzene EPA 8260D

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1,2-Dichlorobenzene

1,3,5-Trimethylbenzene

1,3-Dichlorobenzene

1.4-Dichlorobenzene





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#### **Volatile Aromatics**

Benzene	EPA 8260C	
Bromobenzene	EPA 8260D	
	EPA 8260C	
Chlorobenzene	EPA 8260D	
	EPA 8260C	
Ethyl benzene	EPA 8260D	
	EPA 8260C	
Isopropylbenzene	EPA 8260D	
	EPA 8260C	
m/p-Xylenes	EPA 8260D	
	EPA 8260C	
Naphthalene, Volatile	EPA 8260D	
	EPA 8260C	
n-Butylbenzene	EPA 8260D	
	EPA 8260C	
n-Propylbenzene	EPA 8260D	
	EPA 8260C	
o-Xylene	EPA 8260D	
	EPA 8260C	
p-Isopropyltoluene (P-Cymene)	EPA 8260D	
	EPA 8260C	
sec-Butylbenzene	EPA 8260D	
	EPA 8260C	
Styrene	EPA 8260D	
	EPA 8260C	
tert-Butylbenzene	EPA 8260D	
	EPA 8260C	

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#### **Volatile Aromatics**

<b>-</b> .		
Toluene	EPA 8260D	
	EPA 8260C	
Total Xylenes	EPA 8260D	
	EPA 8260C	
Volatile Halocarbons		
1,1,1,2-Tetrachloroethane	EPA 8260D	
	EPA 8260C	
1,1,1-Trichloroethane	EPA 8260D	
	EPA 8260C	
1,1,2,2-Tetrachloroethane	EPA 8260D	
	EPA 8260C	
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D	
	EPA 8260C	
1,1,2-Trichloroethane	EPA 8260D	
	EPA 8260C	
1,1-Dichloroethane	EPA 8260D	
	EPA 8260C	
1,1-Dichloroethene	EPA 8260D	
	EPA 8260C	
1,1-Dichloropropene	EPA 8260D	
	EPA 8260C	
1,2,3-Trichloropropane	EPA 8260D	
	EPA 8260C	
1,2-Dibromo-3-chloropropane	EPA 8260D	
	EPA 8260C	
1,2-Dibromoethane	EPA 8260D	
	EPA 8260C	

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#### **Volatile Halocarbons**

1,2-Dichloroethane	EPA 8260D	
	EPA 8260C	
1,2-Dichloropropane	EPA 8260D	
	EPA 8260C	
1,3-Dichloropropane	EPA 8260D	
	EPA 8260C	
2,2-Dichloropropane	EPA 8260D	
	EPA 8260C	
Bromochloromethane	EPA 8260D	
	EPA 8260C	
Bromodichloromethane	EPA 8260D	
	EPA 8260C	
Bromoform	EPA 8260D	
	EPA 8260C	
Bromomethane	EPA 8260D	
	EPA 8260C	
Carbon tetrachloride	EPA 8260D	
	EPA 8260C	
Chloroethane	EPA 8260D	
	EPA 8260C	
Chloroform	EPA 8260D	
	EPA 8260C	
Chloromethane	EPA 8260D	
	EPA 8260C	
cis-1,2-Dichloroethene	EPA 8260D	
	EPA 8260C	
cis-1,3-Dichloropropene	EPA 8260D	

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All approved analytes are listed below:

#### **Volatile Halocarbons**

cis-1,3-Dichloropropene	EPA 8260C	
Dibromochloromethane	EPA 8260D	
	EPA 8260C	
Dibromomethane	EPA 8260D	
	EPA 8260C	
Dichlorodifluoromethane	EPA 8260D	
	EPA 8260C	
Hexachlorobutadiene, Volatile	EPA 8260D	
	EPA 8260C	
Methylene chloride	EPA 8260D	
	EPA 8260C	
Tetrachloroethene	EPA 8260D	
	EPA 8260C	
trans-1,2-Dichloroethene	EPA 8260D	
	EPA 8260C	
trans-1,3-Dichloropropene	EPA 8260D	
	EPA 8260C	
trans-1,4-Dichloro-2-butene	EPA 8260D	
	EPA 8260C	
Trichloroethene	EPA 8260D	
	EPA 8260C	
Trichlorofluoromethane	EPA 8260D	
	EPA 8260C	
Vinyl chloride	EPA 8260D	
	EPA 8260C	
Volatile Organics		

### Volatile Organics

1,4-Dioxane EPA 8260D

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#### **Volatile Organics**

voiatile Organics		
1,4-Dioxane	EPA 8260C	
	EPA 8270D SIM	
	EPA 8270E SIM	
2-Butanone (Methylethyl ketone)	EPA 8260D	
	EPA 8260C	
2-Hexanone	EPA 8260D	
	EPA 8260C	
2-Nitropropane	EPA 8260D	
	EPA 8260C	
4-Methyl-2-Pentanone	EPA 8260D	
	EPA 8260C	
Acetone	EPA 8260D	
	EPA 8260C	
Carbon Disulfide	EPA 8260D	
	EPA 8260C	
Cyclohexane	EPA 8260D	
	EPA 8260C	
Di-ethyl ether	EPA 8260D	
	EPA 8260C	
Ethylene Glycol	EPA 8260D	
	EPA 8260C	
	EPA 8015D	
Isobutyl alcohol	EPA 8015D	
Methyl acetate	EPA 8260D	
	EPA 8260C	
Methyl cyclohexane	EPA 8260D	
	EPA 8260C	

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#### **Volatile Organics**

 Methyl tert-butyl ether
 EPA 8260D

 EPA 8260C
 EPA 8260D

 tert-butyl alcohol
 EPA 8260D

 Tetrahydrofuran
 EPA 8260D

 EPA 8260C
 Vinyl acetate
 EPA 8260D

 EPA 8260D
 EPA 8260D

#### **Sample Preparation Methods**

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 9030B
EPA 3050B
EPA 3550C
EPA 3540C
EPA 3546
EPA 3545A
EPA 3051A
EPA 5021A
EPA 3060A
EPA 9010C

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#### Miscellaneous

Lead in Dust Wipes EPA 6010C

**EPA 6010D** 

Lead in Paint EPA 6010C

EPA 6010D

#### **Sample Preparation Methods**

EPA 3050B EPA 3051A



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#### **Acrylates**

Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15

#### **Chlorinated Hydrocarbons**

1,2,4-TrichlorobenzeneEPA TO-15HexachlorobutadieneEPA TO-15HexachloroethaneEPA TO-15

#### Metals I

Lead, Total EPA 29 (6010)

EPA 7010

EDA TO-15

#### **Polychlorinated Biphenyls**

PCBs and Aroclors EPA TO-10A

#### **Polynuclear Aromatics**

Naphthalene EPA TO-15

## Purgeable Aromatics

1,2,4-1rimethylbenzene	EPA 10-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15

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#### **Purgeable Aromatics**

o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15

#### **Purgeable Halocarbons**

1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromo-3-chloropropane	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,2-Dichloroethene cis-1,3-Dichloropropene	EPA TO-15 EPA TO-15
•	

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#### **Purgeable Halocarbons**

Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-15

#### **Volatile Chlorinated Organics**

Benzyl chloride EPA TO-15

#### **Volatile Organics**

1,2-Dichlorotetrafluoroethane	EPA TO-15
1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2,2,4-Trimethylpentane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetone	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
tert-butyl alcohol	EPA TO-15

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# Appendix E Site Cleanup Objectives



### **Full List of SCOs**

Contaminant   CAS Number   Residential   R	Г			Protection of Pu	ublic Health	Protection of			
Contaminant   CAS Number								Protection of Ground- water	Unrestricted
Annexis	Contaminant	CAS Number	Residential	Residential	Commercial	Industrial	_		Use
Marie					METALS				
Sections					16f		13f	16f	13 °
Communic   1,494-3-9   2,57   13   13   13   14   15   15   15   15   15   15   15			350f				_		350 ·
Communication   1965-90-90   22   10 0   10 0   90   10   10   10   10	•						10		7.2
Commission Nationals   1965-89-1   56   190							4		2.5 °
Corpor	:								1 <sup>b</sup>
Teac Cyanoles   27   27   27   20,000 d   NS   40   27	:								
Lane		7440-30 -6						<u> </u>	
Morganesee	•	7439-92 -1							
1968 Memory   1968   1969									1600 °
Nessein	-							<u> </u>	0.18 °
Seembar   782-89-2   56	•	7440-02 -0			/				
200	Selenium	7782-49 -2				-,			3.9 <sup>c</sup>
### PAST PAGE (SNW) ### 275-1  **S***  **B***	Silver	7440-22 -4					2		2
22.4.5TP Act (Shews) 93-72-1   \$8   100a   500b   1,000c   NS   3.8   3.8   47-00F   69-36   1.5   8.8   8.9   62   120   10,0007   8.4   6.00F   69-36   1.7   7.9   47   94   10,0037   8.6   1.6	Zinc	7440-66 -6	2200	10,000 d	10,000 d	10,000 d	109f	2,480	109 -
AR CODE		•	•	PES	TICIDES / PCBs			•	
147.00T	,		58		500b				3.8
IRCODO	•		1.8		62	120	0.0033 e	17	0.0033 b
Ale	:								0.0033 b
	:								0.0033 b
Description   1918-97   0.072   0.36   3   14   0.6   0.09   0.00							-		0.005 -
Disease   Property   19	•				3.4				0.02
SEMI_VOLATILES   100s					3				0.036
Deberoplane   130-64-9   14   59   50   1,000c   NS   210   7   7   7   7   7   7   7   7   7									0.094
Delidin	-								0.04
Enclosellaria   959-98-8   4.81   241   2001   9201   NS   102   2.2   Enclosellaria   132158-59   4.81   241   2001   9201   NS   102   2.2   Enclosellaria   132158-59   4.81   241   2001   9201   NS   1000c   2.4   Enclosellaria sulfate   1031-07-8   4.81   241   2001   9201   NS   1,000c   2.4   Enclosellaria sulfate   1031-07-8   4.81   241   2001   9201   NS   1,000c   2.4   Enclosellaria sulfate   1031-07-8   4.81   241   2001   9201   NS   1,000c   2.4   Enclosellaria sulfate   1031-07-8   4.81   241   2001   9201   NS   1,000c   2.4   Enclosellaria sulfate   1031-07-8   4.81   2.2   11   59   410   0,014   0,06   0.01   Enclosellaria sulfate   1031-07-8   4.81   2.2   11   59   410   0,014   0,06   0.01   Enclosellaria sulfate   1031-07-8   4.81   2.2   11   3.9   410   0,014   0,06   0.01   Enclosellaria sulfate   1031-07-8   1.3   9.2   2.2   2.3   6   0.1   0.1   Enclosellaria sulfate   1031-07-8   1.3   9.2   2.2   2.3   6   0.1   0.1   Enclosellaria sulfate   1031-07-8   1.0   Enclosellaria sulfate   1.0   1.0									7
Second									0.005
Commonstration   Comm							-		
Testing   Table   Ta								_	
				+			+	+	0.014
Indiane   \$8-89-9   0.28   1.3   9.2   23   6   0.1   0.0   0.0   0.5							_		0.042
Semily   S	•								
SEMI-VOLATILES   Access   Semi-VOLATILES   Semi-VOLATIL			1	1.3	1		1		
Acenaphthene   33-32-9   100a   100a   500b   1,000c   20   98   20   Anthracene   120-12-7   100a   100a   500b   1,000c   NS   107   10   Anthracene   120-12-7   100a   100a   500b   1,000c   NS   1,000c   10   Benzo(a)phyrene   56-55-3   1f   1f   5.6   11   NS   1f   1f   2.6   22   ½   Benzo(a)phyrene   50-32-8   1f   1f   1f   1f   1.1   2.6   22   ½   Benzo(a)phyrene   50-32-8   1f   1f   5.6   11   NS   1.7   ½   Benzo(a)phyrene   102-9-9-2   1f   1f   1f   5.6   11   NS   1.7   ½   Benzo(a)phyrene   191-24-2   100a   100a   500b   1,000c   NS   1,000c   10   Benzo(a)phyrene   191-24-2   100a   100a   500b   1,000c   NS   1.7   0.0   Benzo(a)phyrene   218-01-9   1f   3.9   56   110   NS   1.7   0.0   Benzo(a)phyrene   218-01-9   1f   3.9   56   110   NS   1.7   0.0   Benzo(a)phyrene   205-40-0   100a   100a   500b   1,000c   NS   1,000c   10   Benzo(a)phyrene   205-40-0   100a   100a   500b   1,000c   NS   1,000c   10   Benzo(a)phyrene   205-40-0   100a   100a   500b   1,000c   NS   1,000c   10   Benzo(a)phyrene   205-40-0   100a   100a   500b   1,000c   NS   0,33e   0.3   Benzo(a)phyrene   205-40-0   100a   100a   500b   1,000c   NS   0,33e   0.3   Benzo(a)phyrene   205-40-0   205-4		1	1	ļ± 	MI-VOLATILES	25	1	5.2	0.1
Annihystene   208-96-8   100a   100a   500b   1,000c   NS   1,000c   100a   100a   500b   1,000c   NS   1,000c   100a   100a   500b   1,000c   NS   1,000c   100a	Acenaphthene	83-32-9	100a			1.000c	20	98	20
Benze   Section   Sectio	Acenapthylene	208-96-8		100a			NS	107	100 ·
Benzo(a)pyrene   50-32-8   1f   1f   1f   1f   1.1   2.6   22   15	Anthracene	120-12-7	100a	100a	500b	1,000c	NS	1,000c	100 -
Benzo(b) fluoranthene   205-99-2   1f   1f   5.6   11   NS   1.7   12   12   12   12   12   12   12   1	Benz(a)anthracene	56-55-3	1f	1f	5.6	11	NS	1f	1c
Benzo(g,h,i) perylene	Benzo(a)pyrene	50-32-8	1f	1f	1f	1.1	2.6	22	1°
Benzo(k) fluoranthene   207-08-9   1   3.9   56   110   NS   1.7   0.8	Benzo(b) fluoranthene	205-99-2	1f	1f	5.6	11	NS	1.7	1 <sup>c</sup>
Chrysene 218-01-9 1f 3.9 56 110 NS If 15 15 15 15 15 15 15 15 15 16 15 17 16 17 17 16 16 17 17 16 16 17 17 16 16 16 17 17 16 16 16 17 17 16 16 16 16 17 17 16 16 16 16 17 16 16 16 17 17 16 16 16 16 17 16 16 16 17 16 16 16 16 17 16 16 16 16 17 16 16 16 16 17 16 16 16 16 17 16 16 16 16 16 16 16 16 16 16 16 16 16	Benzo(g,h,i) perylene	191-24-2	100a	100a	500b	1,000c	NS	1,000c	100
Dibenz(a,h) anthracene   53-70-3   0.33e   0.33e   0.56   1.1   NS   1,000c   0.5	Benzo(k) fluoranthene	207-08-9	1	3.9	56	110	NS	1.7	0.8 °
Fluoranthene   206.44-0   100a   100a   500b   1,000c   NS   1,000c   10   Fluorene   86.73-7   100a   100a   500b   1,000c   30   386   30   Indeno(1,2,3-d) pyrene   193.39-5   0.5f   0.5f   5.6   11   NS   8.2   0.5   Indeno(1,2,3-d) pyrene   193.39-5   0.5f   0.5f   5.6   11   NS   8.2   0.5   Indeno(1,2,3-d) pyrene   106.39-4   100a   100a   500b   1,000c   NS   0.33e   0.5   Indeno(1,2,3-d) pyrene   108.39-4   100a   100a   500b   1,000c   NS   0.33e   0.5   Indeno(1,2,3-d) pyrene   108.49-7   100a   100a   500b   1,000c   NS   0.33e   0.5   Indeno(1,2,3-d) pyrene   106.44-5   34   100a   500b   1,000c   NS   0.33e   0.5   Indeno(1,2,3-d) pyrene   106.44-5   34   100a   500b   1,000c   NS   0.33e   0.5   Indeno(1,2,3-d) pyrene   106.44-5   34   100a   500b   1,000c   NS   0.38e   0.5   Indeno(1,2,3-d) pyrene   108.95-2   100a   100a   500b   1,000c   NS   1,000c   10   Indeno(1,2,3-d) pyrene   129.00-0   100a   100a   500b   1,000c   NS   1,000c   10   Indeno(1,2,3-d) pyrene   129.00-0   100a   100a   500b   1,000c   NS   1,000c   10   Industrial pyrene   129.00-0   100a   100a   500b   1,000c   NS   1,000c   10   Industrial pyrene   129.00-0   100a   100a   500b   1,000c   NS   1,000c   10   Industrial pyrene   129.00-0   100a   100a   500b   1,000c   NS   0.68   0.68   0.68   Industrial pyrene   129.00-0   100a   100a   100a   500b   1,000c   NS   0.33   0.3   Industrial pyrene   129.00-0   100a   100a   100a   500b   1,000c   NS   0.27   0.2   Industrial pyrene   129.00-0   120.00-0	-		1f	3.9	56	110	NS	1f	1 <sup>c</sup>
Fluorene 86-73-7 100a 100a 500b 1,000c 30 366 30 366 30 10deno(1,2,3-cd) pyrene 193-39-5 0.5f 0.5f 5.6 11 NS 8.2 0.5	, ,		0.33e	0.33e	0.56	1.1		1,000c	0.33 b
Modeno(1,2,3-cd) pyrene   193-39-5   0.5f   0.5f   5.6   11   NS   8.2   0.5								<u> </u>	100 -
108-39-4   100a   100a   500b   1,000c   NS   0,33e   0.3     Naphthalene   91-20-3   100a   100a   500b   1,000c   NS   12   12     12							-		
Naphthalene									0.5 °
Percent   95-48-7   100a   100a   500b   1,000c   NS   0.33e   0.35e   0.35e   0.25e   0.24e   106-44-5   34   100a   500b   1,000c   NS   0.33e   0.35e   0									0.33 <sup>b</sup>
Decresor   106-44-5   34   100a   500b   1,000c   NS   0.33e   0.35e									
Pentachlorophenol 87-86-5 2.4 6.7 6.7 55 0.8e 0.8e 0.8e 0.8e 0.8e 0.8e 0.8e 0.8e									0.33 b
Phenanthrene   85-01-8   100a   100a   500b   1,000c   NS   1,000c   10									0.33 b
Phenol   108-95-2   100a   100a   500b   1,000c   30   0.33e   0.35e   0.35e   1,000c   100a   129-00-0   100a   100a   500b   1,000c   NS   1,000c   100a									
Protection of Public Health   Protection of Ground-water									0.33°
Protection of Public Health   Residential   Resources   Resources   Resources   Resources									100
Residential   Residential   Residential   Residential   Residential   Resources   Resources   Resources   Resources	,	.25-00-0				1,0000			100
Contaminant         CAS Number         Residential         Residential         Commercial         Industrial         Resources           VOLATILES           1,1,1-Trichloroethane         71-55-6         100a         100a         500b         1,000c         NS         0.68         0.6           1,1-Dichloroethane         75-34-3         19         26         240         480         NS         0.27         0.2           1,1-Dichloroethene         75-35-4         100a         100a         500b         1,000c         NS         0.33         0.3           1,2-Dichloroethene         95-50-1         100a         100a         500b         1,000c         NS         1.1         1.1           1,2-Dichloroethane         107-06-2         2.3         3.1         30         60         10         0.02f         0.0           cis-1,2-Dichloroethene         156-59-2         59         100a         500b         1,000c         NS         0.25         0.2           trans-1,2-Dichloroethene         156-60-5         100a         100a         500b         1,000c         NS         0.19         0.1           trans-1,2-Dichloroethene         541-73-1         17         49         280					IDIIC HEAITH				House adults (
VOLATILES           1,1,1-Trichloroethane         71-55-6         100a         100a         500b         1,000c         NS         0.68         0.6           1,1-Dichloroethane         75-34-3         19         26         240         480         NS         0.27         0.2           1,1-Dichloroethene         75-35-4         100a         100a         500b         1,000c         NS         0.33         0.3           1,2-Dichloroethane         95-50-1         100a         100a         500b         1,000c         NS         1.1         1.1           1,2-Dichloroethane         107-06-2         2.3         3.1         30         60         10         0.02f         0.0           cis-1,2-Dichloroethene         156-59-2         59         100a         500b         1,000c         NS         0.25         0.2           trans-1,2-Dichloroethene         156-60-5         100a         100a         500b         1,000c         NS         0.19         0.1           1,3-Dichloroethene         541-73-1         17         49         280         560         NS         2.4         2.4	0	0.4.0.11	Residential		Commercial	Industrial	_	Ground- water	Unrestricted
1,1,1-Trichloroethane     71-55-6     100a     100a     500b     1,000c     NS     0.68     0.6       1,1-Dichloroethane     75-34-3     19     26     240     480     NS     0.27     0.2       1,1-Dichloroethane     75-35-4     100a     100a     500b     1,000c     NS     0.33     0.3       1,2-Dichloroethane     95-50-1     100a     100a     500b     1,000c     NS     1.1     1.1       1,2-Dichloroethane     107-06-2     2.3     3.1     30     60     10     0.02f     0.6       cis-1,2-Dichloroethane     156-59-2     59     100a     500b     1,000c     NS     0.25     0.2       trans-1,2-Dichloroethane     156-60-5     100a     100a     500b     1,000c     NS     0.19     0.1       trans-1,2-Dichloroethane     541-73-1     17     49     280     560     NS     2.4     2.4	Contaminant	CA5 Number		Nesidelliai	VOL 4711		Resources	1	Use
1,1-Dichloroethane     75-34-3     19     26     240     480     NS     0.27     0.2       1,1-Dichloroethene     75-35-4     100a     100a     500b     1,000c     NS     0.33     0.3       1,2-Dichloroethene     95-50-1     100a     100a     500b     1,000c     NS     1.1     1.1       1,2-Dichloroethane     107-06-2     2.3     3.1     30     60     10     0.02f     0.0       is-1,2-Dichloroethene     156-59-2     59     100a     500b     1,000c     NS     0.25     0.2       rans-1,2-Dichloroethene     156-60-5     100a     100a     500b     1,000c     NS     0.19     0.1       1,3-Dichlorobenzene     541-73-1     17     49     280     560     NS     2.4     2.4	1.4.4 Taiabla 45	74 55 6	100	100		1 000	NIC	0.60	0.60
1,1-Dichloroethene     75-35-4     100a     100a     500b     1,000c     NS     0.33     0.3       1,2-Dichlorobenzene     95-50-1     100a     100a     500b     1,000c     NS     1.1     1.1       1,2-Dichloroethane     107-06-2     2.3     3.1     30     60     10     0.02f     0.0       cis-1,2-Dichloroethene     156-59-2     59     100a     500b     1,000c     NS     0.25     0.2       rans-1,2-Dichloroethene     156-60-5     100a     100a     500b     1,000c     NS     0.19     0.1       1,3-Dichlorobenzene     541-73-1     17     49     280     560     NS     2.4     2.4									0.68
1,2-Dichlorobenzene     95-50-1     100a     100a     500b     1,000c     NS     1.1     1.1       1,2-Dichloroethane     107-06-2     2.3     3.1     30     60     10     0.02f     0.0       cis-1,2-Dichloroethane     156-59-2     59     100a     500b     1,000c     NS     0.25     0.2       rans-1,2-Dichloroethane     156-60-5     100a     100a     500b     1,000c     NS     0.19     0.1       1,3-Dichlorobenzene     541-73-1     17     49     280     560     NS     2.4     2.4									0.27
1,2-Dichloroethane     107-06-2     2.3     3.1     30     60     10     0.02f     0.0       cis-1,2-Dichloroethane     156-59-2     59     100a     500b     1,000c     NS     0.25     0.2       rans-1,2-Dichloroethane     156-60-5     100a     100a     500b     1,000c     NS     0.19     0.1       1,3-Dichlorobenzene     541-73-1     17     49     280     560     NS     2.4     2.4									0.33
cis-1,2-Dichloroethene     156-59-2     59     100a     500b     1,000c     NS     0.25     0.2       rans-1,2-Dichloroethene     156-60-5     100a     100a     500b     1,000c     NS     0.19     0.1       1,3-Dichlorobenzene     541-73-1     17     49     280     560     NS     2.4     2.4	•								
rans-1,2-Dichloroethene 156-60-5 100a 100a 500b 1,000c NS 0.19 0.1 1,3-Dichlorobenzene 541-73-1 17 49 280 560 NS 2.4 2.4									0.02 <sup>c</sup> 0.25
1,3-Dichlorobenzene 541-73-1 17 49 280 560 NS 2.4 2.4									0.25
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2									
1,4-Dichlorobenzene 106-46-7 9.8 13 130 250 20 1.8 1.8 1.6									1.8
							+		0.1 b
					+			+	0.05
1000 1000 1000 11000									0.06

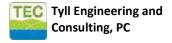
#### **Full List of SCOs**

Contaminant CAS Number		Protection of P	ublic Health	Protection of	Protection of			
	CAS Number	Residential	Restricted- Residential	Commercial	Industrial	Ecological Resources	Ground- water	Unrestricted Use
Butylbenzene	104-51-8	100a	100a	500b	1,000c	NS	12	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76	0.76
Chlorobenzene	108-90-7	100a	100a	500b	1,000c	40	1.1	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1	1
Hexachlorobenzene	118-74-1	0.33e	1.2	6	12	NS	3.2	0.33 <sup>b</sup>
Methyl ethyl ketone	78-93-3	100a	100a	500b	1,000c	100a	0.12	0.12
Methyl tert-butyl ether	1634-04 -4	62	100a	500b	1,000c	NS	0.93	0.93
Methylene chloride	75-09-2	51	100a	500b	1,000c	12	0.05	0.05
n-Propylbenzene	103-65-1	100a	100a	500b	1,000c	NS	3.9	3.9
sec-Butylbenzene	135-98-8	100a	100a	500b	1,000c	NS	11	11
tert-Butylbenzene	98-06-6	100a	100a	500b	1,000c	NS	5.9	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3	1.3
Toluene	108-88-3	100a	100a	500b	1,000c	36	0.7	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6	3.6
1,3,5-Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02	0.02
Xylene (mixed)	1330-20 -7	100a	100a	500b	1,000c	0.26	1.6	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm). NS=Not specified. See Technical Support Document (TSD). Footnotes

- a The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.
- b The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.
- c The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.
- d The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.
- e For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

# Appendix F Construction Health and Safety Plan (CHASP)



# SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

for

1665 Stillwell Avenue, Brooklyn, NY 11223 NYSDEC Site No. C224307

# **Prepared for:**

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway,
Albany, NY 12233

# **Prepared by:**

Tyll Engineering and Consulting, PC 169 Commack Road, Suite 173 Commack, NY 11725

February 2024





# SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

Client: Refulgence LLC

Site Name: 1665 Stillwell Avenue, Brooklyn, NY

Site Address: 1665 Stillwell Avenue, Brooklyn, NY 11223 ("Site")

Site Number: C224307

Date Prepared: February 16, 2024

Project Description: Environmental Remediation

TYLL ENGINEERING AND CONSULTING, RSK ENVIRONMENTAL, AND ITS SUBCONTRACTORS DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THIS HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL HELP REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR ANY INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE(S) WITHOUT PRIOR RESEARCH AND EVALUATION.



# CONSTRUCTION HEALTH AND SAFETY PLAN

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APPENDIX F HOSPITAL INFORMATION, MAP AND FIELD ACCIDENT REPORT

APPENDIX G FIELD ACCIDENT REPORT



# STATEMENT OF COMMITMENT

This Site-Specific Construction Health and Safety Plan (CHASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during any investigative activities planned specifically for the site located at **1665 Stillwell Avenue**, **Brooklyn**, **NY 11223** (the Site). This CHASP, which applies to persons present at the Site actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This CHASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. The subcontractors are retained as independent contractors and are responsible for ensuring the health and safety of their own employees. The subcontractor has the option of adopting this CHASP or providing its own for the planned scope of work.



#### 1.1 INTRODUCTION

The Purpose and Policy of this Site-Specific Construction Health and Safety Plan (HASP) has been developed to comply with the regulations under 26 CFR 1926, Construction, Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER), and COVID-19 Control and Prevention. It addresses safety and health hazards related to subsurface sample collection activities and is based on the best information available with the site work activities to be conducted at 1665 Stillwell Avenue, Brooklyn, NY 11223 (the Site). This document describes the health and safety guidelines developed by Karen Tyll, P.E., for the implementation of a Remedial Investigation Work Plan (RIWP) for the Site, to protect on-site personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during the subsurface investigation activities. The CHASP may be revised by Karen Tyll, P.E., at the request of the New City Office of Environmental Remediation (NYCDEP) upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by RSK's Sr. Project Manager, Site Safety Officer and/or the RSK Health and Safety Consultant.

# 1.1 Scope

This CHASP addresses the potential hazards related to the Site and lists the proposed remedial action that is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry:

- 1. Performance of a Special Community Air Monitoring Program (CAMP) for particulates and volatile organic carbon compounds to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities.
- 2. Establishment of applicable NYSDEC Track 4 Restricted Residential Soil Cleanup Objectives (RRSCOs) and protection of groundwater (PGW) standards.
- 3. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
- 4. Utilizing Waste Characterization Study for soils generated during site redevelopment excavation activities for disposal purposes. The waste characterization soil samples were collected at a frequency dictated by the disposal facility.
- 5. Excavation and removal of soil/fill exceeding Track 4 RRSCOs and PGW standards. For remediation purposes, the top 2-feet of Sitewide soil/fill will be excavated to meet the Restricted Residential SCOs. Approximately 592-cu. Yds. (888-tons) of soil/fill will be generated during remediation excavation.
- 6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
- 7. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
- 8. Removal of all UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.
- 9. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
- 10. Collection and analysis of eight (8) end-point samples to determine the performance of the remedy with respect to attainment of Track 4 RRSCOs. In the event the soil samples exceed RRSCOs and PGW SCOs,



further excavation will take place, and five (5) post-excavation confirmatory samples will be collected post excavation to meet RRSCOs and PGW standards.

- 11. Import of materials to be used for backfilling and cover in compliance with this plan and in accordance with applicable laws and regulations.
- 12. As a part of the development, construction of a composite cover will consist of a 4-inch-thick concrete building cellar slab underlain with a 20-mil vapor barrier (Raven VBP-20) followed by 6-inches layer of <sup>3</sup>/<sub>4</sub>-inch crushed blue stone, and a 4-inch-thick concrete slab underlain with a 20-mil vapor barrier (Raven VBP-20), 6-inches layer of <sup>3</sup>/<sub>4</sub>-inch crushed blue stone, and 2-feet of imported certified clean fill beneath the remainder of the lot (driveway and rear yard). The elevator pit will be constructed with a 2-feet mat slab and underlain with a 20-mil vapor barrier (Raven VBP-20). The composite cover will be constructed under the supervision of the project's Registered Architect.
- 13. As a part of the development, installation of a 20-mil (or better) vapor barrier will be completed beneath the building cellar slab, footings and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier will consist of a 20-mil Raven Industries Vapor Block Plus (VBP-20) below the slabs within the full building area. All welds, seams and penetrations will be properly sealed to prevent preferential pathways for vapor migration, and installed per the manufacturer's specifications. The remedial engineer will oversee and certify in the FER that the vapor barrier was designed and properly installed within the new building footprint.
- 14. Installation of an active sub-slab de-pressurization system (SSDS) consisting of a single loop of horizontal pipe set in the middle of a gas permeable layer immediately beneath the building cellar slab and vapor barrier system. The SSDS gas permeable layer will consist of a 6-inch layer of 34-inch crushed blue stone placed directly beneath the building cellar slab. The horizontal piping will consist of looped 4-inch slotted HDPE corrugated pipe which will be fabric wrapped, manifolded to a schedule-40 6-inch solid Schedule-40 PVC riser pipe that will penetrate the most northeastern section of the foundation wall and travels along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SSDS is an Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SSDS was designed and properly installed to establish a vacuum in the gas permeable layer and a negative (decreasing outward) pressure gradient across the entire building slab to prevent vapor migration into the building.
- 15. Installation of an active Soil Vapor Extraction (SVE) system within a vapor hotspot area (SV-1 & SV-2 from RI, and SV-5 from the Phase-II) as identified in the previous RI on the northeastern corner of the Site (proposed rear yard) in order to remediate chlorinated and petroleum-related VOCs. The system will be constructed with a 4-inch slotted (0.050" slot size) PVC SVE well fabric wrapped installed vertically at a termination depth of 12-feet bgs with a porous annulus not to exceed 8-inches diameter. The SVE annulus will be filled with 3/4-inch crushed blue stone to surround the slotted piping and will be connected to a horizontal 4-inch solid PVC pipe which will run beneath site grade and perpendicular toward the rear of the building's most northeastern section and travel along the building rear exterior wall to the first-floor roof. The pipe will be fitted with an inline vacuum fan and finished 3-feet above the top of the parapet line on the first-floor roof with a Schedule-40 PVC 6-inch goose neck pipe to prevent rain infiltration. The Active SVE is Engineering Control for the remedial action that will be installed under the supervision of the remedial engineer. The remedial engineer will certify in the FER that the SVE was designed and properly installed to establish a vacuum in the vapor hotspot area.
- 16. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.



- 17. Dewatering is anticipated during the proposed elevator shaft excavation, and will be done in compliance with city, state, and federal laws and regulations. Extracted groundwater will either be containerized for off-site licensed or permitted disposal or will be treated under the Long Island Well permit from New York City Department of Environmental Protection (NYCDEP) to meet pretreatment requirements prior to discharge to the sewer system.
- 18. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
- 19. Submission of an approved Site Management Plan (SMP) in the Final Engineering Report (FER) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
- 20. Submission of an FER that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
- 21. Establishment of Engineering Controls in this RAWP and a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without NYSDEC-approval.

# 1.2 Application

This HASP applies to all personnel involved in the above tasks who wish to gain access into the active work areas of the Site, including but not limited to:

- RSK employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

# 1.3 Site Safety Plan Acceptance, Acknowledgment and Amendments

The site safety officer is responsible for informing personnel (RSK employees and/or owner or owner's representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to this HASP. Amendments to this HASP are acknowledged by completing forms included in **Appendix B**.

# 1.4 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Construction Health and Safety Plan are:

Name	Company/Title	Address	<b>Contact Numbers</b>
Drumita Dmello	RSK Environmental	132-02 89 <sup>th</sup> Avenue Ste. #222	(718) 438-2200, Ext. 205
	Site Safety Officer	Richmond Hill, NY 11418	(646) 249-6129
Dhanraj Singh	RSK Environmental	132-02 89 <sup>th</sup> Avenue Ste. #222	(718) 438-2200, Ext. 202
	Sr. Project Manager	Richmond Hill, NY 11418	(347) 728-0768



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Chandrashekar Singh	RSK Environmental Field Scientist	132-02 89 <sup>th</sup> Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200 (347) 304-1514
Karen Tyll, P.E.	Tyll Engineering & Consulting PC.	169 Commack Road, Suite 173, Commack, NY 11725	(631)664-6477

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this HASP. The site safety officer will conduct daily (tail gate or toolbox) safety meetings at the project site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-site personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, then the project manager will be consulted.

The site safety officer is also responsible for coordinating health and safety activities related to hazardous material exposure on-site. The site safety officer is responsible for the following:

- 1. Educating personnel about information in this HASP and other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.
- 2. Coordinating site safety decisions with the project manager.
- 3. Designating exclusion, decontamination and support zones on a daily basis.
- 4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.
- 5. Maintaining the work zone entry/exit log and site entry/exit log.
- 6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the site safety officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site). The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the site safety officer or appropriate key personnel.



#### 2.0 SITE BACKGROUND AND SCOPE OF WORK

The Site is located at 1665 Stillwell Avenue, Brooklyn, NY 11223 (identified in Block: 6618 & Lot: 48). The Site consists of a rectangular-shaped parcel with a lot area of approximately 8,000-sq.ft. in size. The lot is identified as vacant and pending demolition of existing building for site redevelopment. The lot is located east of Stillwell Avenue, south of Kings Highway, west of W 13<sup>th</sup> Street, and north of Quentin Road in Brooklyn, Kings County, NY.

# 2.1 Prior Investigations

A Phase I Environmental Site Assessment was performed by American Environmental Assessment & Solutions Inc. (AEAS) of Brooklyn, New York, dated May 9, 2019, in general accordance with ASTM E1527-13 in order to identify recognized environmental conditions (RECs) associated with the site. The Phase I identified the following RECs for the site:

- The site was assigned an E-Designation for "Hazardous Materials" (E-145) by New York City Department of City Planning (NYCDCP) as part of the July 27, 2005, Bensonhurst Rezoning (CEQR 05DCP055K). Due to this "e" designation, a subsurface investigation was required before development could proceed and satisfaction from NYC Office of Environmental Remediation (OER) will be required before occupancy is permitted.
- Historical use of the site for dry cleaning activities from 1999 through 2014.
- Review of Historical Sanborn Fire Insurance maps indicated the site adjacent to the north (1663 Stillwell Avenue/126-136 Kings Highway) was occupied by an auto repair and gasoline station. Four underground storage tanks (USTs) were identified on the maps dated 1930 through 1981. The site was identified on the NY AST and NY E-designation databases. Historical site usage and the presence of USTs on-site may have impacted 1665 Stillwell Avenue and was identified as a concern.

AEAS recommended a subsurface investigation in the Phase I ESA due to the site's historic use as a drycleaner and the E-designation assigned by NYCDCP.

AEAS also performed subsurface investigation activities during June and July 2019 for the site by American Environmental Assessment & Solutions, Inc. (AEAS) of Brooklyn, New York. This investigation included soil, groundwater and soil vapor sampling and a geophysical survey.

VOCs were detected in all six soil vapor samples collected during the preliminary subsurface investigation performed by AEAS. Chlorinated solvents (tetrachloroethene and trichloroethene) were detected in the soil vapor samples in elevated levels throughout the site, particularly in the northeast corner of the site adjacent to the shed where dry cleaning chemicals associated with previous site use were stored.

Findings of the preliminary investigation indicated one soil sample location contained the metal lead in a concentration exceeding NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Residential Soil Cleanup Objectives (RSCOs). A number of additional metals were detected in the samples in concentrations falling below UUSCOs. There were no VOCs, SVOCs, Pesticides or PCBs detected in soil sample in concentrations exceeding UUSCOs.

Two groundwater monitoring wells sampled during the preliminary investigation contained VOCs and SVOCs in concentrations exceeding Ambient Water Quality Standards and Guidance Values for groundwater as published in NYSDEC TOGS 1.1.1. Compounds detected exceeding NYSDEC criteria included: 2-Isopropyltouene,



Isopropylbenzene, Propylbenzene, sec-butylbenzene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene and Indeno(1,2,3-cd) pyrene.

The owner will implement engineering and institutional controls during site remediation and redevelopment activities in order to limit worker and public exposure to contaminated materials in subsurface material on-site.

# 2.2 Redevelopment Plans

The proposed future use of the Site will consist of a new five-story (15,912.60-sq.ft.) mixed-use building with a commercial space in the cellar and 1st floor, and sixteen (16) residential units 2nd floor through 5th floor. The proposed FAR for commercial is 0.428 and for residential it is 1.561 with a max. building height of 59-feet 8-inch. The layout will consist of no front yard, a 38-feet paved rear yard to be utilized for off-street parking and a 14-feet 10-inch side yard to be utilized as a paved driveway. The proposed cellar depth (top of slab) for the new building will be 10-feet below site grade (bsg). No uncapped areas or landscaping are proposed as part of this redevelopment. The proposed cellar will have a 3,057sq.ft. commercial space with an occupancy of thirty-one (31) persons and the remainder will be utilized as bicycle parking, two (2) utility rooms, a mechanical room, an elevator access and two (2) toilets. The proposed 1st floor will have a commercial space 3,499-sq. ft. in size with an occupancy of thirty-five (35) persons, lobby, a mechanical room, an elevator access and two (2) toilets. Each floor will consist of four (4) residential units that will have two bedrooms, a bathroom, living area, and a kitchenette. Two (2) terrace spaces are proposed for the residential units on the 5th floor. The proposed building will be serviced by an elevator on all floors. The proposed elevator shaft will be 17.5-feet bsg. The roof bulkhead will consist of a rooftop recreation space 616.5-sq. ft. in size, elevator control room and will house the hot water heaters, vents, and exhausts.

The eastern portion of the site will be a paved parking area with eight parking spaces. A driveway will be constructed on the southern portion of the site, providing access to the rear yard. The architectural plans for the proposed building are attached as **Appendix C.** 



#### 3.0 HAZARD ASSESSMENT

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most sites; and presents a summary of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

# 3.1 Physical Hazards

# 3.1.1 Tripping Hazards

An area of risk associated with on-site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

# 3.1.2 Climbing Hazards

During site activities, workers may have to work on drilling equipment by climbing. The drilling contractor will conform with any applicable NIOSH and OSHA requirements or climbing activities.

# 3.1.3 Cuts and Lacerations

Field activities that involve drilling activities usually involve contact with certain technical drilling machinery and tooling. A first aid kit approved by the American Red Cross will be available during all intrusive activities.

# 3.1.4 Lifting Hazards

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the drilling program may be required to lift heavy objects. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

## 3.1.5 Utility Hazards

Before conducting any drilling, the drilling contractor will be responsible for locating and verifying all existing utilities at each boring location.

## 3.1.6 Traffic Hazards

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with DOT guidelines. The drilling contractor shall carry on his operations without undue interference or delays to traffic. The drilling contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

# **3.2** Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

# 3.2.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress. The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.



#### 1. Prevention

- a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
- b. Work in Pairs. Individuals should avoid undertaking any activity alone.
- c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
- d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.

# 2. Recognition and Treatment

a. Heat Rash (or prickly heat):

Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.

Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and

tingling.

Treatment: Remove source of irritation and cool skin with water or wet cloths.

b. Heat Cramps (or heat prostration)

Cause: Profuse perspiration accompanied by inadequate replenishment of body water and

electrolytes.

Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and

clammy skin, approximately normal body temperature.

Treatment: Perform the following while making arrangement for transport to a medical

facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm but loosen all clothing. If conscious, provide sips of saltwater solution, using one teaspoon of salt in 12 ounces of water. Transport to a

medical facility.

c. Heat Stroke

Cause: Same as heat exhaustion. This is also an extremely serious condition. Symptoms: Dry hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.

Treatment: Cool worker immediately by immersing or spraying with cool water or sponge

bare skin after removing protective clothing. Transport to hospital.

# 3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may results in excessive loss of body heat (hypothermia) and/or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on-site field personnel should be closely monitored. Personnel and supervisors working on-site will be made aware of the signs and symptoms of frostbite and hypothermia such ass shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated due to light and numbing of the toes and fingers.



### 3.3 Chemical Hazards

Chemical hazards will be full list of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Pesticides/PCBs, Target Analyte List Metals, and Perfluoroalkyl Substances (PFAS). The primary routes of exposure to the identified contaminants in soil, groundwater or soil vapor to on-site construction workers are through inhalation, ingestion and absorption.

**Appendix D** includes information sheets for chemicals that may be encountered at the site.

# 3.3.1 Respirable Dust

Dust may be generated from vehicular traffic and/or drilling activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the site safety officer. If elevated dust levels persist, the site safety office will employ dust monitoring using a particulate monitor. If monitoring detects concentrations greater than 150  $\mu$ g/m3 over daily background, the site safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soils or groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

## 3.3.2 Dust Control and Monitoring During Earthwork

Dust generated during site activities or other earthwork may contain contaminants identified in soils at the site. Dust will be controlled by wetting the working surface with water. Calcium chloride may be used if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in a site-specific Dust Control Plan (if applicable). Site workers will not be required to wear APR's unless dust concentrations are consistently over  $150 \,\mu\text{g/m}3$  over site-specific background in the breathing zone as measured by a dust monitor unless the site safety officer directs workers to wear APRs. The site safety officer will use visible dust as an indicator to implement the dust control plan.

# 3.3.3 Organic Vapors

The site safety officer will periodically monitor organic vapors with a Photo-ionization Detector (PID) during site activities to determine whether organic vapor concentrations exceed action levels shown in Section 5 and/or the Community Air Monitoring Plan.



# 4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with the site air monitoring program, OSHA 29 CFR 1910.120(c), (g), 1910.132, and COVID-19 requirements. Protective equipment shall be NIOSH approved and respiratory protection including face mask shall conform to OSHA 29 CFR Part 1910.133, 1910.134, and COVID-19 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133 and COVID-19; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.** 

#### 4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work clothes, coveralls, or Tyvek, as needed;
- steel toe and steel shank work boots;
- hard hat:
- gloves, as needed;
- safety glasses and/or face shield;
- face mask:
- hearing protection;
- equipment replacements are available as needed.

# 4.2 Level C

Level C PPE shall be donned when sustained concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), by more than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated Tyvek coveralls;
- steel-toe and steel-shank work boots;
- chemical resistant over-boots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat:
- face/splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The site safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes. The exact PPE ensemble is decided on a site-by-site basis by the Site Safety Officer with the intent to provide the most protective and efficient worker PPE.



# 4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that site work will be performed in Level D.** If air monitoring results indicate the necessity to upgrade the level of protection, engineering controls (i.e., Facing equipment away from the wind and placing site personnel upwind of drilling, active venting, etc.) will be implemented before requiring the use of respiratory protection.



#### 5.0 AIR MONITORING AND ACTION LEVELS

29 CFR 1910.120(h) specifies that monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits or published exposure levels if there are no permissible exposure limits, for hazardous substances.

# **5.1** Air Monitoring Requirements

If site work is performed, air will be monitored for VOCs with a portable MiniRAE 3000 Photo Ionization Detector (PID), or the equivalent. If necessary, Lower Explosive Limit (LEL) and oxygen will be monitored with a Combustible Gas Indicator (CGI). If appropriate, fugitive dust will be monitored using a MiniRAE Model PDM-3 aerosol monitor. Air will be monitored when any of the following conditions apply:

- initial site entry;
- during any work where a potential IDLH condition or flammable atmosphere could develop;
- work begins on another portion of the site;
- contaminants, other than those previously identified, have been discovered;
- each time a different task or activity is initiated;
- during boring, trenching and/or excavation work.

The designated site safety officer will record air monitoring data and ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. Instruments will be zeroed daily and checked for accuracy. Monitoring results will be recorded in a field notebook and will be transferred to instrument reading logs.

#### 5.2 Work Stoppage Responses

The following work stoppage responses will be initiated whenever one or more of the action levels necessitating is exceeded:

- 1. The SSO will be consulted immediately.
- 2. All personnel (except as necessary for continued monitoring and contaminant migration, if applicable) will be cleared from the work area (e.g., from the exclusion zone).
- 3. Monitoring will be continued until intrusive work resumes.

# **5.3** Action Levels During Site Activities

Instrument readings will be taken in the breathing zone within the Site unless otherwise noted. Each action level is independent of all other action levels in determining responses.

Organic Vapors (PID)	LEL %	Responses	
0-1 ppm above background	0%	Continue with site drilling activities	
		Level D protection	
		Continue monitoring every 10 minutes	
1-50 ppm Above Background,	1-30%	Continue with site drilling activities	
Sustained Reading		Level D protection	



		<ul> <li>Continue monitoring every 10 minutes</li> </ul>	
50-250 ppm Above Background,	30-60%	Continue with site drilling activities	
Sustained Reading		Level D protection and employ engineering controls	
		Continue monitoring for organic vapors 200 ft	
		downwind	
		Continuous monitoring for LEL	
>250 ppm Above Background,	>60%	• Discontinue drilling activities, unless PID is only	
Sustained Reading		action level exceeded	
		Employ engineering controls	
		• Continuous monitoring for organic vapors 200 ft	
		downwind.	

Notes: Air monitoring will occur in the breathing zone 30 inches above the site grade.

If action levels for any one of the monitoring parameters are exceeded, the appropriate responses listed in the right-hand column should be taken.

# **5.4 Community Air Monitoring Plan CAMP)**

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

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

A Special Community Monitoring Plan is put in place for this Site to fulfil the special requirements for work within 20 feet of potentially exposed individuals and structures and special requirements for indoor work with co-located residences or facilities as per the following:

- Special Requirements for work within 20 feet of potentially exposed individuals and structures: As the Site is within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates will reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices are considered to prevent exposures related to the work activities and to control dust and odors. Consideration is given to implementing the planned activities during weekends or evening hours in non-residential settings, when the potentially exposed populations are at a minimum.
  - o If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring will occur within the occupied structure(s). Depending upon the nature of



contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions will also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings will be discussed with NYSDOH prior to commencement of the work.

- o If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities will be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions will be pre-determined, as necessary, for each site.
- Special Requirements for Indoor Work with Co-Located Residences or Facilities: Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work will be absent from the room in which the work will occur. Monitoring requirements will be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, will be understood and the monitoring locations established accordingly. In these situations, as recommended, the exhaust fans or other engineering controls will be used to create negative air pressure within the work area during remedial activities. Additionally, the planned work will be implemented during hours (e.g., weekends or evenings) when building occupancy is at a minimum.

# **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. Similarly, upwind concentrations will also be monitored continuously during all ground intrusive work. 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 shut down.

All 15-minute readings must be recorded and be available for DEC 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 will be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 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/m3 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/m3 of the upwind level and in preventing visible dust migration.
- Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.



# 6.0 SITE CONTROL

### 6.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the site safety officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the site) depending on the tasks being performed on any given day. The site safety officer will outline these locations before work begins and when zones change. The site safety officer records this information in the site logbook.

Due to the dimensions of the Site and the work area, it is expected that an exclusion zone will not be required. All onsite workers during drilling activities must provide evidence of OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training to conduct work within the exclusion zone established by the site safety officer. The exclusion zone is defined by the site safety officer but will typically be a 50-foot area around work activities. Gross decontamination (as determined by the site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer, if provided.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the site safety officer.



#### 7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. Emergency telephone numbers and a map to the hospital will be posted in the command post. Site personnel should be familiar with the emergency procedures, and the locations of site safety, first aid, and communication equipment.

# 7.1 Emergency Equipment On-site

Private telephones: Site personnel.

Two-way radios: Site personnel where necessary.

Emergency Alarms: On-site vehicle horns\*.

First aid kits: On-site, in vehicles or office.

Fire extinguisher: On-site, in office or on equipment.

# **7.2** Emergency Telephone Numbers

General Emergencies	911
Fire Department	911
Coney Island Hospital Emergency Department	(718) 616-4327
NYSDEC Spills Hotline	(800) 457-7362
National Response Center	(800) 424-8802
Poison Control	(800) 222-1222
Field Scientist	(347) 304-1514
Sr. Project Manager	(347) 728-0768
Site Safety Officer	(646) 249-6129

# 7.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the site safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the site, or upgrade/downgrade the level of protective clothing and respiratory protection;
- Ensure that appropriate federal, state, and local agencies are informed, and emergency response plans are
  coordinated. In the event of fire or explosion, the local fire department should be summoned immediately.
  If toxic materials are released to the air, the local authorities should be informed in order to assess the need
  for evacuation;
- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;
- Determine the cause of incidents and make recommendations to prevent recurrence; and,
- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Danny Singh, Sr. Project Manager (347) 728-0768
- Drumita Dmello, Site Safety Officer (646) 249-6129

<sup>\*</sup> Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or site safety officer.



# 7.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix E**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix F**) and information on the chemical(s) to which they may have been exposed (**Appendix D**).

# 7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- use of firefighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

#### 7.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The site safety officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.
- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

# 7.7 Spill Control Procedures

Spills associated with site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.



# 7.8 Vapor Release Plan

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped. If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

- contact the local police;
- continue to monitor air every 30 minutes, 20 feet from the closest off-site property. If two successive readings are below 5 ppm (non-methane), off-site air monitoring will be halted.
- All property line and off-site air monitoring locations and results associated with vapor releases will be recorded in the site safety logbook.



# APPENDIX A SITE SAFETY ACKNOWLEDGEMENT FORM



# DAILY BREIFING SIGN-IN SHEET

Date:	Person Conducting Briefing:	
Project Name and Location:		
	d, special safety concerns, recent incidents, etc.):	
	, , ,	
2. OTHER ISSUES (HASP chang	es, attendee comments, etc.):	
`	·	
3. ATTENDEES (Print Name):		
1.	10.	
2.	11.	
3.	12.	
	12	
4.	13.	
5.	14.	
<i>J.</i>	14.	
6.	15.	
7.	16.	
8.	17.	
9.	18.	



# APPENDIX B COVID-19 DISCLOSURE FORM



# **Declaration Form (COVID-19)**

Due to COVID-19, we are asking all employees, sub-contractors and clients to sign a declaration	on prior to coming
on to the Site:	for the Health
and Safety of everyone involved.	

Prior to coming to the Site, we ask that you review the questions below and make a declaration if your response to all the questions below are "No".

- Have you, or anyone whom you are sharing a residence with, been in contact with any person suffering or suspected to be suffering from COVID-19 in the last 14-days?
- Did you have any fever in the last 48-hours or do you have the respiratory symptoms (e.g., cough, runny nose, sore throat or breathing difficulty)?
- Have you travelled outside the U.S in the last 21-days?

If your response to any of the above questions is "Yes", then we regret to inform that you are not permitted to the Site at this time.

By signing below, it is your declaration that your responses to the above questions are "No", and that this declaration is true and accurate to the best of your knowledge.

Date	Print Name	Temperature (F)	Signature



# APPENDIX C SITE SAFETY PLAN AMENDMENTS



# SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment #:		
Site Name:		
Reason for Amendment:		
Alternative Procedures:		
Required Changes in PPE:		
Desirat Conscients adout (six advers)	 Date	
Project Superintendent (signature)	Date	
Welder 18.64 Construction	 Date	
Health and Safety Consultant (signature)	Date	
Site Sefety Officer (cioneters) Deta		
Site Safety Officer (signature) Date		



# APPENDIX D PROPOSED STRUCTURAL PLANS

# Please see Appendix A of RAWP



# APPENDIX E CHEMICAL HAZARDS

# CHEMICAL HAZARDS

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

# 1,1,1,2-TETRACHLOROETHANE ICSC: 1486 (April 2004)

CAS #: 630-20-6 UN #: 1702

EC Number: 211-135-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with hot surfaces. NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Burning sensation. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Headache. Nausea.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Refer for medical attention . Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in dry sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  Transportation UN Classification	
STORAGE	UN Hazard Class: 6.1; UN Pack Group: II	
Separated from strong oxidants and strong bases. Well closed.		
PACKAGING		
Do not transport with food and feedstuffs.		





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### 1,1,1,2-TETRACHLOROETHANE ICSC: 1486

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance YELLOW-TO-RED LIQUID.

**Physical dangers** 

#### Chemical dangers

Decomposes on heating. This produces toxic and corrosive gases including hydrogen chloride. Reacts with strong bases and strong oxidants.

Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub> / Cl<sub>3</sub>CCH<sub>2</sub>Cl Molecular mass: 167.8

Boiling point: 130.5°C Melting point: -70.2°C

Relative density (water = 1): 1.54 Solubility in water, g/100ml at 25°C: 0.11 Vapour pressure, kPa at 25°C: 1.9

Octanol/water partition coefficient as log Pow: 2.66

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by ingestion and by inhalation.

#### Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at  $20^{\circ}\text{C}$ .

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

# **ENVIRONMENT**

The substance is harmful to aquatic organisms.

#### **NOTES**

See ICSC 0332.

# **ADDITIONAL INFORMATION**

# EC Classification

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1,1,1-TRICHLOROETHANE ICSC: 0079 (April 2007)

Methyl chloroform Methyltrichloromethane alpha-Trichloroethane

CAS #: 71-55-6 UN #: 2831

EC Number: 200-756-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire. See Notes.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!					
	SYMPTOMS	PREVENTION	FIRST AID		
Inhalation	Cough. Sore throat. Headache. Dizziness. Drowsiness. Nausea. Incoordination. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.		
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.		
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion	Nausea. Vomiting. Abdominal pain. Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.		

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria	
STORAGE	WARNING	
Separated from food and feedstuffs, strong oxidants, aluminium, magnesium and zinc. Cool. Dry. Store in an area without drain or sewer access.	Causes mild skin irritation Causes eye irritation May cause drowsiness and dizziness May cause damage to cardiovascular system if inhaled Harmful to aquatic life	
PACKAGING	Transportation UN Classification	
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: III	
1984 W 1987   1989 W 1987   1980 W 1987   19		



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1,1,1-TRICHLOROETHANE ICSC: 0079

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air.

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes. Reacts violently with aluminium, aluminium alloys, magnesium, bases, strong oxidants, acetone and zinc.

Formula: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub> / CCl<sub>3</sub>CH<sub>3</sub> Molecular mass: 133.4 Boiling point: 74°C Melting point: -30°C

Relative density (water = 1): 1.34

Solubility in water: poor

Vapour pressure, kPa at 20°C: 13.3 Relative vapour density (air = 1): 4.6

Flash point: see Notes

Auto-ignition temperature: 537°C Explosive limits, vol% in air: 8-16

Octanol/water partition coefficient as log Pow: 2.49

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes, respiratory tract and skin. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. Exposure at high levels could cause cardiac dysrhythmia.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 350 ppm as TWA; 450 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 550 mg/m<sup>3</sup>, 100 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 555 mg/m<sup>3</sup>, 100 ppm as TWA; 1110 mg/m<sup>3</sup>, 200 ppm as STEL

### **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## **NOTES**

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

The substance burns only in excess oxygen or if a strong source of ignition is present.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Depending on the degree of exposure, periodic medical examination is suggested.

Use of alcoholic beverages enhances the harmful effect.

#### ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn, N; Note: F; R: 20-59; S: (2)-24/25-59-61

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## 1,1,2,2-TETRACHLOROETHANE

Acetylene tetrachloride sym-Tetrachloroethane 1,1-Dichloro-2-2,dichloroethane

CAS #: 79-34-5 UN #: 1702

EC Number: 201-197-8

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
INOT COMBUSTIBLE (FIVES Off Irritating or		In case of fire in the surroundings, use appropriate extinguishing media.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Nausea. Vomiting. Dizziness. Drowsiness. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Dry skin. Further see Inhalation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

S Criteria
DANGER
if inhaled irritation
ry irritation ss or dizziness to liver to liver through prolonged or repeated g cancer g genetic defects
, 90.10.10 40.100.10
UN Pack Group: II





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ICSC: 0332 (April 2017)

#### 1,1,2,2-TETRACHLOROETHANE ICSC: 0332

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

#### Chemical dangers

Decomposes on heating and under the influence of air, UV light and moisture. This produces toxic and corrosive gases including hydrogen chloride and phosgene. Reacts violently with alkali metals, strong bases and powdered metals. This produces toxic and corrosive gases. Attacks plastics and rubber.

Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub> / CHCl<sub>2</sub>CHCl<sub>2</sub>

Molecular mass: 167.9 Boiling point: 146°C Melting point: -42,5°C

Relative density (water = 1): 1.59 Solubility in water, g/100ml at 20°C: 0.29 Vapour pressure, Pa at 20°C: 647 Relative vapour density (air = 1): 5.8

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03

Viscosity: 1.11 mm<sup>2</sup>/s at 20°C

Octanol/water partition coefficient as log Pow: 2.39

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system, liver and kidneys. This may result in central nervous system depression and impaired functions. Exposure could cause unconsciousness. Exposure could cause death.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and liver. This may result in impaired functions. This substance is possibly carcinogenic to humans. May cause heritable genetic damage to human germ cells.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 14 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: D

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

#### NOTES

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T+, N; R: 26/27-51/53; S: (1/2)-38-45-61

## 1,1,2-TRICHLOROETHANE ICSC: 0080 (April 2009)

Vinyl trichloride beta-Trichloroethane

CAS #: 79-00-5 UN #: 2810

EC Number: 201-166-9

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
_ ~	NO open flames. NO contact with hot surfaces.	Use powder, water spray, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .	
Eyes	Redness.	Wear safety spectacles or face shield.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.	
Ingestion	Aspiration hazard! See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention . Do NOT induce vomiting.	

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: filter respirator for organic gases and vapours According to UN GHS Criteria adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER STORAGE** Harmful if swallowed Toxic if inhaled Separated from strong oxidants, strong bases and metals. Well Causes mild skin irritation closed. Ventilation along the floor. Provision to contain effluent Causes eye irritation from fire extinguishing. Store in an area without drain or sewer May cause drowsiness or dizziness access. May be fatal if swallowed and enters airways Harmful to aquatic life with long lasting effects **Transportation PACKAGING UN Classification** UN Hazard Class: 6.1; UN Pack Group: III Marine pollutant.



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#### 1,1,2-TRICHLOROETHANE ICSC: 0080

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with strong bases, strong oxidants and metals. This generates fire and explosion hazard.

Formula: C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub> / CHCl<sub>2</sub>CH<sub>2</sub>Cl

Molecular mass: 133.4 Boiling point: 114°C Melting point: -36°C

Relative density (water = 1): 1.4

Solubility in water, g/100ml at 20°C: 0.45 (very poor)

Vapour pressure, kPa at 20°C: 2.5 Relative vapour density (air = 1): 4.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09

Explosive limits, vol% in air: 6-15.5

Octanol/water partition coefficient as log Pow: 2.35

Viscosity: 1.17 mm<sup>2</sup>/s at 25°C

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance is mildly irritating to the skin. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the kidneys and liver. This may result in impaired functions. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged contact with skin may cause dryness and cracking.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 5,5 mg/m<sup>3</sup>, 1 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: D; carcinogen category: 3

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

#### **NOTES**

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

Use of alcoholic beverages enhances the harmful effect.

The relation between odour and the occupational exposure limit cannot be indicated.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

## **ADDITIONAL INFORMATION**

## EC Classification

Symbol: Xn; R: 20/21/22-40-66; S: (2)-9-36/37-46

1,1-DICHLOROETHANE ICSC: 0249 (April 2017)

Ethane, 1,1-dichloro-Ethylidene chloride

CAS #: 75-34-3 UN #: 2362

EC Number: 200-863-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating		Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Lethargy. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	<b>DANGER</b> Highly flammable liquid and vapour May cause damage to liver and kidneys through prolonged or
1	repeated exposure  Harmful to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Marine pollutant.	UN Hazard Class: 3; UN Pack Group: II





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#### 1,1-DICHLOROETHANE ICSC: 0249

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Decomposes on heating and on burning. This produces toxic and corrosive fumes including phosgene (see ICSC 0007) and hydrogen chloride (see ICSC 0163). Reacts violently with strong oxidants, alkali metals, alkaline earth metals and powdered metals. This generates fire and explosion hazard. Attacks aluminium, iron and polyethylene. Contact with strong caustic causes formation of flammable and toxic acetaldehyde gas.

Formula: CH<sub>3</sub>CHCl<sub>2</sub> Molecular mass: 99.0 Boiling point: 57°C Melting point: -98°C

Relative density (water = 1): 1.2

Solubility in water, g/100ml at 20°C: 0.6 (poor)

Vapour pressure, kPa at 20°C: 24 Relative vapour density (air = 1): 3.4

Flash point: -6°C c.c.

Auto-ignition temperature: 458°C Explosive limits, vol% in air: 5.6-11.4

Octanol/water partition coefficient as log Pow: 1.8

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes and upper respiratory tract. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and liver.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 205 mg/m<sup>3</sup>, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C; carcinogen category: 3.

EU-OEL: 412 mg/m<sup>3</sup>, 100 ppm as TWA; (skin)

#### **ENVIRONMENT**

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

#### **NOTES**

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

#### **ADDITIONAL INFORMATION**

## EC Classification

Symbol: F, Xn; R: 11-22-36/37-52/53; S: (2)-16-23-61

VINYLIDENE CHLORIDE

1,1-Dichloroethene

1,1-Dichloroethylene

CAS #: 75-35-4

UN #: 1303 (stabilized) EC Number: 200-864-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	irritating or toxic fumos (or gases) in a	smoking. Closed system, ventilation,	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.	
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).	
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Evacuate danger area! Remove all ignition sources. Consult an According to UN GHS Criteria expert! Personal protection: filter respirator for organic vapours of low boiling point adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER STORAGE** Extremely flammable liquid and vapour Store only if stabilized. Fireproof. Keep in the dark. Cool. Toxic if swallowed Separated from incompatible materials. See Chemical Dangers. May be harmful if inhaled Store in an area without drain or sewer access. Provision to May cause drowsiness or dizziness contain effluent from fire extinguishing May cause damage to liver and kidneys through prolonged or repeated exposure **PACKAGING** Harmful to aquatic life Airtight. Transportation Unbreakable packaging. **UN Classification** Put breakable packaging into closed unbreakable container. UN Hazard Class: 3; UN Pack Group: I Marine pollutant.





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ICSC: 0083 (April 2014)

#### VINYLIDENE CHLORIDE ICSC: 0083

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. Vapours are uninhibited and may polymerize, causing blockage of vents.

#### Chemical dangers

The substance can readily form explosive peroxides. The substance readily polymerizes due to heating or under the influence of oxygen, sunlight, copper or aluminium. This generates fire or explosion hazard. May explode on heating or on contact with flames. Decomposes on burning. This produces toxic and corrosive fumes of hydrogen chloride and phosgene. Reacts violently with oxidants.

Formula:  $C_2H_2Cl_2 / H_2C=CCl_2$ 

Molecular mass: 97.0 Boiling point: 32°C Melting point: -122°C

Relative density (water = 1): 1.2

Solubility in water, g/100ml at 25°C: 0.25 (very poor)

Vapour pressure, kPa at 20°C: 66.5 Relative vapour density (air = 1): 3.3

Relative density of the vapour/air-mixture at 20°C (air = 1): 2.5

Flash point: -25°C c.c.

Auto-ignition temperature: 530°C Explosive limits, vol% in air: 5.6-16

Octanol/water partition coefficient as log Pow: 2.41

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes and upper respiratory tract. Exposure far above the OEL could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the kidneys and liver. This may result in liver function impairment and kidney impairment. Tumours have been detected in experimental animals but may not be relevant to humans.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 8.0 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); carcinogen category: 3; pregnancy risk group: C.

EU-OEL: 8 mg/m<sup>3</sup>, 2 ppm as TWA; 20 mg/m<sup>3</sup>, 5 ppm as STEL

#### ENVIRONMENT

The substance is harmful to aquatic organisms.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F+, Xn; R: 12-20-40; S: (2)-7-16-29-36/37-46; Note: D

## 1,2,4-TRICHLOROBENZENE

1,2,4-Trichlorobenzol unsym-Trichlorobenzene

CAS #: 120-82-1 UN #: 2321

EC Number: 204-428-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
l .	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open tiames	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. If solid: sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from strong oxidants, acids and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	





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ICSC: 1049 (November 2003)

1,2,4-TRICHLOROBENZENE ICSC: 1049

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID OR WHITE CRYSTALS WITH

CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic fumes including hydrogen

chloride. Reacts violently with oxidants.

Formula: C<sub>6</sub>H<sub>3</sub>Cl<sub>3</sub> Molecular mass: 181.5 Boiling point: 213°C Melting point: 17°C

Relative density (water = 1): 1.5 Solubility in water, mg/l: 34.6 Vapour pressure, Pa at 25°C: 40 Relative vapour density (air = 1): 6.26

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.002

Flash point: 105°C c.c.

Auto-ignition temperature: 571°C

Explosive limits, vol% in air: 2.5-6.6 (at 150°C) Octanol/water partition coefficient as log Pow: 3.98

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as STEL.

MAK: skin absorption (H); carcinogen category: 3.

EU-OEL: 15.1 mg/m<sup>3</sup>, 2 ppm as TWA; 37.8 mg/m<sup>3</sup>, 5 ppm as STEL; (skin)

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### **NOTES**

The occupational exposure limit value should not be exceeded during any part of the working exposure. See ICSCs 0344 and 1222.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn, N; R: 22-38-50/53; S: (2)-23-37/39-60-61

## 1,2,4-TRIMETHYLBENZENE ICSC: 1433 (June 2002)

Pseudocumene

CAS #: 95-63-6 UN #: 1993

EC Number: 202-436-9

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Flammable. Above 44°C explosive	system, ventilation and explosion-	Use alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 3; UN Pack Group: III
Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	
PACKAGING	





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1,2,4-TRIMETHYLBENZENE ICSC: 1433

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Decomposes on burning. This produces toxic and irritating fumes.

Reacts violently with strong oxidants. This generates fire and explosion

hazard.

Formula: C<sub>9</sub>H<sub>12</sub> Molecular mass: 120,2 Boiling point: 169°C Melting point: -44°C

Relative density (water = 1): 0.88 Solubility in water: very poor Relative vapour density (air = 1): 4.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 44°C c.c.

Auto-ignition temperature: 500°C Explosive limits, vol% in air: 0.9-6.4

Octanol/water partition coefficient as log Pow: 3.8

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged inhalation may cause effects on the lungs. This may result in chronic bronchitis. The substance may have effects on the central nervous system and blood. See Notes.

## **OCCUPATIONAL EXPOSURE LIMITS**

EU-OEL: 100 mg/m<sup>3</sup>, 20 ppm as TWA.

MAK: 100 mg/m<sup>3</sup>, 20 ppm; peak limitation category: II(2); pregnancy risk group: C

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

## **NOTES**

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

See ICSCs 1155, 1362 and 1389.

1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn, N; R: 10-20-36/37/38-51/53; S: (2)-26-61

ETHYLENE DIBROMIDE ICSC: 0045 (June 2012)

1,2-Dibromoethane

EDB

CAS #: 106-93-4 UN #: 1605

EC Number: 203-444-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion. See Chemical Dangers.		In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Laboured breathing. Shortness of breath. Vomiting. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Drowsiness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	Toxic if swallowed, in contact with skin or if inhaled Causes skin and eye irritation May cause respiratory irritation
Separated from strong oxidants, strong bases, powdered metals and food and feedstuffs. See Chemical Dangers. Ventilation along the floor. Store in an area without drain or sewer access.	May cause cancer Suspected of damaging fertility or the unborn child Causes damage to liver and kidneys May cause drowsiness or dizziness Harmful to aquatic life
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: I



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#### ETHYLENE DIBROMIDE ICSC: 0045

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR. TURNS BROWN ON EXPOSURE TO LIGHT.

**Physical dangers** 

Chemical dangers

Decomposes on heating or on burning and on contact with hot surfaces. This produces toxic and corrosive fumes of hydrogen bromide and bromine (see ICSC 0107). Reacts violently with powdered aluminium, powdered magnesium, calcium, strong bases and strong oxidants. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: Br(CH<sub>2</sub>)<sub>2</sub>Br / C<sub>2</sub>H<sub>4</sub>Br<sub>2</sub>

Molecular mass: 187.9 Boiling point: 131°C Melting point: 10°C

Relative density (water = 1): 2.2

Solubility in water, g/100ml at 20°C: 0.34 (poor)

Vapour pressure, kPa at 20°C: 1.5 Relative vapour density (air = 1): 6.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.06

Octanol/water partition coefficient as log Pow: 1.96

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the liver and kidneys. This may result in tissue lesions. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys, resulting in impaired functions. This substance is probably carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 2.

EU-OEL: 0.8 mg/m<sup>3</sup>, 0.1 ppm as TWA; (skin)

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

#### ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T, N; R: 45-23/24/25-36/37/38-51/53; S: 53-45-61; Note: E

## 1,2-DICHLOROBENZENE ICSC: 1066 (November 2003) ortho-Dichlorobenzene

CAS #: 95-50-1 UN #: 1591

EC Number: 202-425-9

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Above 66°C explosive vapour/air mixtures may be formed.	1 ·	Use water spray, powder, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Sore throat. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from aluminium, oxidants and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



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## 1,2-DICHLOROBENZENE ICSC: 1066

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC

ODOUR.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic and corrosive gases including hydrogen chloride. Reacts with aluminium and oxidants. Attacks plastics and rubber.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>
Molecular mass: 147.0
Boiling point: 180-183°C
Melting point: -17°C

Relative density (water = 1): 1.3 Solubility in water: very poor Vapour pressure, kPa at 20°C: 0.16 Relative vapour density (air = 1): 5.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.006

Flash point: 66°C c.c.

Auto-ignition temperature: 648°C Explosive limits, vol% in air: 2.2-9.2

Octanol/water partition coefficient as log Pow: 3.38

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system and liver. Exposure could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and blood.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 25 ppm as TWA; 50 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 61 mg/m<sup>3</sup>, 10 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 122 mg/m<sup>3</sup>, 20 ppm as TWA; 306 mg/m<sup>3</sup>, 50 ppm as STEL; (skin)

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

## **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: Xn, N; R: 22-36/37/38-50/53; S: (2)-23-60-61

UN #: 1184

1,2-DICHLOROETHANE ICSC: 0250 (April 2013)

Ethylene dichloride 1,2-Ethylene dichloride Ethane dichloride

Ethane dichloride CAS #: 107-06-2

EC Number: 203-458-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	and lighting. Prevent build-up of	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Nausea. Vomiting. Cough. Headache. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Administration of oxygen may be needed. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer immediately for medical attention.

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Evacuate danger area! Consult an expert! Personal protection: According to UN GHS Criteria filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER** Highly flammable liquid and vapour Harmful if swallowed **STORAGE** May be harmful in contact with skin Toxic if inhaled Fireproof. Separated from food and feedstuffs and incompatible Causes skin and eye irritation materials. See Chemical Dangers. Cool. Dry. Well closed. Store in Suspected of causing cancer an area without drain or sewer access. Causes damage to lungs, liver and kidneys May cause drowsiness or dizziness May cause damage to liver and kidneys through prolonged or **PACKAGING** repeated exposure Harmful to aquatic life Unbreakable packaging. Put breakable packaging into closed unbreakable container. **Transportation UN Classification** Do not transport with food and feedstuffs. UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: II



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#### 1,2-DICHLOROETHANE ICSC: 0250

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS VISCOUS LIQUID WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR, MOISTURE AND LIGHT.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

#### Chemical dangers

Decomposes on heating and on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with alkali metals, powdered metals, ammonia, bases and strong oxidants. This generates fire and explosion hazard. Attacks many metals in the presence of water.

Formula: CICH<sub>2</sub>CH<sub>2</sub>CI / C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>

Molecular mass: 98.96 Boiling point: 83.5°C Melting point: -35.7°C

Relative density (water = 1): 1.2 Solubility in water, g/100ml: 0.87 Vapour pressure, kPa at 20°C: 8.7 Relative vapour density (air = 1): 3.42

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: 13°C c.c.

Auto-ignition temperature: 440°C Explosive limits, vol% in air: 4.2-16

Octanol/water partition coefficient as log Pow: 1.48

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The vapour is irritating to the eyes, skin and respiratory tract. Inhalation may cause lung oedema. See Notes. The substance may cause effects on the kidneys and liver. This may result in impaired functions, liver damage and kidney damage. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys, resulting in impaired functions. This substance is possibly carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: skin absorption (H); carcinogen category: 2.

EU-OEL: 8.2 mg/m<sup>3</sup>, 2 ppm as TWA; (skin)

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, T; R: 45-11-22-36/37/38; S: 53-45; Note: E

## 1,2-DICHLOROPROPANE ICSC: 0441 (June 2015)

Propylene dichloride
CAS #: 78-87-5

CAS #: 78-87-5 UN #: 1279

EC Number: 201-152-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	rise in pressure with risk of bursting.	and lighting. Do NOT use	Use powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat. Headache. Drowsiness. Dizziness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin. Redness. Pain.	Protective gloves.	Rinse and then wash skin with water and soap. Refer for medical attention .	
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Nausea. Headache. Drowsiness. Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention . Do NOT induce vomiting.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER	
STORAGE	Highly flammable liquid and vapour Harmful if swallowed or if inhaled May cause an allergic skin reaction	
Fireproof. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	May cause cancer May cause damage to central nervous system May cause damage to liver and kidneys through prolonged or repeated exposure	
PACKAGING	Harmful to aquatic life  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II	



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#### 1,2-DICHLOROPROPANE ICSC: 0441

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

On combustion, forms toxic and corrosive fumes. Attacks aluminium alloys and some types of plastic. Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula:  $C_3H_6Cl_2$  -  $CH_3CHCICH_2Cl$ 

Molecular mass: 113.0 Boiling point: 96°C Melting point: -100°C

Relative density (water = 1): 1.16 Solubility in water, g/100ml at 20°C: 0.26 Vapour pressure, kPa at 20°C: 27.9 Relative vapour density (air = 1): 3.9

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.15

Flash point: 16°C c.c.

Auto-ignition temperature: 557°C Explosive limits, vol% in air: 3.4-14.5

Octanol/water partition coefficient as log Pow: 2.02 (calculated)

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys. This substance is carcinogenic to humans.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; (DSEN); A4 (not classifiable as a human carcinogen).

MAK: skin absorption (H); carcinogen category: 1

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## NOTES

Do NOT take working clothes home.

## **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: F, Xn; R: 11-20/22; S: (2)-16-24

## **DICHLOROTETRAFLUOROETHANE**

1,2-Dichloro-1,1,2,2-tetrafluoroethane

UN #: 1958

EC Number: 200-937-7

CFC114 CAS #: 76-14-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Not combustible. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Suffocation. See Notes.	Use ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Ventilation. NEVER direct water jet on liquid. Do NOT let this chemical enter the environment. Personal protection: chemical protection suit including self-contained breathing apparatus.	According to UN GHS Criteria	
STORAGE	Transportation	
Fireproof if in building. Cool.	UN Classification	
PACKAGING	UN Hazard Class: 2.2	



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ICSC: 0649 (November 1998)

#### DICHLOROTETRAFLUOROETHANE

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS.

#### **Physical dangers**

The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

#### Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen chloride and hydrogen fluoride.

Formula: C<sub>2</sub>Cl<sub>2</sub>F<sub>4</sub> / ClF<sub>2</sub>C-CClF<sub>2</sub>

Molecular mass: 170.92 Boiling point: 4.1°C Melting point: -94°C

Relative density (water = 1): 1.5 Solubility in water at 25°C: none Vapour pressure, kPa at 25°C: 268 Relative vapour density (air = 1): 5.89

Octanol/water partition coefficient as log Pow: 2.8

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system. This may result in cardiac disorders.

#### Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

ICSC: 0649

Effects of long-term or repeated exposure

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 7100 mg/m<sup>3</sup>, 1000 ppm; peak limitation category: II(8); pregnancy risk group: D

## **ENVIRONMENT**

Avoid release to the environment because of its impact on the ozone layer.

#### **NOTES**

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

## 1,3,5-TRIMETHYLBENZENE ICSC: 1155 (June 2002)

Mesitylene

CAS #: 108-67-8 UN #: 2325

EC Number: 203-604-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Flammable. Above 50°C explosive	system, ventilation and explosion-	Use alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III
STORAGE	
Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	
PACKAGING	
Marine pollutant.	
DOMESTICAL DESCRIPTION OF THE PROPERTY OF THE	1.00





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1,3,5-TRIMETHYLBENZENE ICSC: 1155

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic and irritating fumes. Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: C<sub>9</sub>H<sub>12</sub> Molecular mass: 120.2 Boiling point: 165°C Melting point: -45°C

Relative density (water = 1): 0.86 Solubility in water: very poor Vapour pressure, kPa at 20°C: 0.25 Relative vapour density (air = 1): 4.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 50°C c.c.

Auto-ignition temperature: 550°C

Octanol/water partition coefficient as log Pow: 3.42

## **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged inhalation may cause effects on the lungs. This may result in chronic bronchitis. The substance may have effects on the central nervous system and blood. See Notes.

## **OCCUPATIONAL EXPOSURE LIMITS**

EU-OEL: 100 mg/m<sup>3</sup>, 20 ppm as TWA.

MAK: 100 mg/m<sup>3</sup>, 20 ppm; peak limitation category: II(2); pregnancy risk group: C

#### **ENVIRONMENT**

The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

## **NOTES**

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

See ICSCs 1362, 1389 and 1433.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xi, N; R: 10-37-51/53; S: (2)-61

1,3-BUTADIENE ICSC: 0017 (April 2017)

Divinyl

Vinylethylene

Biethylene Erythrene

Pyrrolylene Buta-1,3-diene

CAS #: 106-99-0 UN #: 1010 (stabilized) EC Number: 203-450-8

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Extremely flammable. Gas/air	smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray, powder, carbon dioxide, foam. In case of fire: keep cylinder cool by spraying with water.

AVOID ALL CONTACT!					
	SYMPTOMS PREVENTION FIRST AID				
Inhalation	Cough. Headache. Drowsiness.	Use closed system and ventilation.	Fresh air, rest. Refer for medical attention.		
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .		
Eyes	ON CONTACT WITH LIQUID: FROSTBITE.	Wear face shield.	ON FROSTBITE: rinse with plenty of water. Refer immediately for medical attention.		
Ingestion		Do not eat, drink, or smoke during work.			

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Remove all ignition sources. Evacuate danger area! Consult an According to UN GHS Criteria expert! Personal protection: self-contained breathing apparatus. Shut off cylinder if possible. Isolate the area until the gas has dispersed. NEVER direct water jet on liquid.

## **STORAGE**

Store only if stabilized. Fireproof. Cool. Keep in a well-ventilated room. Separated from incompatible materials and food and feedstuffs. See Chemical Dangers. See Physical Dangers. Refer to the manufacturer's instructions for proper storage conditions.

#### **PACKAGING**

Do not transport with food and feedstuffs. Transport only if stabilized.



Contains gas under pressure; may explode if heated Extremely flammable gas May cause cancer May cause genetic defects

**Transportation UN Classification** UN Hazard Class: 2.1



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#### 1,3-BUTADIENE ICSC: 0017

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

## **Physical dangers**

The gas is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated. Vapours are uninhibited and may polymerize, causing blockage of vents.

#### Chemical dangers

The substance can form peroxides on exposure to air, initiating explosive polymerization. The substance may polymerize due to warming. This generates fire or explosion hazard. Decomposes explosively on rapid heating under pressure. Reacts vigorously with oxidants and many other substances. This generates fire and explosion hazard. Attacks many plastics and some forms of rubber.

Formula:  $C_4H_6$  /  $CH_2$ =(CH)<sub>2</sub>= $CH_2$ 

Molecular mass: 54.1 Boiling point: -4°C Melting point: -109°C

Relative density (water = 1): 0.6 Solubility in water, g/100ml: 0.1 (none) Vapour pressure, kPa at 20°C: 245 Relative vapour density (air = 1): 1.9

Flash point: -76°C c.c.

Auto-ignition temperature: 414°C Explosive limits, vol% in air: 1.1-16.3

Octanol/water partition coefficient as log Pow: 1.99

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance at very high concentrations is irritating to the eyes and respiratory tract. Rapid evaporation of the liquid may cause frostbite. Inhalation of high concentrations may cause depression of the central nervous system.

#### Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

#### Effects of long-term or repeated exposure

The substance may have effects on the bone marrow. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 2 ppm as TWA; A2 (suspected human carcinogen).

EU-OEL: 2.2 mg/m<sup>3</sup>, 1 ppm as TWA.

MAK: carcinogen category: 1; germ cell mutagen group: 2

## **ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

## **NOTES**

The odour warning when the exposure limit value is exceeded is insufficient. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F+, T; R: 45-46-12; S: 53-45; Note: D

## 1,3-DICHLOROBENZENE

m-Dichlorobenzene

m-Phenylene dichloride

CAS #: 541-73-1 UN #: 2810

EC Number: 208-792-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	`	NO open flames. Above 63°C use a	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!						
	SYMPTOMS PREVENTION FIRST AID					
Inhalation	Cough. Drowsiness. Nausea. Sore throat. Vomiting. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.			
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .			
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.			
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Provision to contain effluent from fire extinguishing. Separated from strong oxidants, aluminium and food and feedstuffs. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	1
CONTROL WINDOWS SERVICES	





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ICSC: 1095 (April 2000)

1,3-DICHLOROBENZENE ICSC: 1095

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID.

**Physical dangers** 

The vapour is heavier than air.

Chemical dangers

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with aluminium.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>
Molecular mass: 147.00
Boiling point: 173°C
Melting point: -24.8°C

Relative density (water = 1): 1.288

Solubility in water: none

Vapour pressure, kPa at 25°C: 0.286 Relative vapour density (air = 1): 5.1

Flash point: 63°C

Octanol/water partition coefficient as log Pow: 3.53

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The vapour is irritating to the eyes, skin and respiratory tract. See

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the kidneys and liver. See Notes.

#### **OCCUPATIONAL EXPOSURE LIMITS**

MAK: 12 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); pregnancy risk group: C

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

## **NOTES**

Data on the toxicity of m-dichlorobenzene are limited. See ICSCs 0037 and 1066.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn, N; R: 22-51/53; S: (2)-61

1,4-DICHLOROBENZENE ICSC: 0037 (May 2018)

p-Dichlorobenzene PDCB

CAS #: 106-46-7 UN #: 3077

EC Number: 203-400-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 66°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	closed system, ventilation and	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!						
	SYMPTOMS PREVENTION FIRST AID					
Inhalation	Cough. Sore throat. Drowsiness. Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.			
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.			
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.			
Ingestion	Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink. Refer for medical attention .			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING
Separated from strong oxidants and food and feedstuffs. Provision to contain effluent from fire extinguishing. Keep in a well-ventilated room. Store in an area without drain or sewer access.	Harmful if swallowed Causes serious eye irritation Suspected of causing cancer Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation
Do not transport with food and feedstuffs. Marine pollutant.	UN Classification UN Hazard Class: 9; UN Pack Group: III





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#### 1,4-DICHLOROBENZENE ICSC: 0037

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

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

Chemical dangers

On combustion, forms toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Upon heating, toxic fumes are formed. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>
Molecular mass: 147
Boiling point: 174°C
Melting point: 53°C
Density: 1.2 g/cm³

Solubility in water, mg/l at 20°C: 49 (practically insoluble)

Vapour pressure, Pa at 20°C: 170 Relative vapour density (air = 1): 5.08

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 66°C c.c.

Explosive limits, vol% in air: 1.7-5.9

Octanol/water partition coefficient as log Pow: 3.37

Auto-ignition temperature: 640°C Viscosity: 0.73 mPa\*s at 70°C

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by inqestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, respiratory tract and skin. The substance may cause effects on the blood. This may result in haemolytic anaemia. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver, central nervous system, blood and lungs. This may result in liver function impairment, neuropathy and anaemia. This substance is possibly carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 12 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 12 mg/m<sup>3</sup>, 2 ppm as TWA; 60 mg/m<sup>3</sup>, 10 ppm as STEL; (skin)

## **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn, N; R: 36-40-50/53; S: (2)-36/37-46-60-61

1,4-DIOXANE ICSC: 0041 (November 2008)

1,4-Diethylene dioxide Dioxane

para-Dioxane

CAS #: 123-91-1 UN #: 1165

EC Number: 204-661-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	explosion-proof electrical equipment	Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!							
	SYMPTOMS PREVENTION FIRST AID						
Inhalation	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.				
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.				
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).				
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.				

CLASSIFICATION & LABELLING
According to UN GHS Criteria
DANGER
Highly flammable liquid and vapour Causes eye irritation May cause respiratory irritation Suspected of causing cancer May be harmful if swallowed and enters airways
Transportation UN Classification
UN Hazard Class: 3; UN Pack Group: II





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1,4-DIOXANE ICSC: 0041

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

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The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Formula: C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>
Molecular mass: 88.1
Boiling point: 101°C
Melting point: 12°C

Relative density (water = 1): 1.03 Solubility in water: miscible Vapour pressure, kPa at 20°C: 3.9 Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08

Flash point: 12°C c.c.

Auto-ignition temperature: 180°C Explosive limits, vol% in air: 2-22.0

Octanol/water partition coefficient as log Pow: -0.27

Viscosity: 1.17 mm<sup>2</sup>/s at 25°C

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and through the skin.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C, on spraying or dispersing much faster.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 37 mg/m<sup>3</sup>, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 73 mg/m<sup>3</sup>, 20 ppm as TWA

## **ENVIRONMENT**

#### **NOTES**

Refer for medical attention if breathing difficulties and/or fever develop. Check for peroxides prior to distillation; eliminate if found.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn; R: 11-19-36/37-40-66; S: (2)-9-16-36/37-46; Note: D

2-HEXANONE ICSC: 0489 (November 1998)

Methyl n-butyl ketone n-Butyl methyl ketone MBK

CAS #: 591-78-6 UN #: 1224

EC Number: 209-731-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1	Flammable. Above 23°C explosive	system ventilation and explosion-	Use alcohol-resistant foam, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Headache. Nausea. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Sore throat. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Fireproof. Separated from strong oxidants.	UN Hazard Class: 3; UN Pack Group: III
PACKAGING	
Note: 6	



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10/26/21, 11:40 AM

2-HEXANONE ICSC: 0489

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Reacts violently with oxidants. This generates fire and explosion hazard.

Attacks plastics.

Formula: C<sub>6</sub>H<sub>12</sub>O / C<sub>4</sub>H<sub>9</sub>COCH<sub>3</sub>

Molecular mass: 100.2 Boiling point: 126-128°C Melting point: -57°C

Relative density (water = 1): 0.8 Solubility in water, g/100ml at 20°C: 1.4 Vapour pressure, kPa at 20°C: 0.36 Relative vapour density (air = 1): 3.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 23°C c.c.

Auto-ignition temperature: 423°C Explosive limits, vol% in air: 1.2-8.0

Octanol/water partition coefficient as log Pow: 1.38

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and through the skin.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the nervous system. Exposure far above the OEL could cause unconsciousness.

#### Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin).

MAK: 21 mg/m<sup>3</sup>, 5 ppm; peak limitation category: II(8); skin absorption (H)

#### **ENVIRONMENT**

## **NOTES**

Use of alcoholic beverages enhances the harmful effect.

MBK potentiates the toxicity of some other chemical substances like chloroform, carbon tetrachloride, ethanol.

Depending on the degree of exposure, periodic medical examination is suggested.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T; R: 10-48/23-62-67; S: (1/2)-36/37-45

# Material Safety Data Sheet p-Ethyltoluene, 98%

## ACC# 35092

## Section 1 - Chemical Product and Company Identification

MSDS Name: p-Ethyltoluene, 98%

**Catalog Numbers:** AC119010000, AC119010050, AC119010100, AC119010250, AC119010500 **Synonyms:** 4-Ethyltoluene; 1-Ethyl-4-methylbenzene; 1-Methyl-4-ethylbenzene; p-Ethyltoluene.

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

For information in North America, call: 800-ACROS-01 For emergencies in the US, call CHEMTREC: 800-424-9300

## Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
622-96-8	p-Ethyltoluene	98	210-761-2

## Section 3 - Hazards Identification

#### **EMERGENCY OVERVIEW**

Appearance: clear very slight yellow liquid. Flash Point: 36 deg C.

**Warning!** Flammable liquid and vapor. May cause eye and skin irritation. May cause respiratory tract irritation. May cause central nervous system depression. May cause lung damage. The toxicological properties of this material have not been fully investigated.

Target Organs: Central nervous system, lungs.

#### **Potential Health Effects**

Eye: May cause chemical conjunctivitis and corneal damage.

**Skin:** May be harmful if absorbed through the skin. May cause irritation and dermatitis. May cause cyanosis of the extremities.

Ingestion: Aspiration hazard. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Ingestion of large amounts may cause CNS depression. May cause lung damage.

Inhalation: May cause respiratory tract irritation. Aspiration may lead to pulmonary edema. May be harmful

if inhaled. Vapors may cause dizziness or suffocation. May cause burning sensation in the chest.

Chronic: Effects may be delayed.

## 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. Wash clothing before reuse.

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

**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. Do NOT use mouth-to-mouth resuscitation. **Notes to Physician:** Treat symptomatically and supportively.

# Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

**Extinguishing Media:** For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Water may be ineffective. Do NOT use straight streams of water.

Flash Point: 36 deg C (96.80 deg F)

**Autoignition Temperature:** 475 deg C ( 887.00 deg F)

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

Upper: Not available.

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

# Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8. **Spills/Leaks:** Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

# Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.

**Storage:** Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

# 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 general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

# **Exposure Limits**

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
p-Ethyltoluene	none listed	none listed	none listed

**OSHA Vacated PELs:** p-Ethyltoluene: No OSHA Vacated PELs are listed for this chemical.

# **Personal Protective Equipment**

**Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

# Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear very slight yellow

**Odor:** Toluene-like **pH:** Not available.

Vapor Pressure: 3 mm Hg @ 25 deg C

Vapor Density: 4.15 (air=1) Evaporation Rate:Not available.

Viscosity: Not available.

**Boiling Point:** 162 deg C @ 760 mm Hg **Freezing/Melting Point:**-62 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Insoluble.

Specific Gravity/Density:.8600 g/cm3

Molecular Formula: C9H12 Molecular Weight: 120.19

# Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Ignition sources, excess heat.

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

Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon

dioxide.

Hazardous Polymerization: Has not been reported.

# Section 11 - Toxicological Information

RTECS#:

CAS# 622-96-8: XT2550000

**LD50/LC50:** CAS# 622-96-8:

Inhalation, mouse: LC50 = 54000 mg/m3/4H;

Oral, rat: LD50 = 4850 mg/kg;

Carcinogenicity:

CAS# 622-96-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

**Epidemiology:** No information found **Teratogenicity:** No information found

Reproductive Effects: See actual entry in RTECS for complete information.

**Mutagenicity:** See actual entry in RTECS for complete information.

Neurotoxicity: No information found

Other Studies:

# Section 12 - Ecological Information

No information available.

# Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed. RCRA U-Series: None listed.

# Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FLAMMABLE LIQUIDS, N.O.S.	FLAMMABLE LIQUID NOS (P-ETHYLTOLUENE)
Hazard Class:	3	3
UN Number:	UN1993	UN1993
Packing Group:	III	III
Additional Info:		FP 36 C

# Section 15 - Regulatory Information

## **US FEDERAL**

#### **TSCA**

CAS# 622-96-8 is listed on the TSCA inventory.

# **Health & Safety Reporting List**

CAS# 622-96-8: Effective 4/29/83, Sunset 4/29/93

#### **Chemical Test Rules**

None of the chemicals in this product are under a Chemical Test Rule.

# Section 12b

None of the chemicals are listed under TSCA Section 12b.

# **TSCA Significant New Use Rule**

None of the chemicals in this material have a SNUR under TSCA.

# **CERCLA Hazardous Substances and corresponding RQs**

None of the chemicals in this material have an RQ.

# **SARA Section 302 Extremely Hazardous Substances**

None of the chemicals in this product have a TPQ.

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

## **Clean Air Act:**

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

#### **Clean Water Act:**

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

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

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

# OSHA:

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

#### **STATE**

CAS# 622-96-8 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

# California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

# **European/International Regulations European Labeling in Accordance with EC Directives Hazard Symbols:**

XN

#### **Risk Phrases:**

R 10 Flammable.

R 65 Harmful: may cause lung damage if swallowed.

# **Safety Phrases:**

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

## WGK (Water Danger/Protection)

CAS# 622-96-8: No information available.

# Canada - DSL/NDSL

CAS# 622-96-8 is listed on Canada's NDSL List.

#### Canada - WHMIS

This product has a WHMIS classification of B2.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

# **Canadian Ingredient Disclosure List**

CAS# 622-96-8 is not listed on the Canadian Ingredient Disclosure List.

# Section 16 - Additional Information

**MSDS Creation Date:** 9/02/1997 **Revision #8 Date:** 9/26/2007

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

p-CYMENE ICSC: 0617 (November 1997)
1-Methyl-4-isopropylbenzene

Dolcymene

Camphogen
CAS #: 99-87-6
UN #: 2046

EC Number: 202-796-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1	Flammable. Above 47°C explosive		Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS PREVENTION FIRST AID		
Inhalation	Dizziness. Drowsiness. Vomiting.	Use ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Drowsiness. Headache. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.	According to UN GHS Criteria  Transportation	
STORAGE	UN Classification UN Hazard Class: 3; UN Pack Group: III	
Fireproof.		
PACKAGING		





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p-CYMENE ICSC: 0617

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air.

Chemical dangers

Reacts with oxidants. Attacks rubber.

Formula:  $C_{10}H_{14} / CH_3C_6H_4CH(CH_3)_2$ 

Molecular mass: 134.2 Boiling point: 177°C Melting point: -68°C

Relative density (water = 1): 0.85 Solubility in water, g/100ml at 25°C: 0.002 Vapour pressure, Pa at 20°C: 200 Relative vapour density (air = 1): 4.62

Flash point: 47°C c.c.

Auto-ignition temperature: 435°C Explosive limits, vol% in air: 0.7-5.6

Octanol/water partition coefficient as log Pow: 4.1

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes and skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

# Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

OCCUPA	ΔΤΙΩΝΔ	L EXPOS	IIRF I	IMITS
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# **ENVIRONMENT**

#### **NOTES**

# **ADDITIONAL INFORMATION**

**EC Classification** 

# METHYL ISOBUTYL KETONE

MIBK

4-Methyl-2-pentanone

Isopropylacetone

Hexone

CAS #: 108-10-1 UN #: 1245

EC Number: 203-550-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	explosion-proof electrical equipment	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Diarrhoea. Dizziness. Headache. Nausea. Sore throat. Unconsciousness. Vomiting. Weakness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification	
STORAGE	UN Hazard Class: 3; UN Pack Group: II	
Fireproof. Separated from strong oxidants. Well closed.		
PACKAGING		
Airtight.		



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ICSC: 0511 (July 1997)

METHYL ISOBUTYL KETONE ICSC: 0511

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### **Physical dangers**

The vapour mixes well with air, explosive mixtures are easily formed.

#### Chemical dangers

The substance can form explosive peroxides on exposure to air. Reacts violently with strong oxidants and strong reducing agents.

Formula: C<sub>6</sub>H<sub>12</sub>O / CH<sub>3</sub>COCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

Molecular mass: 100.2 Boiling point: 117-118°C Melting point: -84.7°C

Relative density (water = 1): 0.80 Solubility in water, g/100ml at 20°C: 1.91 Vapour pressure, kPa at 20°C: 2.1 Relative vapour density (air = 1): 3.45

Flash point: 14°C c.c.

Auto-ignition temperature: 460°C Explosive limits, vol% in air: 1.4-7.5

Octanol/water partition coefficient as log Pow: 1.38

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance and the vapour are irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system at high concentrations. This may result in narcosis.

# Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 ppm as TWA; 75 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 83 mg/m<sup>3</sup>, 20 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 83 mg/m<sup>3</sup>, 20 ppm as TWA; 208 mg/m<sup>3</sup>, 50 ppm as STEL

#### **ENVIRONMENT**

#### **NOTES**

Check for peroxides prior to distillation; eliminate if found.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn; R: 11-20-36/37-66; S: (2)-9-16-29; Note: 6

**ACETONE** ICSC: 0087 (April 2009) 2-Propanone

Dimethyl ketone Methyl ketone

CAS #: 67-64-1 UN #: 1090

EC Number: 200-662-2

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	and lighting. Do NOT use	Use powder, alcohol-resistant foam, water, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Confusion. Headache. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain. Blurred vision.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours of low boiling point adapted to the airborne concentration of the substance. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria	
STORAGE	DANGER	
Fireproof. Separated from : see Chemical Dangers. Store in an area without drain or sewer access.	Highly flammable liquid and vapour Causes eye irritation	
PACKAGING	Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II	





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10/26/21, 11:46 AM ICSC 0087 - ACETONE

ACETONE ICSC: 0087

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxide generates explosive peroxides. Reacts with chloroform and bromoform under basic conditions. This generates fire and explosion hazard. Attacks plastics.

Formula: C<sub>3</sub>H<sub>6</sub>O / CH<sub>3</sub>-CO-CH<sub>3</sub>

Molecular mass: 58.1 Boiling point: 56°C Melting point: -95°C

Relative density (water = 1): 0.8 Solubility in water: miscible Vapour pressure, kPa at 20°C: 24 Relative vapour density (air = 1): 2.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -18°C c.c.

Auto-ignition temperature: 465°C Explosive limits, vol% in air: 2.2-13

Octanol/water partition coefficient as log Pow: -0.24

Viscosity: 0.34 mm<sup>2</sup>/s at 40°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. Exposure at high levels could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

# Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged contact with skin may cause dryness and cracking.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 250 ppm as TWA; 500 ppm as STEL; BEI issued; A4 (not classifiable as a human carcinogen).

MAK: 1200 mg/m<sup>3</sup>, 500 ppm; peak limitation category: I(2); pregnancy risk group: B.

EU-OEL: 1210 mg/m<sup>3</sup>, 500 ppm as TWA

# **ENVIRONMENT**

#### **NOTES**

Use of alcoholic beverages enhances the harmful effect.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xi; R: 11-36-66-67; S: (2)-9-16-26

**ACRYLONITRILE** ICSC: 0092 (March 2001)

Cyanoethylene 2-Propenenitrile Vinyl cyanide

CAS #: 107-13-1 UN #: 1093

EC Number: 203-466-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
or toxic fumos (or goess) in a fire	bases or strong acids. Closed	Use water spray, powder, alcohol- resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Convulsions. Chest tightness.	Use closed system or ventilation.	Fresh air, rest. Refer for medical attention. See Notes.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I
STORAGE	
Fireproof. Separated from strong oxidants, strong bases and food and feedstuffs. Cool. Keep in the dark. Ventilation along the floor. Store only if stabilized.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	
Walker Realizer	5-90 V





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# ACRYLONITRILE ICSC: 0092

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS OR PALE YELLOW LIQUID WITH PUNGENT ODOUR.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

The substance polymerizes due to heating and under the influence of light and bases. This generates fire or explosion hazard. Decomposes on heating. This produces toxic fumes including hydrogen cyanide and nitrogen oxides. Reacts violently with strong acids and strong oxidants. Attacks plastics and rubber.

Formula: C<sub>3</sub>H<sub>3</sub>N / CH<sub>2</sub>=CH-CN

Molecular mass: 53.1 Boiling point: 77°C Melting point: -84°C

Relative density (water = 1): 0.8 Solubility in water, g/100ml at 20°C: 7 Vapour pressure, kPa at 20°C: 11.0 Relative vapour density (air = 1): 1.8

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05

Flash point: -1°C c.c.

Auto-ignition temperature: 481°C Explosive limits, vol% in air: 3.0-17.0

Octanol/water partition coefficient as log Pow: 0.25

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause death. The effects may be delayed. See Notes. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: carcinogen category: 2; sensitization of skin (SH); skin absorption (H)

# **ENVIRONMENT**

The substance is harmful to aquatic organisms.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Exposure to the substance will result in cyanide formation.

See ICSC 0671.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

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

Rinse contaminated clothing with plenty of water because of fire hazard.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, T, N; R: 45-11-23/24/25-37/38-41-43-51/53; S: 9-16-53-45-61; Note: D, E

Cyclohexatriene

Benzol

CAS #: 71-43-2 UN #: 1114

EC Number: 200-753-7

BENZENE ICSC: 0015 (November 2016)

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Highly flammable. Vapour/air mixtures are explosive. Risk of fire and explosion. See Chemical Dangers.		Use foam, water spray, carbon dioxide, powder. In case of fire: keep drums, etc., cool by spraying with water.

	AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	MAY BE ABSORBED! Dry skin. Redness. Pain. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Sore throat. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Remove all ignition sources. Evacuate danger area! Consult an According to UN GHS Criteria expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Highly flammable liquid and vapour May be fatal if swallowed and enters airways Causes skin irritation Causes serious eye irritation **STORAGE** May cause genetic defects Fireproof. Separated from food and feedstuffs, oxidants and May cause cancer Causes damage to the bone marrow and the central nervous halogens. Store in an area without drain or sewer access. system through prolonged or repeated exposure Harmful to aquatic life with long lasting effects **PACKAGING** Transportation UN Classification Do not transport with food and feedstuffs. UN Hazard Class: 3; UN Pack Group: II





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BENZENE ICSC: 0015

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with oxidants, nitric acid, sulfuric acid and halogens. This generates fire and explosion hazard. Attacks plastics and rubber.

Formula: C<sub>6</sub>H<sub>6</sub> Molecular mass: 78.1 Boiling point: 80°C Melting point: 6°C

Relative density (water = 1): 0.88 Solubility in water, g/100ml at 25°C: 0.18 Vapour pressure, kPa at 20°C: 10 Relative vapour density (air = 1): 2.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -11°C c.c.

Auto-ignition temperature: 498°C Explosive limits, vol% in air: 1.2-8.0

Octanol/water partition coefficient as log Pow: 2.13

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. Exposure far above the OEL could cause unconsciousness and death. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and immune system. The substance may have effects on the bone marrow. This may result in anaemia. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. See Notes.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1 (confirmed human carcinogen); BEI issued.

EU-OEL: 3.25 mg/m<sup>3</sup>, 1 ppm as TWA; (skin).

MAK: carcinogen category: 1; germ cell mutagen group: 3A; skin absorption (H)

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

#### **NOTES**

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

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

Benzene causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene and acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, T; R: 45-46-11-36/38-48/23/24/25-65; S: 53-45; Note: E

BENZYL CHLORIDE

alpha-Chlorotoluene (Chloromethyl)benzene

Tolyl chloride

CAS #: 100-44-7 UN #: 1738

EC Number: 202-853-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	\ \ \ \ /	INO open flames. Above 67°C use a	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
SYMPTOMS PREVENTION FIF		FIRST AID	
Inhalation	Burning sensation. Cough. Nausea. Headache. Shortness of breath. Dizziness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Watering of the eyes. Redness. Pain. Blurred vision. Severe deep burns.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Vomiting. Burning sensation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered non-metallic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II
Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Dry. Ventilation along the floor. Store only if stabilized.	
PACKAGING	
Do not transport with food and feedstuffs.	



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ICSC: 0016 (October 2001)

## BENZYL CHLORIDE ICSC: 0016

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH PUNGENT ODOUR.

Physical dangers

#### Chemical dangers

The substance polymerizes under the influence of all common metals except nickel and lead. This produces corrosive fumes (hydrogen chloride - see ICSC 0163). This generates fire or explosion hazard. On combustion, forms toxic and corrosive fumes of hydrogen chloride. Reacts vigorously with strong oxidants. Attacks many metals in the presence of water.

Formula: C<sub>7</sub>H<sub>7</sub>Cl / C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Cl

Molecular mass: 126.6 Boiling point: 179°C Melting point: ~-43°C

Relative density (water = 1): 1.1 Solubility in water, g/100ml: <0.1 (none) Vapour pressure, Pa at 20°C: 120 Relative vapour density (air = 1): 4.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 67°C c.c.

Auto-ignition temperature: 585°C Explosive limits, vol% in air: 1.1-14.0

Octanol/water partition coefficient as log Pow: 2.3

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is corrosive to the eyes. The vapour is irritating to the eyes, skin and respiratory tract. Inhalation of the vapour or aerosol may cause lung oedema. See Notes. The substance may cause effects on the central nervous system. This may result in unconsciousness.

#### Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying much faster.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver and kidneys. This may result in tissue lesions. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); carcinogen category: 2

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered. An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

# **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: T; R: 45-22-23-37/38-41-48/22; S: 53-45; Note: E

# BROMODICHLOROMETHANE ICSC: 0393 (April 2006)

Dichlorobromomethane Methane, bromodichloro-

CAS #: 75-27-4

EC Number: 200-856-7

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Effects of long-term or repeated exposure.	Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
	According to UN GHS Criteria
STORAGE	
Separated from strong oxidants, strong bases and magnesium. Ventilation along the floor.	WARNING Harmful if swallowed
	Suspected of causing cancer May cause damage to liver and kidneys through prolonged or
PACKAGING	repeated exposure if swallowed
	Transportation UN Classification
	ON Classification



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BROMODICHLOROMETHANE ICSC: 0393

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID.

**Physical dangers** 

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen bromide and hydrogen chloride. Reacts with strong bases, strong oxidants and magnesium.

Formula: CHBrCl<sub>2</sub>
Molecular mass: 163.8
Boiling point: 90°C
Melting point: -57°C
Density: 1.9 g/cm³

Solubility in water, g/100ml at 20°C: 0.45 (poor)

Vapour pressure, kPa at 20°C: 6.6 Relative vapour density (air = 1): 5.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3

Octanol/water partition coefficient as log Pow: 2

#### **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

Ingestion may cause effects on the kidneys and liver. This may result in impaired functions. This substance is possibly carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

# **ENVIRONMENT**

#### **NOTES**

Bromodichloromethane can be found in chlorinated water.

Health effects of exposure to the substance have not been investigated adequately other than by ingestion.

# **ADDITIONAL INFORMATION**

**EC Classification** 

BROMOFORM ICSC: 0108 (April 2009)

Tribromomethane Methenyl tribromide Methyl tribromide

CAS #: 75-25-2 UN #: 2515

EC Number: 200-854-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Further see Ingestion.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. See Ingestion.	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Watering of the eyes. Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Headache. Dizziness. Drowsiness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Evacuate danger area! Consult an expert! Personal protection: According to UN GHS Criteria complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer. WARNING **STORAGE** Harmful if swallowed Causes skin and eye irritation Separated from strong bases, oxidants, metals and food and May cause respiratory irritation feedstuffs. Keep in the dark. Ventilation along the floor. Store only May cause damage to the nervous system and liver if stabilized. Store in an area without drain or sewer access. May cause damage to liver through prolonged or repeated Provision to contain effluent from fire extinguishing. exposure Harmful to aquatic life with long lasting effects **PACKAGING Transportation UN Classification** Do not transport with food and feedstuffs. UN Hazard Class: 6.1; UN Pack Group: III Marine pollutant.





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BROMOFORM ICSC: 0108

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR. TURNS YELLOW ON EXPOSURE TO LIGHT AND AIR.

## **Physical dangers**

No data.

#### Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen bromide and bromine. Reacts violently with oxidants and bases. Reacts with powdered metals. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CHBr<sub>3</sub>
Molecular mass: 252.7
Boiling point: 149.5°C
Melting point: 8.3°C

Relative density (water = 1): 2.9

Solubility in water, g/100ml at 20°C: 0.1 (poor)

Vapour pressure, kPa at 20°C: 0.67 Relative vapour density (air = 1): 8.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05

Octanol/water partition coefficient as log Pow: 2.38

Viscosity: 0.74 mm²/s at 15°C

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by inqestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system.

# Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver and kidneys.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: carcinogen category: 3

#### **ENVIRONMENT**

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, N; R: 22-23-36/38-51/53; S: (1/2)-28-45-61-63

UN #: 1131

**CARBON DISULFIDE** ICSC: 0022 (April 2000)

Carbon bisulfide Carbon sulfide

Carbon disulphide CAS #: 75-15-0

EC Number: 200-843-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	irritating or toxic fumes (or gases) in a	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Do NOT expose to friction or shock.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Irritability. Hallucinations.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work.	Give nothing to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Remove all ignition sources. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I
Fireproof. Separated from oxidants and food and feedstuffs. Cool. Store in an area without drain or sewer access.	,
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	





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CARBON DISULFIDE ICSC: 0022

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

#### Chemical dangers

May decompose explosively on shock, friction or concussion. May explode on heating. The substance may ignite spontaneously on contact with hot surfaces and air. This produces toxic fumes of sulfur dioxide (see ICSC 0074). Reacts violently with oxidants. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CS<sub>2</sub>
Molecular mass: 76.1
Boiling point: 46°C
Melting point: -111°C

Relative density (water = 1): 1.26 Solubility in water, g/100ml at 20°C: 0.2 Vapour pressure, kPa at 25°C: 48 Relative vapour density (air = 1): 2.63

Flash point: -30°C c.c.

Auto-ignition temperature: 90°C Explosive limits, vol% in air: 1-50

Octanol/water partition coefficient as log Pow: 1.84

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. Exposure between 200 and 500 ppm could cause death.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the cardiovascular system and nervous system. This may result in coronary heart disease, severe neurobehavioural effects, polyneuritis and psychoses. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 16 mg/m<sup>3</sup>, 5 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: B.

EU-OEL: 15 mg/m<sup>3</sup>, 5 ppm as TWA; (skin)

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms.

# **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, T; R: 11-36/38-48/23-62-63; S: (1/2)-16-33-36/37-45

# **CARBON TETRACHLORIDE**

Tetrachloromethane Tetrachlorocarbon

Tetra

CAS #: 56-23-5 UN #: 1846

EC Number: 200-262-8

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: II
Separated from food and feedstuffs and metals. See Chemical Dangers. Ventilation along the floor. Cool.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant.	



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ICSC: 0024 (November 2000)

CARBON TETRACHLORIDE ICSC: 0024

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air.

Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride (see ICSC 0163), chlorine (see ICSC 0126) and phosgene (see ICSC 0007). Reacts with some metals such as aluminium, magnesium and zinc. This generates fire and explosion hazard.

Formula: CCl₄

Molecular mass: 153.8 Boiling point: 76.5°C Melting point: -23°C

Relative density (water = 1): 1.59

Solubility in water, g/100ml at 20°C: 0.1 (poor)

Vapour pressure, kPa at 20°C: 12.2 Relative vapour density (air = 1): 5.3

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5

Octanol/water partition coefficient as log Pow: 2.64

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the liver, kidneys and central nervous system. This may result in unconsciousness. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. This substance is possibly carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin); A2 (suspected human carcinogen).

MAK: 3.2 mg/m<sup>3</sup>, 0.5 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 6.4 mg/m<sup>3</sup>, 1 ppm as TWA; 32 mg/m<sup>3</sup>, 5 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is harmful to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer.

#### **NOTES**

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: T, N; R: 23/24/25-40-48/23-52/53-59; S: (1/2)-23-36/37-45-59-61

# CHLOROBENZENE

Benzene chloride Chlorobenzol

Phenyl chloride CAS #: 108-90-7

UN #: 1134

EC Number: 203-628-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	27°C explosive vapour/air mixtures	smoking. Above 27°C use a closed	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	Transportation UN Classification
STORAGE	UN Hazard Class: 3; UN Pack Group: III
Fireproof. Separated from strong oxidants.	
PACKAGING	





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ICSC: 0642 (November 2003)

# CHLOROBENZENE ICSC: 0642

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Decomposes on heating and on contact with hot surfaces and flames. This produces toxic and corrosive fumes. Reacts violently with strong oxidants. This generates fire and explosion hazard. Attacks rubber and some plastics.

Formula: C<sub>6</sub>H<sub>5</sub>Cl Molecular mass: 112.6 Boiling point: 132°C Melting point: -45°C

Relative density (water = 1): 1.11 Solubility in water, g/100ml at 20°C: 0.05 Vapour pressure, kPa at 20°C: 1.17 Relative vapour density (air = 1): 3.88

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03

Flash point: 27°C c.c.

Auto-ignition temperature: 590°C Explosive limits, vol% in air: 1.3-11

Octanol/water partition coefficient as log Pow: 2.18/2.84

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes and skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. This may result in lowering of consciousness.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 23 mg/m<sup>3</sup>, 5 ppm; peak limitation category: II(2); pregnancy risk group: C.

EU-OEL: 23 mg/m<sup>3</sup>, 5 ppm as TWA; 70 mg/m<sup>3</sup>, 15 ppm as STEL

## **ENVIRONMENT**

The substance is harmful to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

Do NOT use in the vicinity of a fire or a hot surface, or during welding

#### **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn, N; R: 10-20-51/53; S: (2)-24/25-61

1-CHLOROETHANE ICSC: 0132 (October 2000)

Ethyl chloride Monochloroethane

CAS #: 75-00-3 UN #: 1037

EC Number: 200-830-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state. Use nonsparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Lethargy. Headache. Abdominal cramps.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	Transportation
Fireproof.	UN Classification
PACKAGING	UN Hazard Class: 2.1
Special insulated cylinder. Special fittings.	



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## 1-CHLOROETHANE ICSC: 0132

#### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The gas is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

Decomposes on heating and on burning. This produces toxic gases of hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007).

Formula: C<sub>2</sub>H<sub>5</sub>Cl / CH<sub>3</sub>CH<sub>2</sub>Cl Molecular mass: 64.5

Boiling point: 12.5°C Melting point: -138°C

Relative density (water = 1): 0.918 Solubility in water, g/100ml at 20°C: 0.574 Vapour pressure, kPa at 20°C: 133.3 Relative vapour density (air = 1): 2.22

Flash point: -50°C c.c.

Auto-ignition temperature: 519°C Explosive limits, vol% in air: 3.6-14.8

Octanol/water partition coefficient as log Pow: 1.54

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes, skin and respiratory tract. Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness, cardiac dysrhythmia and death.

#### Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 3.

EU-OEL: 268 mg/m<sup>3</sup>, 100 ppm as TWA

# **ENVIRONMENT**

The substance is harmful to aquatic organisms.

# **NOTES**

Use of alcoholic beverages enhances the harmful effect.

Rinse contaminated clothing with plenty of water because of fire hazard.

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

#### **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: F+, Xn; R: 12-40-52/53; S: (2)-9-16-33-36/37-61

**CHLOROFORM** ICSC: 0027 (November 2000) Trichloromethane

Methane trichloride Formyl trichloride

CAS #: 67-66-3 UN #: 1888

EC Number: 200-663-8

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. See Notes. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Headache. Nausea. Use ventiliation, local exhaust of hreathing protection		Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain. combination with breathing lens	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Rest. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Ventilation along the floor.	
PACKAGING	
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	
(A)	



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## CHLOROFORM ICSC: 0027

#### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### **Physical dangers**

The vapour is heavier than air.

#### Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007) and chlorine (see ICSC 0126). Reacts violently with strong bases, strong oxidants and some metals such as aluminium, magnesium and zinc. This generates fire and explosion hazard. Attacks plastics, rubber and coatings.

Formula: CHCl<sub>3</sub>
Molecular mass: 119.4
Boiling point: 62°C
Melting point: -64°C

Solubility in water, g/100ml at 20°C: 0.8 Vapour pressure, kPa at 20°C: 212 Relative vapour density (air = 1): 4.12

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.7

Octanol/water partition coefficient as log Pow: 1.97

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the central nervous system, liver and kidneys. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys. This substance is possibly carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 2.5 mg/m<sup>3</sup>, 0.5 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 10 mg/m<sup>3</sup>, 2 ppm as TWA; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

#### **NOTES**

Turns combustible on addition of small amounts of a flammable substance or an increase in the oxygen content of the air. Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn; R: 22-38-40-48/20/22; S: (2)-36/37

METHYL CHLORIDE ICSC: 0419 (June 2015)

Chloromethane Monochloromethane

CAS #: 74-87-3 UN #: 1063

EC Number: 200-817-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Heating will cause rise in pressure with risk of bursting. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

	STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation Nausea. Vomiting. Convulsions.		Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.		
Skin	Skin MAY BE ABSORBED! ON CONTACT Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .		
Eyes See Skin. Wear safety goggles, face shield or eye protection in combination with breathing protection.				
Ingestion				

CLASSIFICATION & LABELLING
According to UN GHS Criteria
DANGER Extremely flammable gas
Contains gas under pressure; may explode if heated Suspected of damaging fertility or the unborn child May cause damage to central nervous system if inhaled
May cause damage to central nervous system through prolonged or repeated exposure if inhaled
Transportation UN Classification
UN Hazard Class: 2.1



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#### METHYL CHLORIDE ICSC: 0419

#### PHYSICAL & CHEMICAL INFORMATION

# Physical State; Appearance

COLOURLESS LIQUEFIED GAS.

#### Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible. The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen. See Notes.

#### Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and phosgene. Reacts violently with powdered aluminium, powdered zinc, aluminium trichloride and ethylene This generates fire and explosion hazard. Attacks many metals in the presence of moisture.

Formula: CH<sub>3</sub>Cl Molecular mass: 50.5 Boiling point: -23.7°C Melting point: -97°C

Relative density (water = 1): 0.91 Solubility in water, g/100ml at 25°C: 0.5 Vapour pressure, kPa at 25°C: 573 Relative vapour density (air = 1): 2.47 Flash point: Flammable gas

Auto-ignition temperature: 632°C
Explosive limits, vol% in air: 8.1-17.4

Octanol/water partition coefficient as log Pow: 0.91

Viscosity: 0.1834 cP at 20°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and through the skin.

#### Effects of short-term exposure

The liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause liver, cardiovascular system and kidney damage. Exposure could cause unconsciousness. Medical observation is indicated. The effects may be delayed.

#### Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

#### Effects of long-term or repeated exposure

The substance may have effects on the central nervous system. This may result in effects measured using behavioural tests. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; 100 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen).

MAK: 21 mg/m<sup>3</sup>, 10 ppm; peak limitation category: II(1); pregnancy risk group: D.

EU-OEL: 42 mg/m<sup>3</sup>, 20 ppm as TWA

#### **ENVIRONMENT**

#### **NOTES**

Following intoxication patient should be observed carefully for 48 hours.

Check oxygen content before entering area.

#### ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: F+, Xn; R: 12-40-48/20; S: (2)-9-16-33



# **SAFETY DATA SHEET**

Creation Date 22-Sep-2009 Revision Date 23-Jan-2018 Revision Number 3

# 1. Identification

Product Name cis-1,2-Dichloroethylene

Cat No.: AC113380000; AC113380025; AC113380100; AC113380500

**Synonyms** cis-Acetylene dichloride.

**Recommended Use** Laboratory chemicals.

**Uses advised against** Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Acros Organics
One Reagent Lane One Reagent Lane
Fair Lawn, NJ 07410 Fair Lawn, NJ 07410

Tel: (201) 796-7100

**Emergency Telephone Number** 

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11 Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99 **CHEMTREC** Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

# 2. Hazard(s) identification

#### Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids

Acute oral toxicity

Category 4

Acute Inhalation Toxicity - Vapors

Skin Corrosion/Irritation

Serious Eye Damage/Eye Irritation

Category 2

Specific target organ toxicity (single exposure)

Category 3

Target Organs - Respiratory system.

# Label Elements

#### Signal Word

Danger

## **Hazard Statements**

Highly flammable liquid and vapor Harmful if swallowed Harmful if inhaled

Causes serious eye irritation Causes skin irritation May cause respiratory irritation



# **Precautionary Statements**

#### Prevention

Wear protective gloves/protective clothing/eye protection/face protection

Use only outdoors or in a well-ventilated area

Avoid breathing dust/fume/gas/mist/vapors/spray

Keep away from heat/sparks/open flames/hot surfaces. - No smoking

Keep container tightly closed

Ground/bond container and receiving equipment

Take precautionary measures against static discharge

Do not eat, drink or smoke when using this product

#### Response

Call a POISON CENTER or doctor/physician if you feel unwell

#### Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Call a POISON CENTER or doctor/physician if you feel unwell

#### Skin

IF ON SKIN: Wash with plenty of soap and water

Take off contaminated clothing and wash before reuse

If skin irritation occurs: Get medical advice/attention

#### **Eyes**

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing If eye irritation persists: Get medical advice/attention

# Ingestion

Rinse mouth

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

#### Fire

Explosion risk in case of fire

Fight fire with normal precautions from a reasonable distance

Evacuate area

#### Storage

Store in a well-ventilated place. Keep cool

Store in a closed container

Store locked up

# **Disposal**

Dispose of contents/container to an approved waste disposal plant

#### Hazards not otherwise classified (HNOC)

None identified

# 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
cis-1,2-Dichloroethylene	156-59-2	97

4. First-aid measures

**Eve Contact** Rinse immediately with plenty of water, also under the evelids, for at least 15 minutes. Get

medical attention.

**Skin Contact** Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.

Remove to fresh air. Get medical attention. If not breathing, give artificial respiration. Inhalation

Do NOT induce vomiting. Get medical attention. Ingestion

Most important symptoms and

effects

**Notes to Physician** 

Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like

headache, dizziness, tiredness, nausea and vomiting

Treat symptomatically

# 5. Fire-fighting measures

Water spray. Carbon dioxide (CO<sub>2</sub>). Dry chemical. Water mist may be used to cool closed **Suitable Extinguishing Media** 

containers. Chemical foam. Water mist may be used to cool closed containers.

No information available **Unsuitable Extinguishing Media** 

6 °C / 42.8 °F **Flash Point** 

Method -No information available

440 °C / 824 °F **Autoignition Temperature** 

**Explosion Limits** 

12.80% Upper Lower 9.70%

Sensitivity to Mechanical Impact No information available Sensitivity to Static Discharge No information available

#### Specific Hazards Arising from the Chemical

Flammable. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

#### **Hazardous Combustion Products**

Carbon monoxide (CO). Carbon dioxide (CO2). Hydrogen chloride gas.

# **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 **Flammability** Instability Physical hazards 2 3 0 N/A

# 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment as required. Remove all

sources of ignition. Take precautionary measures against static discharges. Avoid contact

with skin, eyes or clothing.

See Section 12 for additional Ecological Information. Do not flush into surface water or **Environmental Precautions** 

sanitary sewer system.

Methods for Containment and Clean Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition.

Use spark-proof tools and explosion-proof equipment.

# 7. Handling and storage

#### Handling

Ensure adequate ventilation. Wear personal protective equipment/face protection. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes or clothing. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.

#### Storage

Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed. Keep away from heat, sparks and flame. Flammables area. Keep container tightly closed in a dry and well-ventilated place.

# 8. Exposure controls / personal protection

#### **Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
cis-1,2-Dichloroethylene	TWA: 200 ppm			TWA: 200 ppm

#### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Ensure adequate ventilation, especially in confined areas. Use explosion-proof **Engineering Measures** 

electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers

are close to the workstation location.

#### **Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by

OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard

EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** No protective equipment is needed under normal use conditions.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

# 9. Physical and chemical properties

**Physical State** Liquid **Appearance** Colorless aromatic Odor

No information available **Odor Threshold** рΗ No information available Melting Point/Range -80 °C / -112 °F

**Boiling Point/Range** 60 °C / 140 °F @ 760 mmHg

6 °C / 42.8 °F **Flash Point Evaporation Rate** No information available

Flammability (solid.gas) Not applicable

Flammability or explosive limits

12.80% Upper Lower 9.70%

Vapor Pressure 201 mmHg @ 25 °C **Vapor Density** 3.34 (Air = 1.0)1.280

**Specific Gravity** 

Solubility No information available Partition coefficient; n-octanol/water No data available

**Autoignition Temperature Decomposition Temperature Viscosity** 

No information available **Molecular Formula** C2 H2 Cl2

**Molecular Weight** 96.94

# 10. Stability and reactivity

None known, based on information available **Reactive Hazard** 

Stability Stable under normal conditions.

**Conditions to Avoid** Keep away from open flames, hot surfaces and sources of ignition. Exposure to air.

Exposure to light. Incompatible products. Exposure to moist air or water.

440 °C / 824 °F

No information available

**Incompatible Materials Bases** 

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO2), Hydrogen chloride gas

**Hazardous Polymerization** Hazardous polymerization does not occur.

**Hazardous Reactions** None under normal processing.

# 11. Toxicological information

**Acute Toxicity** 

**Product Information Component Information** 

**Toxicologically Synergistic** No information available

**Products** 

delayed

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
cis-1,2-Dichloroethylen	156-59-2	Not listed				
е						

**Mutagenic Effects** No information available

**Reproductive Effects** No information available. No information available. **Developmental Effects** 

No information available. **Teratogenicity** 

STOT - single exposure Respiratory system STOT - repeated exposure None known

**Aspiration hazard** No information available

Symptoms / effects,both acute and Inhalation of high vapor concentrations may cause symptoms like headache, dizziness,

tiredness, nausea and vomiting

**Endocrine Disruptor Information** No information available

The toxicological properties have not been fully investigated. Other Adverse Effects

Revision Date 23-Jan-2018

# 12. Ecological information

#### **Ecotoxicity**

Do not empty into drains. Do not flush into surface water or sanitary sewer system. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
cis-1,2-Dichloroethylene	Not listed	Not listed	EC50 = 721 mg/L 5 min	Not listed
			EC50 = 905 mg/L 30 min	

Persistence and Degradability

Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation** 

No information available.

**Mobility** 

Will likely be mobile in the environment due to its volatility.

# 13. Disposal considerations

**Waste Disposal Methods** 

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

# 14. Transport information

DOT

UN-No UN1150

Proper Shipping Name 1,2-DICHLOROETHYLENE

Hazard Class 3
Packing Group ||

TDG UN-No

UN-No UN1150

Proper Shipping Name 1,2-DICHLOROETHYLENE

Hazard Class 3 Packing Group II

**IATA** 

**UN-No** UN1150

Proper Shipping Name 1,2-DICHLOROETHYLENE

Hazard Class 3
Packing Group ||

IMDG/IMO

**UN-No** UN1150

Proper Shipping Name 1,2-DICHLOROETHYLENE

Hazard Class 3
Packing Group ||

# 15. Regulatory information

# **United States of America Inventory**

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
cis-1,2-Dichloroethylene	156-59-2	X	ACTIVE	-

#### Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

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#### International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
cis-1,2-Dichloroethylene	156-59-2		X	205-859-7	-	X	Χ	Χ	KE-10124

#### U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

**OSHA** - Occupational Safety and

Health Administration

Not applicable

**CERCLA** 

**California Proposition 65** This product does not contain any Proposition 65 chemicals.

# U.S. State Right-to-Know

Regulations

	Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ī	cis-1,2-Dichloroethylene	X	-	X	-	-

# **U.S. Department of Transportation**

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

#### U.S. Department of Homeland

Security

This product does not contain any DHS chemicals.

# Other International Regulations

Mexico - Grade No information available

# 16. Other information

Prepared By Regulatory Affairs

Thermo Fisher Scientific

Email: EMSDS.RA@thermofisher.com

 Creation Date
 22-Sep-2009

 Revision Date
 23-Jan-2018

 Print Date
 23-Jan-2018

Revision Summary

This document has been updated to comply with the US OSHA HazCom 2012 Standard

replacing the current legislation under 29 CFR 1910.1200 to align with the Globally

Harmonized System of Classification and Labeling of Chemicals (GHS).

#### **Disclaimer**

The information provided in this Safety Data Sheet 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 guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered 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 materials or in any process, unless specified in the text

Revision Date 23-Jan-2018

# **End of SDS**



# TCI AMERICA SAFETY DATA SHEET

Revision number: 3 Revision date: 11/10/2015

# 1. IDENTIFICATION

**Product name:** cis-1,3-Dichloropropene

Product code: D2792

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street

Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail:

sales-US@TCIchemicals.com www.TCIchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department: TCI America

Environmental Health Safety and Security

+1-503-286-7624

# 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 3]

Acute Toxicity - Dermal [Category 3] Acute Toxicity - Inhalation [Category 3] Skin Corrosion/Irritation [Category 2] Eye Damage/Irritation [Category 2A] Sensitization - Skin [Category 1]

Carcinogenicity [Category 2]

Specific Target Organ Toxicity (Single Exposure) [Category 2] Specific Target Organ Toxicity (Repeated Exposure) [Category 2]

Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s): Causes serious eye irritation

Causes skin irritation Flammable liquid and vapor May cause an allergic skin reaction Suspected of causing cancer

Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Very toxic to aquatic life

Very toxic to aquatic life with long lasting effects May cause damage to organs: Respiratory System

May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

# Pictogram(s) or Symbol(s):











Precautionary Statement(s):

cis-1,3-Dichloropropene TCI AMERICA Page 2 of 6

# 2. HAZARD(S) IDENTIFICATION

[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Do not breathe fume, mist, vapors or spray. Use only outdoors or in a well-ventilated area. Wear protective gloves. Wear eye and face protection. Avoid breathing dusts or mists. Contaminated work clothing must not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Wash all exposed skin thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off immediately all contaminated clothing and wash it before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor. Get medical advice or attention if you feel unwell. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage]

Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

# 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: cis-1,3-Dichloropropene

 $\begin{array}{lll} \textbf{Percent:} & > 98.0\% (GC) \\ \textbf{CAS Number:} & 10061-01-5 \\ \textbf{Molecular Weight:} & 110.97 \\ \textbf{Chemical Formula:} & C_3H_4Cl_2 \\ \end{array}$ 

Synonyms: cis-3-Chloroallyl Chloride

# 4. FIRST-AID MEASURES

Inhalation: May cause coughing, difficult breathing and nausea. Immediately call a poison center or doctor. Effects of

exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Skin contact: Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be

delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with

material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

**Ingestion:** Toxic if swallowed. Do not induce vomiting with out medical advice. Effects of exposure (ingestion) to

substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to

protect themselves.

Symptoms/effects:

Acute: Redness

**Delayed:** May cause skin sensitization. Possibly carcinogenic to humans.

cis-1,3-Dichloropropene **TCI AMERICA** Page 3 of 6

# 4. FIRST-AID MEASURES

Immediate medical attention:

WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

# 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:

Dry chemical, CO<sub>2</sub> or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

#### Specific hazards arising from the chemical

**Hazardous combustion products:** Other specific hazards:

These products include: Carbon oxides Halogenated compounds WARNING: Highly toxic HCl gas is produced during combustion.

#### Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

#### Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

# 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-

proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn

unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Wear protective clothing

(chemical resistant suit and chemical resistant boots). Vapor respirator, Be sure to use a MSHA/NIOSH

approved respirator or equivalent. Wear protective gloves (nitrile).

**Emergency procedures:** Isolate area until gas has dispersed. Do not clean-up or dispose except under supervision of a specialist.

In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if

needed.

#### Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

# **Environmental precautions:**

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

# 7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest.

Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face

protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of Conditions for safe storage:

ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent

leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon).

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

No data available **Exposure limits:** 

Page 4 of 6 cis-1,3-Dichloropropene **TCI AMERICA** 

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

# **Appropriate engineering controls:**

Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

# Personal protective equipment

Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Respiratory protection:

Hand protection: Wear protective gloves. Eye protection: Splash goggles.

Wear protective clothing (chemical resistant suit and chemical resistant boots). Skin and body protection:

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Colorless - Slightly pale yellow Color:

Odor: No data available Odor threshold: No data available

Melting point/freezing point: No data available pH: No data available Boiling point/range: 104°C (219°F) 5.7kPa/25°C Vapor pressure: 3.8

**Decomposition temperature:** No data available Vapor density:

Relative density: **Dynamic Viscosity:** No data available

**Kinematic Viscosity:** No data available

Partition coefficient: No data available No data available **Evaporation rate:** 

(Butyl Acetate = 1) n-octanol/water (log Pow)

27°C (81°F) 392°C (738°F) Flash point: Autoignition temperature:

Flammability (solid, gas): No data available Flammability or explosive limits:

> 5.3% Lower: Upper: 14.5%

Solubility(ies):

Water: Very slightly soluble Soluble: Ether, Benzene, Chloroform

# 10. STABILITY AND REACTIVITY

Not Available. Reactivity:

Stable under recommended storage conditions. (See Section 7) **Chemical Stability:** Possibility of Hazardous Reactions: In use, may form flammable/explosive vapor-air mixture.

Avoid excessive heat and light. Conditions to avoid:

Incompatible materials: Oxidizing agents **Hazardous Decomposition Products:** No data available

# 11. TOXICOLOGICAL INFORMATION

RTECS Number: UC8325000

**Acute Toxicity:** No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity: dns-hmn-hla 100 umol/L

mmo-sat 20 ug/plate (+/-S9)

#### Carcinogenicity:

scu-mus TDLo:9240 mg/kg/77W-I

Group 2B (Possibly carcinogenic NTP: OSHA: b (Reasonably anticipated to be No data available

carcinogens). to humans).

Reproductive toxicity: No data available

**Routes of Exposure:** Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain. Skin contact may result in sensitization. Readily absorbed through skin.

**Potential Health Effects:** 

Skin and eye contact may result in irritation.

Target organ(s):

May cause damage to organs: Respiratory System

May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

# 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

No data available Fish: Crustacea: No data available No data available Algae:

Persistence and degradability: No data available

Bioaccumulative potential (BCF): <2.5 (conc. 34.6 ug/L), <26 (conc. 26 ug/L)

Mobillity in soil: No data available Partition coefficient: No data available n-octanol/water (log Pow)

Soil adsorption (Koc): No data available No data available Henry's Law:

constant (PaM3/mol)

# 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

Dispose of as unused product. Do not re-use empty containers. Disposal of container:

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

# 14. TRANSPORT INFORMATION

DOT (US)

**UN number: Proper Shipping Name:** Class or Division: **Packing Group:** 3 Flammable liquid

UN2047 Dichloropropenes

IATA UN number:

**Proper Shipping Name:** Class or Division: **Packing Group:** UN2047

Dichloropentanes 3 Flammable liquid

**IMDG** 

Class or Division: **UN number: Proper Shipping Name: Packing Group:** 

UN2047 Dichloropropenes 3 Flammable liquid

F-E, S-D EmS number:

100 Pounds (45.4 Kilograms) Reportable Quantitiy:

# 15. REGULATORY INFORMATION

cis-1,3-Dichloropropene TCI AMERICA Page 6 of 6

# 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:

- (i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
- (ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

#### **US Federal Regulations**

# **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed SARA 302: Not Listed

# **State Regulations**

#### State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

# Other Information

NFPA Rating: HMIS Classification:

Health:2Health:2Flammability:3Flammability:3Instability:0Physical:0

#### **International Inventories**

WHMIS hazard class: B2: Flammable Liquid.

D1B: Materials causing immediate and serious toxic effects. (Toxic)

D2B: Materials causing other toxic effects. (Toxic)

**EC-No**: 233-195-8

# 16. OTHER INFORMATION

Revision date: 11/10/2015 Revision number: 3

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

CYCLOHEXANE ICSC: 0242 (June 2011)

Hexahydrobenzene Hexamethylene

Hexanaphthene CAS #: 110-82-7

UN #: 1145 EC Number: 203-806-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	and lighting. Do NOT use compressed air for filling, discharging,	Use water spray, foam, powder, carbon dioxide. Water may be ineffective. In case of fire: keep drums, etc., cool by spraying with water.

	PREVENT GENERATION OF MISTS!						
	SYMPTOMS	PREVENTION	FIRST AID				
Inhalation	Cough. Nausea. Headache. Dizziness. Weakness. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.				
Skin	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.				
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).				
Ingestion	Abdominal pain. Nausea. Vomiting. Aspiration hazard! Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.				

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria  DANGER
STORAGE	Highly flammable liquid and vapour Causes eye irritation
Fireproof. Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.	Causes mild skin irritation May cause drowsiness and dizziness May be fatal if swallowed and enters airways Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
7450 A	



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CYCLOHEXANE ICSC: 0242

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Heating may cause violent combustion or explosion. Reacts with strong oxidants.

Formula: C<sub>6</sub>H<sub>12</sub> Molecular mass: 84.2 Boiling point: 81°C Melting point: 7°C

Relative density (water = 1): 0.8

Solubility in water, g/100ml at 25°C: 0.0058 (very poor)

Vapour pressure, kPa at 20°C: 10.3 Relative vapour density (air = 1): 2.9

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -18°C c.c.

Auto-ignition temperature: 260°C Explosive limits, vol% in air: 1.3-8.4

Octanol/water partition coefficient as log Pow: 3.4

Viscosity: 1.26x10-6 mm²/s at 26°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure could cause lowering of consciousness.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dryness and cracking and dermatitis.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 100 ppm as TWA.

MAK: 700 mg/m<sup>3</sup>, 200 ppm; peak limitation category: II(4); pregnancy risk group: D.

EU-OEL: 700 mg/m<sup>3</sup>, 200 ppm as TWA

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

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

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn, N; R: 11-38-65-67-50/53; S: (2)-9-16-25-33-60-61-62; Note: 4



# **SAFETY DATA SHEET**

Revision Date 14-Feb-2020 Revision Number 2

# 1. Identification

Product Name Dibromochloromethane

Cat No. : A16938

**CAS-No** 124-48-1

Synonyms CDBM; Dibromochloromethane

Recommended Use Laboratory chemicals.

**Uses advised against** Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

# Company

Alfa Aesar

Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

Ward Hill, MA 01835-8099

Tel: 800-343-0660 Fax: 800-322-4757 **Email:** tech@alfa.com

www.alfa.com

# **Emergency Telephone Number**

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.

After normal business hours, call Carechem 24 at (866) 928-0789.

# 2. Hazard(s) identification

#### Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity

Skin Corrosion/Irritation

Serious Eye Damage/Eye Irritation

Specific target organ toxicity (single exposure)

Category 2

Category 2

Category 3

Target Organs - Respiratory system.

# Label Elements

# **Signal Word**

Warning

#### **Hazard Statements**

Harmful if swallowed Causes skin irritation Causes serious eye irritation May cause respiratory irritation

Dibromochloromethane Revision Date 14-Feb-2020



# **Precautionary Statements**

#### Prevention

Wash face, hands and any exposed skin thoroughly after handling

Do not eat, drink or smoke when using this product

Wear protective gloves/protective clothing/eye protection/face protection

Avoid breathing dust/fume/gas/mist/vapors/spray

Use only outdoors or in a well-ventilated area

#### Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Call a POISON CENTER or doctor/physician if you feel unwell

#### Skin

IF ON SKIN: Wash with plenty of soap and water

If skin irritation occurs: Get medical advice/attention

Take off contaminated clothing and wash before reuse

#### Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing If eve irritation persists: Get medical advice/attention

#### Ingestion

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Rinse mouth

# Storage

Store in a well-ventilated place. Keep container tightly closed

Store locked up

# **Disposal**

Dispose of contents/container to an approved waste disposal plant

# Hazards not otherwise classified (HNOC)

None identified

# 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Chlorodibromomethane	124-48-1	> 98

# 4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get

medical attention.

**Skin Contact** Wash off immediately with soap and plenty of water while removing all contaminated

clothes and shoes. Get medical attention.

Inhalation Remove from exposure, lie down. Remove to fresh air. If not breathing, give artificial

respiration. Get medical attention.

**Ingestion** Call a physician immediately. Clean mouth with water.

Most important symptoms and

effects

Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like

headache, dizziness, tiredness, nausea and vomiting

Revision Date 14-Feb-2020 Dibromochloromethane

**Notes to Physician** Treat symptomatically

# Fire-fighting measures

**Suitable Extinguishing Media** Water spray. Carbon dioxide (CO<sub>2</sub>). Dry chemical. Chemical foam.

**Unsuitable Extinguishing Media** No information available

**Flash Point** No information available Method -No information available

**Autoignition Temperature** 

**Explosion Limits** 

No information available

No data available Upper No data available Lower Sensitivity to Mechanical Impact No information available Sensitivity to Static Discharge No information available

# Specific Hazards Arising from the Chemical

Keep product and empty container away from heat and sources of ignition.

#### **Hazardous Combustion Products**

Carbon monoxide (CO). Carbon dioxide (CO<sub>2</sub>). Hydrogen halides. Bromine. Hydrogen chloride gas.

# **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	Flammability	Instability	Physical hazards
2	0	0	N/A

# 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment as required.

See Section 12 for additional Ecological Information. **Environmental Precautions** 

Methods for Containment and Clean Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not flush into surface water Up

or sanitary sewer system.

# 7. Handling and storage

Avoid contact with skin and eyes. Do not breathe mist/vapors/spray. Handle product only in Handling

closed system or provide appropriate exhaust ventilation.

Storage Keep in a dry place. Keep container tightly closed. Keep refrigerated.

# 8. Exposure controls / personal protection

This product does not contain any hazardous materials with occupational exposure **Exposure Guidelines** 

limitsestablished by the region specific regulatory bodies.

**Engineering Measures** Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations

and safety showers are close to the workstation location.

Personal Protective Equipment

Wear appropriate protective eyeglasses or chemical safety goggles as described by **Eye/face Protection** 

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Dibromochloromethane

OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard

EN166.

Wear appropriate protective gloves and clothing to prevent skin exposure. Skin and body protection

No protective equipment is needed under normal use conditions. **Respiratory Protection** 

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

# Physical and chemical properties

Liquid **Physical State** 

Yellow-orange **Appearance** sweet

Odor

**Odor Threshold** No information available No information available pН

Melting Point/Range -22 °C / -7.6 °F

**Boiling Point/Range** 115 - 120 °C / 239 - 248 °F @ 760 mmHg

**Flash Point** No information available **Evaporation Rate** No information available

Flammability (solid,gas) Not applicable

Flammability or explosive limits

No data available Upper Lower No data available **Vapor Pressure** No information available

**Vapor Density** 7.2 **Specific Gravity** 2.451

Solubility No information available Partition coefficient; n-octanol/water No data available

**Autoignition Temperature** No information available **Decomposition Temperature** No information available **Viscosity** No information available

C H Br2 CI Molecular Formula **Molecular Weight** 208.28

# 10. Stability and reactivity

**Reactive Hazard** None known, based on information available

Stability Stable under normal conditions.

**Conditions to Avoid** Incompatible products.

**Incompatible Materials** Strong oxidizing agents, Strong acids, Strong bases, Strong reducing agents, Metals

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO2), Hydrogen halides, Bromine, Hydrogen

chloride gas

**Hazardous Polymerization** No information available.

**Hazardous Reactions** None under normal processing.

# 11. Toxicological information

**Acute Toxicity** 

# **Product Information**

**Component Information** 

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Chlorodibromomethane	LD50 = 370 mg/kg (Rat)	Not listed	Not listed

Revision Date 14-Feb-2020 Dibromochloromethane

**Toxicologically Synergistic** 

No information available

**Products** 

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

The table below indicates whether each agency has listed any ingredient as a carcinogen. Carcinogenicity

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chlorodibromomethan	124-48-1	Not listed				
l e l						

**Mutagenic Effects** Substances which cause concern for man owing to possible mutagenic effects but for which

the available information is not adequate for making a satisfactory assessment

**Reproductive Effects** No information available. **Developmental Effects** No information available.

**Teratogenicity** No information available.

STOT - single exposure Respiratory system STOT - repeated exposure None known

**Aspiration hazard** No information available

delayed

Symptoms / effects, both acute and Inhalation of high vapor concentrations may cause symptoms like headache, dizziness,

tiredness, nausea and vomiting

**Endocrine Disruptor Information** No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

# 12. Ecological information

## **Ecotoxicity**

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains.

Persistence and Degradability Persistence is unlikely

**Bioaccumulation/ Accumulation** No information available.

**Mobility** . Will likely be mobile in the environment due to its water solubility.

Component	log Pow	
Chlorodibromomethane	2.09	

# 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a

hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

# 14. Transport information

DOT

UN2810 **UN-No Hazard Class** 6.1 **Packing Group** Ш

TDG

Revision Date 14-Feb-2020

#### Dibromochloromethane

UN-No UN2810
Hazard Class 6.1
Packing Group III

IATA Not regulated Not regulated Not regulated

# 15. Regulatory information

#### **United States of America Inventory**

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Chlorodibromomethane	124-48-1	X	ACTIVE	-

# Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed '-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

# **International Inventories**

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Chlorodibromomethane	124-48-1	-	Х	204-704-0	-	-	-	-	-

# U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

**CWA (Clean Water Act)** 

	Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
C	Chlorodibromomethane	-	-	X	X

Clean Air Act Not applicable

**OSHA** - Occupational Safety and

Health Administration

Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous

substance under the Comprehensive Environmental Response Compensation and Liability

Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chlorodibromomethane	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

# U.S. State Right-to-Know

Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chlorodibromomethane	X	X	X	-	-

# **U.S. Department of Transportation**

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

Dibromochloromethane Revision Date 14-Feb-2020

**U.S. Department of Homeland** 

Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Health, Safety and Environmental Department

Email: tech@alfa.com

www.alfa.com

**Revision Date** 14-Feb-2020 **Print Date** 14-Feb-2020

Revision Summary SDS authoring systems update, replaces ChemGes SDS No. 124-48-1/2.

#### **Disclaimer**

The information provided in this Safety Data Sheet 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 guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered 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 materials or in any process, unless specified in the text

**End of SDS** 

# **DICHLORODIFLUOROMETHANE**

Difluorodichloromethane

R 12 CFC 12

CAS #: 75-71-8 UN #: 1028

EC Number: 200-893-9

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING		
Ventilation.	Assembling to UNICUE Criteria		
STORAGE	According to UN GHS Criteria		
Separated from incompatible materials. See Chemical Dangers. Cool. Ventilation along the floor.	Transportation		
PACKAGING	UN Classification UN Hazard Class: 2.2		
Special insulated cylinder.	]		



Labour Organization



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ICSC: 0048 (July 2002)

#### DICHLORODIFLUOROMETHANE ICSC: 0048

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

#### Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts violently with metals such as zinc and powdered aluminium. Attacks magnesium and its alloys.

Formula: CCl<sub>2</sub>F<sub>2</sub>
Molecular mass: 120.9
Boiling point: -30°C
Melting point: -158°C

Relative density (water = 1): 1.5 Solubility in water, g/100ml at 20°C: 0.03 Vapour pressure, kPa at 20°C: 568 Relative vapour density (air = 1): 4.2

Octanol/water partition coefficient as log Pow: 2.16

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

#### Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as TWA; A4 (not classifiable as a human carcinogen).

MAK: 5000 mg/m<sup>3</sup>, 1000 ppm; peak limitation category: II(2); pregnancy risk group: C

#### ENVIRONMENT

Avoid release to the environment because of its impact on the ozone layer.

#### **NOTES**

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

# **ADDITIONAL INFORMATION**

# **EC Classification**

# **ETHANOL (ANHYDROUS)**

Ethyl alcohol Absolute ethanol Methyl carbinol Grain alcohol

CAS #: 64-17-5 UN #: 1170

EC Number: 200-578-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	and lighting. Do NOT use compressed air for filling, discharging,	Use water spray, powder, alcohol- resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	STRICT HYGIENE! PREVENT GENERATION OF MISTS!				
	SYMPTOMS	PREVENTION	FIRST AID		
Inhalation	Cough. Headache. Fatigue. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.		
Skin	Dry skin.	Protective clothing. Apron. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.		
Eyes	Redness. Pain. Burning sensation.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion	Burning sensation. Headache. Confusion. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer immediately for medical attention.		

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Ventilation. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in inert absorbent. Wash away remainder with plenty of water. Store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	Highly flammable liquid and vapour Harmful if swallowed
Fireproof. Separated from : see Chemical Dangers.	Causes serious eye irritation May cause damage to organs through prolonged or repeated exposure
PACKAGING	Transportation -UN Classification -UN Hazard Class: 3; UN Pack Group: II
AND A	20 V





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ICSC: 0044 (May 2018)

# ETHANOL (ANHYDROUS) ICSC: 0044

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The vapour mixes well with air, explosive mixtures are easily formed.

#### Chemical dangers

Reacts slowly with calcium hypochlorite, silver oxide and ammonia. This generates fire and explosion hazard. Reacts violently with strong oxidants such as nitric acid, silver nitrate, mercuric nitrate and magnesium perchlorate. This generates fire and explosion hazard.

Formula: CH<sub>3</sub>CH<sub>2</sub>OH / C<sub>2</sub>H<sub>6</sub>O

Molecular mass: 46.1 Boiling point: 78°C Melting point: -114 °C

Relative density (water = 1): 0.79 Solubility in water: miscible Vapour pressure, kPa at 20°C: 5.8 Relative vapour density (air = 1): 1.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03

Flash point: 12.0 °C c.c. Auto-ignition temperature: 400°C Explosive limits, vol% in air: 3.1-27.7

Octanol/water partition coefficient as log Pow: -0.32

Viscosity: 1.074 mPa\*s at 20°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is severely irritating to the eyes. The vapour at high levels is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the upper respiratory tract and central nervous system. This may result in irritation, headache, fatigue and lack of concentration. See Notes.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 380 mg/m<sup>3</sup>, 200 ppm; peak limitation category: II(4); carcinogen category: 5; pregnancy risk group: C; germ cell mutagen group: 5

# **ENVIRONMENT**

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

# **NOTES**

Ethanol consumption during pregnancy may adversely affect the unborn child.

Chronic ingestion of ethanol may cause liver cirrhosis and cancer.

# **ADDITIONAL INFORMATION**

# **EC Classification**

ETHYL ACETATE ICSC: 0367 (April 2014)

Acetic acid, ethyl ester Acetic ether

CAS #: 141-78-6 UN #: 1173

EC Number: 205-500-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	explosion-proof electrical equipment and lighting. Use non-sparking	Use alcohol-resistant foam, foam, powder, carbon dioxide, fine water spray. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
SYMPTOMS PREVENTION FIRST AID			FIRST AID
Inhalation	Sore throat. Cough. Headache. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Rinse contaminated clothes (fire hazard) with plenty of water. Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER
Fireproof. Separated from strong oxidants, strong bases and strong acids.	Highly flammable liquid and vapour May cause drowsiness or dizziness
PACKAGING	Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
754 X28 175 45 77	



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ETHYL ACETATE ICSC: 0367

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

Reacts with strong oxidants. This generates fire and explosion hazard. Reacts violently with strong bases and strong acids. Attacks rubber and some forms of plastic.

Formula: C<sub>4</sub>H<sub>8</sub>O<sub>2</sub> / CH<sub>3</sub>COOC<sub>2</sub>H<sub>5</sub>

Molecular mass: 88.1 Boiling point: 77°C Melting point: -84°C

Relative density (water = 1): 0.9

Solubility in water, g/100ml at 20°C: 8.7 (poor)

Vapour pressure, kPa at 20°C: 10 Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2

Flash point: -4°C c.c.

Auto-ignition temperature: 427°C Explosive limits, vol% in air: 2.0-12.8

Octanol/water partition coefficient as log Pow: 0.73

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 400 ppm as TWA.

MAK: 750 mg/m<sup>3</sup>, 200 ppm; peak limitation category: I(2); pregnancy risk group: C.

EU-OEL: 734 mg/m<sup>3</sup>, 200 ppm as TWA; 1468 mg/m<sup>3</sup>, 400 ppm as STEL

# **ENVIRONMENT**

# **NOTES**

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xi; R: 11-36-66-67; S: (2)-16-26-33

**ETHYLBENZENE** ICSC: 0268 (November 2007)

Ethylbenzol Phenylethane EB

CAS #: 100-41-4 UN #: 1175

EC Number: 202-849-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Highly flammable. Vapour/air mixtures are explosive.	explosion-proof electrical equipment	Use dry powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Burning sensation in the throat and chest. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER  Highly flammable liquid and vapour Harmful if inhaled
STORAGE	May be harmful if swallowed Causes mild skin irritation
Fireproof. Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	Causes eye irritation Suspected of causing cancer May cause respiratory irritation May cause drowsiness and dizziness May be harmful if swallowed and enters airways Toxic to aquatic life
PACKAGING	Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II





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ETHYLBENZENE ICSC: 0268

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH AROMATIC ODOUR.

**Physical dangers** 

The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers

Reacts with strong oxidants. Attacks plastics and rubber.

Formula: C<sub>8</sub>H<sub>10</sub>/C<sub>6</sub>H<sub>5</sub>C<sub>2</sub>H<sub>5</sub> Molecular mass: 106.2 Boiling point: 136°C Melting point: -95°C

Relative density (water = 1): 0.9 Solubility in water, g/100ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 18°C c.c.

Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7

Octanol/water partition coefficient as log Pow: 3.1

Viscosity: 0.6 mm<sup>2</sup>/s at 25°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans. The substance may have effects on the kidneys and liver. This may result in impaired functions.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 88 mg/m<sup>3</sup>, 20 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 442 mg/m<sup>3</sup>, 100 ppm as TWA; 884 mg/m<sup>3</sup>, 200 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

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

#### ADDITIONAL INFORMATION

# **EC Classification**

Symbol: F, Xn; R: 11-20; S: (2)-16-24/25-29

n-HEPTANE ICSC: 0657 (June 2015) Heptane

CAS #: 142-82-5 UN #: 1206

EC Number: 205-563-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	and lighting. Prevent build-up of electrostatic charges (e.g., by	Use alcohol-resistant foam, dry powder, carbon dioxide, water spray. In case of fire: keep drums, etc., cool by spraying with water.

	PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Incoordination. Dizziness. Weakness. Nausea. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Redness. Swelling. Pain.	Protective gloves.	Rinse and then wash skin with water and soap. Refer for medical attention if skin irritation occurs.	
Eyes	Redness.	Wear safety goggles in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Aspiration hazard! Sore throat. Abdominal pain. Headache. Dizziness. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Give nothing to drink. Do NOT induce vomiting. Refer immediately for medical attention. See Notes.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	Highly flammable liquid and vapour
Fireproof. Separated from strong oxidants. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	May be fatal if swallowed and enters airways Causes skin irritation May cause drowsiness or dizziness Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Marine pollutant.	UN Hazard Class: 3; UN Pack Group: II
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10/26/21, 11:59 AM ICSC 0657 - n-HEPTANE

n-HEPTANE ICSC: 0657

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

#### Chemical dangers

Reacts violently with strong oxidants. This generates fire and explosion hazard. Attacks many plastics.

Formula: C<sub>7</sub>H<sub>16</sub> / CH<sub>3</sub>(CH<sub>2</sub>)<sub>5</sub>CH<sub>3</sub>

Molecular mass: 100.2 Boiling point: 98.4°C Melting point: -90.7°C Density (at 20°C): 0.68 g/ml

Solubility in water, mg/l at 25°C: 2.2 (very poor)

Vapour pressure, kPa at 20°C: 4.6 Relative vapour density (air = 1): 3.5

Flash point: -7°C c.c.

Auto-ignition temperature: 220°C Explosive limits, vol% in air: 0.8-6.7

Octanol/water partition coefficient as log Pow: 4.66

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the skin. The vapour is irritating to the respiratory tract. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system.

# Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 400 ppm as TWA; 500 ppm as STEL.

MAK: 2100 mg/m<sup>3</sup>, 500 ppm; peak limitation category: I(1); pregnancy risk group: D.

EU-OEL: 2085 mg/m<sup>3</sup>, 500 ppm as TWA

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

# NOTES

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

The symptoms of chemical pneumonitis do not become manifest until a few hours or even days have passed.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn, N; R: 11-38-50/53-65-67; S: (2)-9-16-29-33-60-61-62; Note: C

# **HEXACHLOROBUTADIENE**

1,1,2,3,4,4-Hexachloro-1,3-butadiene

Perchlorobutadiene

CAS #: 87-68-3 UN #: 2279

EC Number: 201-765-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Burning sensation. Cough. Sore throat. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	MAY BE ABSORBED! Pain. Redness. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Pain. Redness. Severe deep burns. Loss of vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Burning sensation. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from food and feedstuffs. Well closed. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Severe marine pollutant.	
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Labour Organization



Organization

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ICSC: 0896 (August 1997)

#### HEXACHLOROBUTADIENE ICSC: 0896

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

#### Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Attacks rubber and some forms of plastic.

Formula: C<sub>4</sub>Cl<sub>6</sub> / CCl<sub>2</sub>=CClCCl=CCl<sub>2</sub>

Molecular mass: 260.8 Boiling point: 212°C Melting point: -18°C

Relative density (water = 1): 1.68 Solubility in water: none

Vapour pressure, Pa at 20°C: 20 Relative vapour density (air = 1): 9.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 90°C

Auto-ignition temperature: 610°C

Octanol/water partition coefficient as log Pow: 4.90

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The liquid is corrosive. The substance may cause effects on the kidneys.

# Inhalation risk

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

# Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. May cause genetic damage in humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.02 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 0.22 mg/m<sup>3</sup>, 0.02 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

# **NOTES**

# **ADDITIONAL INFORMATION**

# **EC Classification**

n-HEXANE ICSC: 0279 (April 2000) Hexyl hydride

CAS #: 110-54-3 UN #: 1208

EC Number: 203-777-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	and lighting. Do NOT use	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Dizziness. Drowsiness. Lethargy. Headache. Nausea. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin. Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .	
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants. Well closed.	
PACKAGING	





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10/26/21, 12:00 PM ICSC 0279 - n-HEXANE

n-HEXANE ICSC: 0279

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

Reacts with strong oxidants. This generates fire and explosion hazard. Attacks some plastics, rubber and coatings.

Formula: C<sub>6</sub>H<sub>14</sub> Molecular mass: 86.2 Boiling point: 69°C Melting point: -95°C

Relative density (water = 1): 0.7

Solubility in water, g/100ml at 20°C: 0.0013 Vapour pressure, kPa at 20°C: 17 Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3

Flash point: -22°C c.c.

Auto-ignition temperature: 225°C Explosive limits, vol% in air: 1.1-7.5

Octanol/water partition coefficient as log Pow: 3.9

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause lowering of consciousness.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system and peripheral nervous system. This may result in polyneuropathy. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 50 ppm as TWA; (skin); BEI issued.

MAK: 180 mg/m<sup>3</sup>, 50 ppm; peak limitation category: II(8); pregnancy risk group: C.

EU-OEL: 72 mg/m<sup>3</sup>, 20 ppm as TWA

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn, N; R: 11-38-48/20-62-65-67-51/53; S: (2)-9-16-29-33-36/37-61-62

ISOPROPYL ALCOHOL ICSC: 0554 (July 2020)

1-methylethanol

2-hydroxypropane 2-Propanol

Propan-2-ol Isopropanol

Dimethylcarbinol

CAS #: 67-63-0 UN #: 1219

EC Number: 200-661-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air	ventilation, explosion-proof electrical	Use water, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	·	·	·
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Headache. Dizziness. Drowsiness. Further see Ingestion.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. See Notes.
Eyes	Redness. Pain. Blurred vision. Burns.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation. Abdominal pain. Nausea. Vomiting. Ataxia. Convulsions. Laboured breathing. Low blood pressure. Cardiac dysrhythmia. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give nothing to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable non-plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Wash away remainder with plenty of water.	According to UN GHS Criteria  DANGER
STORAGE	Highly flammable liquid and vapour Causes serious eye irritation
Fireproof. Separated from strong oxidants. Cool. Well closed.	May cause drowsiness or dizziness
PACKAGING	Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II



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#### ISOPROPYL ALCOHOL ICSC: 0554

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID.

#### **Physical dangers**

The vapour mixes well with air, explosive mixtures are easily formed.

#### Chemical dangers

Reacts with strong oxidants. This generates explosion hazard. Decomposes on heating. This produces irritating fumes and flammable and toxic gas. Attacks some plastics and rubber.

Formula: C<sub>3</sub>H<sub>8</sub>O / CH<sub>3</sub>CHOHCH<sub>3</sub>

Molecular mass: 60.1 Boiling point: 83°C Melting point: -90°C

Relative density (water = 1): 0.79 Solubility in water: miscible Vapour pressure, kPa at 20°C: 4.4 Relative vapour density (air = 1): 2.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05

Flash point: 11.7°C c.c.

Auto-ignition temperature: 456°C Explosive limits, vol% in air: 2-12

Octanol/water partition coefficient as log Pow: 0.05

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dryness and cracking.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 200 ppm as TWA; 400 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 500 mg/m<sup>3</sup>, 200 ppm; peak limitation category: II(2); pregnancy risk group: C

## **ENVIRONMENT**

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

# **NOTES**

When large surface areas of skin and clothes are exposed to the pure substance the fire hazard is the main concern, for which rinsing first and then removing clothes is advised.

#### ADDITIONAL INFORMATION

#### **EC Classification**

10/26/21, 12:02 PM

(1-Methylethyl)benzene 2-Phenylpropane Isopropylbenzene

CAS #: 98-82-8 UN #: 1918

CUMENE

EC Number: 202-704-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1	Flammable. Above 31°C explosive		Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Incoordination. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation. Aspiration hazard!	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	DANGER
Fireproof. Separated from strong oxidants and acids. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	Flammable liquid and vapour Harmful if swallowed Suspected of causing cancer May be fatal if swallowed and enters airways Very toxic to aquatic life
PACKAGING	Transportation UN Classification
Marine pollutant.	UN Hazard Class: 3; UN Pack Group: III
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ICSC: 0170 (April 2014)

10/26/21, 12:02 PM ICSC 0170 - CUMENE

CUMENE ICSC: 0170

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

As a result of flow, agitation, etc., electrostatic charges can be

generated.

Chemical dangers

Reacts violently with acids and strong oxidants. This generates fire and explosion hazard. The substance can form explosive peroxides.

Formula: C<sub>9</sub>H<sub>12</sub> / C<sub>6</sub>H<sub>5</sub>CH(CH<sub>3</sub>)<sub>2</sub>

Molecular mass: 120.2 Boiling point: 152°C Melting point: -96°C

Relative density (water = 1): 0.90

Solubility in water, g/l at 20°C: 0.2 (very poor)

Vapour pressure, Pa at 20°C: 427 Relative vapour density (air = 1): 4.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 31°C c.c.

Auto-ignition temperature: 420°C Explosive limits, vol% in air: 0.9-6.5

Octanol/water partition coefficient as log Pow: 3.66

Viscosity: 0.85 mm²/s at 25°C

# **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

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

## Effects of short-term exposure

If swallowed the substance easily enters the airways and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and upper respiratory tract. This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 50 mg/m<sup>3</sup>, 10 ppm; peak limitation category: II(4); skin absorption (H); carcinogen category: 3; pregnancy risk group: C.

EU-OEL: 50 mg/m<sup>3</sup>, 10 ppm as TWA; 250 mg/m<sup>3</sup>, 50 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Check for peroxides prior to distillation; eliminate if found.

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: Xn, N; R: 10-37-51/53-65; S: (2)-24-37-61-62; Note: C

METHYL BROMIDE ICSC: 0109 (November 2009)

Bromomethane Monobromomethane

CAS #: 74-83-9 UN #: 1062

EC Number: 200-813-2

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
tumes (or gases) in a fire. Risk of fire	NO open flames. NO contact with aluminium, zinc, magnesium or pure oxygen.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with appropriate extinguishing agent. In case of fire: keep cylinder cool by spraying with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR! FIRST AID: USE PERSONAL PROTECTION.			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Headache. Abdominal pain. Vomiting. Weakness. Shortness of breath. Confusion. Hallucinations. Loss of speech. Incoordination. Convulsions. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Tingling sensation. Itching. Burning sensation. Redness. Blisters. Pain. ON CONTACT WITH LIQUID: FROSTBITE. Further see Inhalation.	Cold-insulating gloves. Protective clothing.	Rinse skin with plenty of water or shower. ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
Eyes	Redness. Pain. Blurred vision. Temporary loss of vision.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. NEVER direct water jet on liquid.	According to UN GHS Criteria	
STORAGE	DANGER Contains gas under pressure; may explode if heated Toxic if inhaled	
Fireproof if in building. Separated from strong oxidants, aluminium and cylinders containing oxygen. Cool. Ventilation along the floor.	Causes skin and eye irritation Causes damage to lungs, kidneys and central nervous system if inhaled	
	Causes damage to the liver, the kidneys and the central nervous system through prolonged or repeated exposure if inhaled	
PACKAGING	Harms public health and the environment by destroying ozone in the upper atmosphere	
	Transportation UN Classification UN Hazard Class: 2.3	

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## METHYL BROMIDE ICSC: 0109

# PHYSICAL & CHEMICAL INFORMATION

## Physical State; Appearance

ODOURLESS COLOURLESS COMPRESSED LIQUEFIED GAS.

#### Physical dangers

The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

## Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen bromide, bromine and carbon oxybromide. Reacts with strong oxidants. Attacks many metals in the presence of water. Attacks aluminium, zinc and magnesium. This produces pyrophoric compounds. This generates fire and explosion hazard.

Formula: CH<sub>3</sub>Br Molecular mass: 94.9 Boiling point: 4°C Melting point: -94°C

Relative density (water = 1): 1.7 (liquid, 0°C) Solubility in water, g/100ml at 20°C: 1.5 Vapour pressure, kPa at 20°C: 1893 Relative vapour density (air = 1): 3.3

Flash point: 194°C

Auto-ignition temperature: 537°C Explosive limits, vol% in air: 10-16

Octanol/water partition coefficient as log Pow: 1.19

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and through the skin also as a vapour.

#### Effects of short-term exposure

The substance, as a liquid, is severely irritating to the skin. The substance, as a liquid, is irritating to the eyes and respiratory tract. Inhalation may cause lung oedema. See Notes. Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed up to 48 hours. Exposure at high levels could cause death. Medical observation is indicated.

#### Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

#### Effects of long-term or repeated exposure

The substance may have effects on the nervous system, kidneys and liver. This may result in impaired functions. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen).

MAK: peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

# **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Toxic effects on the nervous system may be delayed for several hours.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered. Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

## ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T, N; R: 23/25-36/37/38-48/20-68-50-59; S: (1/2)-15-27-36/39-38-45-59-61

# METHYL ETHYL KETONE

Ethyl methyl ketone 2-Butanone

MEK

Methyl acetone

CAS #: 78-93-3 UN #: 1193

EC Number: 201-159-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	and lighting. Do NOT use	Use alcohol-resistant foam, water, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Headache. Dizziness. Nausea. Vomiting. Drowsiness. Numbness. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	See Inhalation. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give nothing to drink. Refer for medical attention .	

# SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: self-contained breathing apparatus. Do NOT According to UN GHS Criteria wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER STORAGE** Highly flammable liquid and vapour Causes serious eye irritation May cause respiratory irritation Fireproof. Separated from strong oxidants and strong acids. Cool. Well closed. Store in an area without drain or sewer access. May cause drowsiness or dizziness Suspected of damaging fertility or the unborn child May be harmful if swallowed and enters airways **PACKAGING Transportation UN Classification** UN Hazard Class: 3; UN Pack Group: II



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ICSC: 0179 (April 2017)

METHYL ETHYL KETONE ICSC: 0179

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers

Reacts violently with strong oxidants and inorganic acids. This generates fire and explosion hazard. Attacks some plastics.

Formula: C<sub>4</sub>H<sub>8</sub>O / CH<sub>3</sub>COCH<sub>2</sub>CH<sub>3</sub>

Molecular mass: 72.1 Boiling point: 80°C Melting point: -86°C

Relative density (water = 1): 0.8

Solubility in water, g/100ml at 20°C: 29 (good)

Vapour pressure, kPa at 20°C: 10.5 Relative vapour density (air = 1): 2.41

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.1

Flash point: -9°C c.c.

Auto-ignition temperature: 505°C Explosive limits, vol% in air: 1.8-11.5

Octanol/water partition coefficient as log Pow: 0.29

Viscosity: 0.40 cP at 25°C

# **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

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

## Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure could cause unconsciousness. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis.

#### Inhalation risk

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

## Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 200 ppm as TWA; 300 ppm as STEL; BEI issued.

MAK: 600 mg/m<sup>3</sup>, 200 ppm; peak limitation category: I(1); skin absorption (H); pregnancy risk group: C.

EU-OEL: 600 mg/m<sup>3</sup>, 200 ppm as TWA; 900 mg/m<sup>3</sup>, 300 ppm as STEL

# **ENVIRONMENT**

Avoid release to the environment in circumstances different to normal use

# **NOTES**

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

# **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: F, Xi; R: 11-36-66-67; S: (2)-9-16; Note: 6

# METHYL TERT-BUTYL ETHER

tert-Butyl methyl ether

MTBE

Methyl-1,1-dimethylethyl ether 2-Methoxy-2-methyl propane

CAS #: 1634-04-4 UN #: 2398

EC Number: 216-653-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. NO contact with oxidizing agents. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Dizziness. Headache. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria  Transportation UN Classification	
STORAGE	UN Hazard Class: 3; UN Pack Group: II	
Fireproof. Separated from strong oxidants and strong acids.		
PACKAGING		





Organization

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ICSC: 1164 (November 2000)

METHYL TERT-BUTYL ETHER ICSC: 1164

# PHYSICAL & CHEMICAL INFORMATION

## Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The vapour is heavier than air and may travel along the ground; distant ignition possible.

# Chemical dangers

Reacts violently with strong oxidants. This generates fire hazard. Decomposes on contact with acids.

Formula: (CH<sub>3</sub>)<sub>3</sub>COCH<sub>3</sub> / C<sub>5</sub>H<sub>12</sub>O

Molecular mass: 88.2 Boiling point: 55°C Melting point: -109°C

Relative density (water = 1): 0.7 Solubility in water, g/100ml at 20°C: 4.2 Vapour pressure, kPa at 20°C: 27 Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5

Flash point: -28°C c.c.

Auto-ignition temperature: 375°C Explosive limits, vol% in air: 1.6-15.1

Octanol/water partition coefficient as log Pow: 1.06

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.

#### Inhalation risk

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

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 50 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 180 mg/m<sup>3</sup>, 50 ppm; carcinogen category: 3; pregnancy risk group: C.

EU-OEL: 183.5 mg/m<sup>3</sup>, 50 ppm as TWA; 367 mg/m<sup>3</sup>, 100 ppm as STEL

# **ENVIRONMENT**

It is strongly advised not to let the chemical enter into the environment because it is persistent.

# **NOTES**

Much less likely to form peroxides than other ethers.

# **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: F, Xi; R: 11-38; S: (2)-9-16-24

DICHLOROMETHANE ICSC: 0058 (April 2017)

Methylene chloride DCM

CAS #: 75-09-2 UN #: 1593

EC Number: 200-838-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	under enecific conditions. See Notes	substances. See Chemical Dangers.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Administration of oxygen may be needed. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Burning sensation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Pain. Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Administration of oxygen may be needed. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER Harmful if swallowed
Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Well closed. Cool. Ventilation along the floor.	Fatal if inhaled Causes skin and eye irritation May cause drowsiness or dizziness Causes damage to central nervous system, blood, liver, the heart and lungs May be harmful if swallowed and enters airways
PACKAGING	Causes damage to the central nervous system through prolonged or repeated exposure if inhaled
Do not transport with food and feedstuffs. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	May cause cancer  Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III

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DICHLOROMETHANE ICSC: 0058

# PHYSICAL & CHEMICAL INFORMATION

## Physical State; Appearance

VERY VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

## Chemical dangers

Decomposes on heating or on burning and on contact with hot surfaces. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007) and carbon monoxide (see ICSC 0023). Reacts violently with strong oxidants, strong bases and metals such as aluminium powder and magnesium powder. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CH<sub>2</sub>Cl<sub>2</sub> Molecular mass: 84.9 Boiling point: 40°C Melting point: -97°C

Relative density (water = 1): 1.3 (20°C)

Solubility in water, g/100ml at 20°C: 1.3 (moderate)

Vapour pressure, kPa at 20°C: 47.4 Relative vapour density (air = 1): 2.9

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.9

Auto-ignition temperature: 605°C Explosive limits, vol% in air: 13-22

See Notes.

Octanol/water partition coefficient as log Pow: 1.25

Viscosity: 0.32 mm<sup>2</sup>/s at 20°C

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

## Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system, blood, liver, heart and lungs. Exposure could cause carbon monoxide poisoning. This may result in impaired functions. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

## Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

The substance may have effects on the central nervous system. This substance is probably carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 50 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); (skin).

MAK: 180 mg/m<sup>3</sup>, 50 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 5; pregnancy risk group: B.

EU-OEL: 353 mg/m<sup>3</sup>, 100 ppm as TWA; 706 mg/m<sup>3</sup>, 200 ppm as STEL; (skin)

# **ENVIRONMENT**

## **NOTES**

Do NOT use in the vicinity of a fire or a hot surface, or during welding. The odour warning when the exposure limit value is exceeded is insufficient.

Depending on the degree of exposure, periodic medical examination is suggested.

## ADDITIONAL INFORMATION

# **EC Classification**

Symbol: Xn; R: 40; S: (2)-23-24/25-36/37

m-XYLENE ICSC: 0085 (August 2002)

meta-Xylene 1,3-Dimethylbenzene

m-Xylol

CAS #: 108-38-3 UN #: 1307

EC Number: 203-576-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1	Flammable. Above 27°C explosive	system, ventilation and explosion-	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III	
STORAGE		
Fireproof. Separated from strong oxidants and strong acids.		
PACKAGING		





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m-XYLENE ICSC: 0085

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts with strong acids and strong oxidants.

Formula: C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub> / C<sub>8</sub>H<sub>10</sub> Molecular mass: 106.2 Boiling point: 139°C Melting point: -48°C

Relative density (water = 1): 0.86

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.8 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 27°C c.c.

Auto-ignition temperature: 527°C Explosive limits, vol% in air: 1.1-7.0

Octanol/water partition coefficient as log Pow: 3.20

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

## Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen); BEI issued.

EU-OEL: 150 ppm as STEL; 221 mg/m<sup>3</sup>, 50 ppm as TWA; 442 mg/m<sup>3</sup>, 100 ppm as STEL; (skin).

MAK: 220 mg/m<sup>3</sup>, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to technical xylene.

See ICSCs 0084 and 0086.

## ADDITIONAL INFORMATION

## **EC Classification**

Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C



# TCI AMERICA SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

# 1. IDENTIFICATION

Product name:ButylbenzeneProduct code:B0713

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

# 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 2B]

Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Warning!

Hazard Statement(s): Causes eye irritation

Flammable liquid and vapor Very toxic to aquatic life

Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):





Precautionary Statement(s):

[Prevention] Wash hands and face thoroughly after handling. Keep away from heat, sparks, open flames or other hot

surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face

protection.

[Response] If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to

do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical,

CO2, water spray or alcohol-resistant foam to extinguish.

[Storage] Store in a well-ventilated place. Keep cool.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

Hazards not otherwise classified: [HNOC] Causes mild skin irritation.

Butylbenzene **TCI AMERICA** Page 2 of 6

# 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance Components: Butvlbenzene Percent: >99.0%(GC) **CAS Number:** 104-51-8 Molecular Weight: 134.22 **Chemical Formula:** C<sub>10</sub>H<sub>14</sub>

# 4. FIRST-AID MEASURES

Eye contact:

Inhalation: Call emergency medical service. Move victim to fresh air. Give artificial respiration if victim is not breathing.

Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and

supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to

protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately

flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and

remove any contact lenses. Keep victim warm and guiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do Ingestion:

> not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat

> symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Symptoms/effects:

Redness. Acute: No data available Delayed:

If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the Immediate medical attention:

injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves

# 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub>, water spray, or alcohol-resistant foam. Consult with local fire authorities before

attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides

Closed containers may explode from heat of a fire. Other specific hazards:

# Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

# 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-

proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor Personal protective equipment:

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

Butylbenzene **TCI AMERICA** Page 3 of 6

# 6. ACCIDENTAL RELEASE MEASURES

**Emergency procedures:** 

Isolate area until gas has dispersed. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

# Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill, use dry sand to contain the flow of material. **Environmental precautions:** 

Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

# 7. HANDLING AND STORAGE

Do NOT breath gas, fumes, vapor, or spray. Avoid contact with skin and eyes. Keep away from heat and Precautions for safe handling:

sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When

using do not eat, drink, or smoke. Keep away from sources of ignition.

Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store Conditions for safe storage:

and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid

prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

No data available **Exposure limits:** 

## Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

# Personal protective equipment

Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Respiratory protection:

Hand protection: Wear protective gloves. Eye protection: Splash goggles. Skin and body protection: Lab coat.

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Clear Form:

Color: Colorless - Almost colorless

Characteristic Odor: Odor threshold: No data available

Melting point/freezing point: -88°C (-126°F) No data available pH: 183°C (361°F) 0.1kPa/25°C Boiling point/range: Vapor pressure:

No data available 4.6 **Decomposition temperature:** Vapor density: No data available

Relative density: 0.86

**Kinematic Viscosity:** No data available

**Evaporation rate:** Partition coefficient: 4.38 No data available

n-octanol/water (log Pow) (Butyl Acetate = 1)

Autoignition temperature: 59°C (138°F) 410°C (770°F) Flash point:

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: 0.8% Upper: 5.8%

**Dynamic Viscosity:** 

Solubility(ies):

Water: Insoluble (11.8mg/L, 25°C) Miscible: Ether, Alcohols, Benzene Butylbenzene TCI AMERICA Page 4 of 6

# 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: In use, may form flammable/explosive vapor-air mixture.

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials:

Hazardous Decomposition Products:

Oxidizing agents

No data available

# 11. TOXICOLOGICAL INFORMATION

RTECS Number: CY9070000

Acute Toxicity: orl-rat LDLo:10 mL/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity: No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Eye contact may result in redness or pain. Skin contact may result in redness, pain or dry skin.

**Potential Health Effects:** 

Skin and eye contact may result in irritation.

Target organ(s): No data available

# 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: 96h LC50:3.3 mg/L (Oryzias latipes)
Crustacea: 48h EC50:1.0 mg/L (Daphnia magna)

Algae: 72h EC50:1.1 mg/L (Selenastrum capricornutum)

Persistence and degradability: No data available

Bioaccumulative potential (BCF): 470

Mobillity in soil: No data available

Partition coefficient: 4.38

n-octanol/water (log Pow)

Soil adsorption (Koc): No data available

Henry's Law: 1621

constant (PaM³/mol)

Butylbenzene TCI AMERICA Page 5 of 6

# 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

# 14. TRANSPORT INFORMATION

DOT (US) UN number

UN number: Proper Shipping Name: Class or Division: Packing Group:

Butyl benzenes 3 Flammable liquid II

IATA

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2709 Butylbenzenes 3 Flammable liquid II

**IMDG** 

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2709 Butylbenzenes 3 Flammable liquid I

EmS number: F-E, S-D

# 15. REGULATORY INFORMATION

# Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

# **US Federal Regulations**

# **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed Not Listed Not Listed

# **State Regulations**

# State Right-to-Know

MassachusettsNot ListedNew JerseyListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

# Other Information

NFPA Rating: HMIS Classification:

# **International Inventories**

WHMIS hazard class: B2: Flammable Liquid.

D2B: Materials causing other toxic effects. (Toxic)

**EC-No**: 203-209-7

# 16. OTHER INFORMATION

Revision date: 10/06/2014 Revision number: 2 Butylbenzene TCI AMERICA Page 6 of 6

# 16. OTHER INFORMATION

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

o-XYLENE ICSC: 0084 (August 2002)

ortho-Xylene 1,2-Dimethylbenzene

o-Xylol

CAS #: 95-47-6 UN #: 1307

EC Number: 202-422-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 32°C explosive vapour/air mixtures may be formed.	system, ventilation and explosion- proof electrical equipment. Prevent	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III	
STORAGE		
Fireproof. Separated from strong oxidants and strong acids.		
PACKAGING		





Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
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o-XYLENE ICSC: 0084

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be

generated.

Chemical dangers

Reacts with strong acids and strong oxidants.

Formula: C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub> / C<sub>8</sub>H<sub>10</sub> Molecular mass: 106.2 Boiling point: 144°C Melting point: -25°C

Relative density (water = 1): 0.88

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.7 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 32°C c.c.

Auto-ignition temperature: 463°C Explosive limits, vol% in air: 0.9-6.7

Octanol/water partition coefficient as log Pow: 3.12

# **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

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

## Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 220 mg/m<sup>3</sup>, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D.

EU-OEL: 221 mg/m<sup>3</sup>, 50 ppm as TWA; 442 mg/m<sup>3</sup>, 100 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to technical xylene.

See ICSCs 0085 and 0086.

## ADDITIONAL INFORMATION

# **EC Classification**

Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

PROPYLENE
Methylethylene
Propene
Methylethene

CAS #: 115-07-1 UN #: 1077

EC Number: 204-062-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Suffocation. See Notes.	Use ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Evacuate danger area! Consult an expert! Ventilation. Remove all ignition sources. NEVER direct water jet on liquid. Personal protection: chemical protection suit including self-contained breathing apparatus.	According to UN GHS Criteria	
STORAGE	Transportation UN Classification	
Fireproof. Cool.	UN Hazard Class: 2.1	
PACKAGING		





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PROPYLENE ICSC: 0559

# PHYSICAL & CHEMICAL INFORMATION

## Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS.

## Physical dangers

The gas is heavier than air and may travel along the ground; distant ignition possible. The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated.

#### Chemical dangers

Reacts violently with oxidants. This generates fire and explosion hazard.

Formula: C<sub>3</sub>H<sub>6</sub> / CH<sub>2</sub>CHCH<sub>3</sub>
Molecular mass: 42.1
Boiling point: -48°C
Melting point: -185°C

Relative density (water = 1): 0.5

Solubility in water: poor

Vapour pressure, kPa at 25°C: 1158 Relative vapour density (air = 1): 1.5 Flash point: Flammable gas Auto-ignition temperature: 460°C Explosive limits, vol% in air: 2.4-10.3

Octanol/water partition coefficient as log Pow: 1.77

# **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

The substance can be absorbed into the body by inhalation.

## Effects of short-term exposure

Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. See Notes.

# Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 500 ppm as TWA; A4 (not classifiable as a human carcinogen)

## **ENVIRONMENT**

## **NOTES**

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: F+; R: 12; S: (2)-9-16-33

p-XYLENE ICSC: 0086 (August 2002)

para-Xylene 1,4-Dimethylbenzene

p-Xylol paraxylene

CAS #: 106-42-3 UN #: 1307

EC Number: 203-396-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	system, ventilation and explosion- proof electrical equipment. Prevent	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III	
STORAGE		
Fireproof. Separated from strong oxidants and strong acids.		
PACKAGING		





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p-XYLENE ICSC: 0086

# PHYSICAL & CHEMICAL INFORMATION

## Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

## Chemical dangers

Reacts with strong acids and strong oxidants.

Formula: C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub> / C<sub>8</sub>H<sub>10</sub> Molecular mass: 106.2 Boiling point: 138°C Melting point: 13°C

Relative density (water = 1): 0.86

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 27°C c.c.

Auto-ignition temperature: 528°C Explosive limits, vol% in air: 1.1-7.0

Octanol/water partition coefficient as log Pow: 3.15

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

## Effects of short-term exposure

The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 220 mg/m³, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D.

EU-OEL: 221 mg/m<sup>3</sup>, 50 ppm as TWA; 442 mg/m<sup>3</sup>, 100 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to technical xylene.

See ICSCs 0084 and 0085.

## ADDITIONAL INFORMATION

## **EC Classification**

Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C



# TCI AMERICA SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

# 1. IDENTIFICATION

**Product name:** sec-Butylbenzene

Product code: B0714

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

# 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 4]

Skin Corrosion/Irritation [Category 2] Eye Damage/Irritation [Category 2B] Flammable Liquids [Category 3]

Signal word: Warning!

Hazard Statement(s): Causes eye irritation

Causes skin irritation Flammable liquid and vapor Harmful if swallowed

Pictogram(s) or Symbol(s):





Precautionary Statement(s):

[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking odd for pacted tightly and protection and face activated to the container of the container and the container and the container of the container and the container of the contain

static discharge. Wear protective gloves, eye protection and face protection.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of

fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage] Store in a well-ventilated place. Keep cool.
[Disposal] Dispose of contents and container in accor

Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

sec-Butylbenzene TCI AMERICA Page 2 of 6

# 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:SubstanceComponents:sec-ButylbenzenePercent:>99.0%(GC)CAS Number:135-98-8Molecular Weight:134.22Chemical Formula:C10H14Synonyms:2-Phenylbutane

# 4. FIRST-AID MEASURES

Eye contact:

Inhalation: Call a poison center or doctor if you feel unwell. Move victim to fresh air. Give artificial respiration if victim

is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat

symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use.

flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with

Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately

material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control

Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.

Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is harmful. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

# 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub>, water spray, or alcohol-resistant foam. Consult with local fire authorities before

attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides

Other specific hazards: Closed containers may explode from heat of a fire.

## Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

# Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

# 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-

proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

sec-Butylbenzene TCI AMERICA Page 3 of 6

# 6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

nitrile)

Emergency procedures: Isolate area until gas has dispersed. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless

wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers,

basements or confined areas; dike if needed.

## Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.

# **Environmental precautions:**

Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

# 7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Do not ingest. Avoid contact with skin and eyes. Keep away

from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face

protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store

and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid

prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

## Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

# Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection:Wear protective gloves.Eye protection:Splash goggles.Skin and body protection:Lab coat.

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Color: Colorless - Almost colorless

Odor: No data available
Odor threshold: No data available

Melting point/freezing point:-83°C (-117°F)pH:No data availableBoiling point/range:173°C (343°F)Vapor pressure:0.2kPa/25°CDecomposition temperature:No data availableVapor density:4.62

Relative density: 0.86

Kinematic Viscosity: No data available

Partition coefficient: 4.57 Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: 52°C (126°F) Autoignition temperature: 415°C (779°F)

Flammability (solid, gas): No data available Flammability or explosive limits:

Upper: 6.9%

No data available

**Dynamic Viscosity:** 

Solubility(ies):

sec-Butylbenzene TCI AMERICA Page 4 of 6

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Water: Insoluble (17.6mg/L, 25°C) Miscible: Ether, Alcohols, Benzene

# 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: In use, may form flammable/explosive vapor-air mixture.

Conditions to avoid:
Incompatible materials:
Hazardous Decomposition Products:

Avoid excessive heat and light.
Strong oxidizing agents
No data available

# 11. TOXICOLOGICAL INFORMATION

RTECS Number: CY9100000

**Acute Toxicity:** 

orl-mus LD50:8700 mg/kg orl-rat LD50:2240 uL/kg

skn-rbt LD50:>16 mL/kg

**Skin corrosion/irritation:** skn-rbt 100 mg/24H MOD

Serious eye damage/irritation: eye-rbt 500 mg/24H MLD

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity: No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.

**Potential Health Effects:** 

Skin and eye contact may result in irritation.

Target organ(s): No data available

# 12. ECOLOGICAL INFORMATION

Ecotoxicity Fish:

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available

Bioaccumulative potential (BCF): 660

Mobillity in soil:

Partition coefficient:

No data available
4.57

Partition coefficient: n-octanol/water (log Pow)

Soil adsorption (Koc): 7200 Henry's Law: 182.3

constant (PaM³/mol)

sec-Butylbenzene TCI AMERICA Page 5 of 6

# 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

# 14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2709 Butyl benzenes 3 Flammable liquid II

IATA

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2709 Butylbenzenes 3 Flammable liquid II

IMDG

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2709 Butylbenzenes 3 Flammable liquid III

EmS number: F-E, S-D

# 15. REGULATORY INFORMATION

## Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

# **US Federal Regulations**

**CERCLA Hazardous substance and Reportable Quantity:** 

SARA 313: Not Listed SARA 302: Not Listed

**State Regulations** 

State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

# Other Information

NFPA Rating: HMIS Classification:

Health:0Health:0Flammability:2Flammability:2Instability:0Physical:0

International Inventories

WHMIS hazard class: B2: Flammable Liquid.

D2A: Materials causing other toxic effects. (Very Toxic)

D2B: Materials causing other toxic effects. (Toxic)

**EC-No**: 205-227-0

# 16. OTHER INFORMATION

Revision date: 10/06/2014 Revision number: 2 sec-Butylbenzene TCI AMERICA Page 6 of 6

# 16. OTHER INFORMATION

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

10/26/21, 12:11 PM STYRENE

> Vinylbenzene Phenylethylene Ethenylbenzene

CAS #: 100-42-5 UN #: 2055

EC Number: 202-851-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	31°C explosive vapour/air mixtures	smoking. Above 31°C use a closed	Use dry powder. Use foam. Use carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective clothing. Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Rest.

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: chemical protection suit including self-According to UN GHS Criteria contained breathing apparatus. Remove all ignition sources. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER** Flammable liquid and vapour **STORAGE** Harmful if inhaled Causes skin and eye irritation Fireproof. Separated from incompatible materials. See Chemical Suspected of causing cancer Dangers. Cool. Keep in the dark. Store only if stabilized. Store in Causes damage to the central nervous system and the liver an area without drain or sewer access. through prolonged or repeated exposure Toxic to aquatic life **PACKAGING** Transportation UN Classification Airtight. Marine pollutant. UN Hazard Class: 3; UN Pack Group: III



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ICSC: 0073 (April 2006)

10/26/21, 12:11 PM ICSC 0073 - STYRENE

STYRENE ICSC: 0073

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW OILY LIQUID.

Physical dangers

## Chemical dangers

The substance can form explosive peroxides. The substance may polymerize due to warming, under the influence of light, oxidants, oxygen and peroxides. This generates fire and explosion hazard. Reacts violently with strong acids and strong oxidants. This generates fire and explosion hazard. Attacks rubber, copper and copper alloys.

Formula: C<sub>8</sub>H<sub>8</sub> / C<sub>6</sub>H<sub>5</sub>CHCH<sub>2</sub> Molecular mass: 104.2 Boiling point: 145°C Melting point: -30.6°C

Relative density (water = 1): 0.91 Solubility in water, g/100ml at 20°C: 0.03 Vapour pressure, kPa at 20°C: 0.67 Relative vapour density (air = 1): 3.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02

Flash point: 31°C c.c.

Auto-ignition temperature: 490°C Explosive limits, vol% in air: 0.9-6.8

Octanol/water partition coefficient as log Pow: 3.0

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. This substance is possibly carcinogenic to humans. See Notes.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; 20 ppm as STEL; (OTO); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: 86 mg/m<sup>3</sup>, 20 ppm; peak limitation category: II(2); carcinogen category: 5; pregnancy risk group: C

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

# NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

Check for peroxides prior to distillation; eliminate if found.

Styrene monomer vapours are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in blockage of vents.

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn; R: 10-20-36/38; S: (2)-23; Note: D

TETRACHLOROETHYLENE ICSC: 0076 (April 2013)

PER

Ethylene Tetrachloride

PERC

Tetracap

1,1,2,2-tetrachloroethene

1,1,2,2-Tetrachloroethylene

Perchloroethylene

Tetrachloroethene

CAS #: 127-18-4 UN #: 1897

EC Number: 204-825-9

Ì		ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
	FIRE & EXPLOSION	toxic fumes (or gases) in a fire. Risk		In case of fire in the surroundings, use appropriate extinguishing media.

STRICT HYGIENE! PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Headache. Drowsiness. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Dry skin. Redness. Burning sensation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Burning sensation. Pain.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat. Aspiration hazard! See Inhalation. Cardiac dysrhythmia. Respiratory arrest.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

## SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: filter respirator for organic gases and vapours According to UN GHS Criteria adapted to the airborne concentration of the substance and complete protective clothing. Ventilation. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **STORAGE WARNING** Causes skin irritation Separated from metals, ignition sources and food and feedstuffs. Suspected of causing cancer See Chemical Dangers. Keep in the dark. Keep in a well-ventilated May be harmful if swallowed and enters airways room. Dry. Cool. May cause drowsiness or dizziness Toxic to aquatic life with long lasting effects **PACKAGING Transportation UN Classification** Do not transport with food and feedstuffs. UN Hazard Class: 6.1; UN Pack Group: III Marine pollutant.



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## TETRACHLOROETHYLENE ICSC: 0076

# PHYSICAL & CHEMICAL INFORMATION

# Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# Physical dangers

The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

## Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride, phosgene and chlorine. Decomposes slowly on contact with moisture. This produces trichloroacetic acid and hydrochloric acid. Reacts violently with finely divided metals. This generates fire and explosion hazard.

Formula: C<sub>2</sub>Cl<sub>4</sub> / Cl<sub>2</sub>C=CCl<sub>2</sub> Molecular mass: 165.8 Boiling point: 121°C Melting point: -22°C Density (at 20°C): 1.62 g/cm³

Solubility in water, g/100ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 1.9 Relative vapour density (air = 1): 5.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09

Octanol/water partition coefficient as log Pow: 3.4

Auto-ignition temperature: > 650°C

# **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

# Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver, kidneys and central nervous system. This substance is probably carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 25 ppm as TWA; 100 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: 69 mg/m<sup>3</sup>, 10 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 3; pregnancy risk group: C. EU-OEL: 138 mg/m<sup>3</sup>, 20 ppm as TWA; 275 mg/m<sup>3</sup>, 40 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

# **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

Use of alcoholic beverages enhances the harmful effect.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn, N; R: 40-51/53; S: (2)-23-36/37-61

#### TETRAHYDROFURAN ICSC: 0578 (November 2019)

Tetramethylene oxide Diethylene oxide 1,4-Epoxybutane Oxacyclopentane

CAS #: 109-99-9 UN #: 2056

EC Number: 203-726-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	explosion-proof electrical equipment	Use alcohol-resistant foam, water spray, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Burning sensation in the throat and chest. Dizziness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness Pain   Wear safety goggles or face shield   minutes (remove co	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.	
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Ventilation. Do NOT wash away into sewer. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER  Highly flammable liquid and vapour Harmful if swallowed	
STORAGE	Causes skin irritation Causes serious eye irritation May cause respiratory irritation	
Fireproof. Well closed. Separated from : see Chemical Dangers.	Suspected of causing cancer May cause damage to kidneys and liver through prolonged or repeated exposure	
PACKAGING	Transportation - UN Classification	
Airtight.	UN Hazard Class: 3; UN Pack Group: II	





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#### TETRAHYDROFURAN ICSC: 0578

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### Chemical dangers

The substance can form explosive peroxides. Reacts violently with strong oxidants, strong bases and some metal halides. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: C<sub>4</sub>H<sub>8</sub>O / (CH<sub>2</sub>)<sub>3</sub>CH<sub>2</sub>O

Molecular mass: 72.1 Boiling point: 66°C Melting point: -108.5°C

Relative density (water = 1): 0.89 Solubility in water: freely soluble Vapour pressure, kPa at 20°C: 19.3 Relative vapour density (air = 1): 2.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.28

Flash point: -14.5°C c.c. Auto-ignition temperature: 321°C Explosive limits, vol% in air: 2-11.8

Octanol/water partition coefficient as log Pow: 0.46 (estimated)

Viscosity: 0.5 mPa\*s at 20°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, by ingestion and through the skin.

#### Effects of short-term exposure

The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system at high levels. This may result in narcosis.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This may result in impaired functions. This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 50 ppm as TWA; 100 ppm as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: 150 mg/m<sup>3</sup>, 50 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C. EU-OEL: 150 mg/m<sup>3</sup>, 50 ppm as TWA; 300 mg/m<sup>3</sup>, 100 ppm as STEL; (skin)

# **ENVIRONMENT**

# **NOTES**

The odour warning when the exposure limit value is exceeded is insufficient. Check for peroxides prior to distillation; eliminate if found.

# ADDITIONAL INFORMATION

# EC Classification

**TOLUENE** Methylbenzene

Toluol

Phenylmethane

CAS #: 108-88-3 UN #: 1294

EC Number: 203-625-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.		Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit and self-contained breathing apparatus. Ventilation. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II
STORAGE	
Fireproof. Separated from strong oxidants.	
PACKAGING	





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ICSC: 0078 (October 2002)

10/26/21, 12:12 PM ICSC 0078 - TOLUENE

TOLUENE ICSC: 0078

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

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

Chemical dangers

Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub> / C<sub>7</sub>H<sub>8</sub> Molecular mass: 92.1 Boiling point: 111°C Melting point: -95°C

Relative density (water = 1): 0.87

Solubility in water: none

Vapour pressure, kPa at 25°C: 3.8 Relative vapour density (air = 1): 3.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 4°C c.c.

Auto-ignition temperature: 480°C Explosive limits, vol% in air: 1.1-7.1

Octanol/water partition coefficient as log Pow: 2.69

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

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

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 ppm as TWA; (OTO); A4 (not classifiable as a human carcinogen); BEI issued.

MAK: 190 mg/m<sup>3</sup>, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 192 mg/m<sup>3</sup>, 50 ppm as TWA; 384 mg/m<sup>3</sup>, 100 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Use of alcoholic beverages enhances the harmful effect.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn; R: 11-38-48/20-63-65-67; S: (2)-36/37-46-62

# Avocado Research Chemicals Ltd - Material Safety Data Sheet 10384

#### 1. IDENTIFICATION OF SUBSTANCE AND SUPPLIER

Name On Label trans-1,2-Dichloroethylene

Product Number 10384

Supplier Johnson Matthey Catalog Company Inc.

30 Bond Street, Ward Hill, Massachusetts, 01835-8099

Emergency Telephone Number: (978) 521-6300; CHEMTREC: (800) 424-9300

Alternative Names None in common use.

# 2. COMPOSITION AND INFORMATION ON COMPONENTS

Name trans-1,2-Dichloroethylene

Minor Impurities Not determined

CAS No. 156-60-5 EINECS No. 2058602 EEC No.

#### 3. HAZARDS IDENTIFICATION

DesignationHIGHLY FLAMMABLE ~ IRRITANTRisk PhrasesR11Highly flammable.

R20/21/22 Harmful by inhalation, in contact with skin and if swallowed.

R36/37/38 Irritating to eyes, respiratory system and skin.

# 4. FIRST AID MEASURES

**Inhalation** Remove to fresh air. If breathing is difficult give oxygen and seek medical attention.

Eye Contact Flush with copious amounts of water for at least 15 minutes. If irritation persists, seek medical

attention.

Skin Contact Remove contaminated clothing. Wash affected area with soap and water. Rinse thoroughly. If

irritation persists or other symptoms are observed, seek medical advice.

**Ingestion** Rinse out mouth and drink lots of water. In case of irritation or other symptoms, seek medical

attention.

#### 5. FIRE FIGHTING MEASURES

may be involved. In general, water-based extinguishers should not be used for fires involving

organic materials. Use carbon dioxide or dry powder.

**Protective Equipment** Wear self-contained breathing apparatus and protective clothing.

Hazardous Products of Combustion may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).

# 6. ACCIDENTAL RELEASE MEASURES

Personal Protection Keep away from ignition sources. Avoid inhalation of vapour. Wear protective equipment including

rubber gloves, eye protection and breathing equipment. Keep unprotected persons away.

**Environmental Protection** 

Collection

Storage

Take precautions to ensure product does not contaminate the ground or enter the drainage system. Absorb in vermiculite or proprietary absorbent material and transfer to sealed containers for

disposal.

# 7. HANDLING AND STORAGE

**Handling** Chemicals should be used only by those trained in handling potentially hazardous materials. Rubber

gloves, eye protection and protective clothing should be worn. Operations should be carried out in

an efficient fume hood or equivalent system.

Store in tightly sealed containers in a cool place.

Protect from moisture.

# 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory Volatile product. Avoid inhalation of vapour. Handle in an efficient fume hood or equivalent system.

Eye Avoid eye contact. Wear safety spectacles, goggles or, for larger quantities, a full face mask.

Hands and Body Irritant product. Avoid skin contact. Wear rubber gloves, protective clothing and, for larger quantities, full arm, body and face protection. Wash hands thoroughly after handling.

# Continued on next page...

# 10384 continued.

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance Colorless liquid
Physical Constants Not available

Molecular formula $C_2H_2Cl_2$ Formula Wt.96.94Water solubilitySI solDensity1.257Flash Point $6^{\circ}$ 

#### 10. STABILITY AND REACTIVITY

Specific Hazard

**Incompatibilities** Oxidising agents.

**Decomposition**Hazardous products of decomposition may include: carbon monoxide, carbon dioxide, hydrogen

chloride (hydrochloric acid).

#### 11. TOXICOLOGICAL INFORMATION

RTECS No. KV9400000

Acute Toxicity LD<sub>50</sub>: ORL-RAT 1235mg/kg; SKN-RBT >5gm/kg

Harmful by inhalation, in contact with skin and if swallowed. Irritating to eyes, respiratory system and

skin.

Special Note Symptoms of exposure may include nausea, dizziness and headache. Prolonged exposure can

have a narcotic effect.

Chronic Toxicity Possible mutagen. May cause damage to the heart, bone marrow and the gastrointestinal and

immune systems.

# 12. ECOLOGICAL EFFECTS

General Take care to prevent chemicals from entering the ground, water courses or drainage systems.

# 13. DISPOSAL CONSIDERATIONS

**Disposal** Disposal should be via an approved contractor and should take full account of local regulations.

#### 14. TRANSPORT INFORMATION

UN Number 1150

Land TransportADR/RIC Code/Class3.2Packing Group IIMaritime TransportIMDG Code/Class3.2Packing Group IIAir TransportIATA Code/Class3.2Packing Group II

# 15. REGULATORY INFORMATION

CAS No. 156-60-5 EINECS No. 2058602 EEC No. UN No. 1150 RTECS No. KV9400000

Hazard Indication HIGHLY FLAMMABLE ~ IRRITANT

Risk & Safety Phrases Highly flammable.

Harmful by inhalation, in contact with skin and if swallowed.

Irritating to eyes, respiratory system and skin.

Keep container tightly closed.

Keep away from sources of ignition - No Smoking.

Do not empty into drains. Wear suitable protective clothing.

**TSCA** Listed substance.

#### 16. OTHER INFORMATION

It must be recognised that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Date of Last Review: 3rd August 1998 Date Printed: 18th September 1998



# TCI AMERICA

SAFETY DATA SHEET

Revision number: 4 Revision date: 08/15/2016

# 1. IDENTIFICATION

**Product name:** trans-1,3-Dichloropropene

Product code: D2346

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TCIchemicals.com www.TCIchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

# 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 3]

Acute Toxicity - Dermal [Category 3] Acute Toxicity - Inhalation [Category 3] Skin Corrosion/Irritation [Category 2] Eye Damage/Irritation [Category 2A] Sensitization - Skin [Category 1]

Carcinogenicity [Category 2]

Specific Target Organ Toxicity (Single Exposure) [Category 2] Specific Target Organ Toxicity (Repeated Exposure) [Category 2]

Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s): Causes serious eye irritation

Causes skin irritation Flammable liquid and vapor May cause an allergic skin reaction

Suspected of causing cancer Toxic if swallowed Toxic in contact with skin Toxic if inhaled Very toxic to aquatic life

Very toxic to aquatic life with long lasting effects May cause damage to organs: Respiratory System

May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

# Pictogram(s) or Symbol(s):











Precautionary Statement(s):

trans-1,3-Dichloropropene TCI AMERICA Page 2 of 6

# 2. HAZARD(S) IDENTIFICATION

[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Do not breathe fume, mist, vapors or spray. Use only outdoors or in a well-ventilated area. Wear protective gloves. Wear eye and face protection. Avoid breathing dusts or mists. Contaminated work clothing must not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Wash all exposed skin thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off immediately all contaminated clothing and wash it before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor. Get medical advice or attention if you feel unwell. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage]

Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool.

[Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

# 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: trans-1,3-Dichloropropene

 $\begin{array}{lll} \textbf{Percent:} & > 98.0\% (GC) \\ \textbf{CAS Number:} & 10061-02-6 \\ \textbf{Molecular Weight:} & 110.97 \\ \textbf{Chemical Formula:} & C_3H_4Cl_2 \\ \end{array}$ 

# 4. FIRST-AID MEASURES

Inhalation: May cause coughing, difficult breathing and nausea. Immediately call a poison center or doctor. Effects of

exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Skin contact: Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be

delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and

remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Ingestion: Toxic if swallowed. Do not induce vomiting with out medical advice. Effects of exposure (ingestion) to

substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to

protect themselves.

Symptoms/effects:

Acute: Redness.

**Delayed:** May cause skin sensitization. Possibly carcinogenic to humans.

trans-1,3-Dichloropropene TCI AMERICA Page 3 of 6

#### 4. FIRST-AID MEASURES

Immediate medical attention:

WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

#### 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:

Dry chemical,  $CO_2$  or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

# Specific hazards arising from the chemical

Hazardous combustion products: Other specific hazards:

These products include: Carbon oxides Halogenated compounds WARNING: Highly toxic HCl gas is produced during combustion.

#### Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

#### Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

#### 6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn

unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Personal protective equipment:

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Wear eye protection (splash goggles) and face protection (full length face shield). Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH

approved respirator or equivalent. Wear protective gloves (nitrile).

**Emergency procedures:** 

Isolate area until gas has dispersed. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

# Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

#### **Environmental precautions:**

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

# 7. HANDLING AND STORAGE

Precautions for safe handling:

Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage:

Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon). Store in a freezer.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

# **Appropriate engineering controls:**

Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

# Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Wear protective gloves. Eye protection: Splash goggles.

Skin and body protection: Wear protective clothing (chemical resistant suit and chemical resistant boots).

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Coloriess - Pale yellow

Odor: Pungent
Odor threshold: Pungent
No data available

Melting point/freezing point:No data availablepH:No data availableBoiling point/range:112°C (234°F)Vapor pressure:No data availableDecomposition temperature:No data availableVapor density:No data availableRelative density:1.22Dynamic Viscosity:No data available

Kinematic Viscosity: No data available

Partition coefficient: 1.41 Evaporation rate: No data available

n-octanol/water (log  $P_{ow}$ ) (Butyl Acetate = 1)

Flash point: 21°C (70°F) Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: 5.3% Upper: 14.5%

Solubility(ies):

Water: Very slightly soluble Soluble: Ether, Benzene, Chloroform

# 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Air sensitive. Heat sensitive.

Possibility of Hazardous Reactions: In use, may form flammable/explosive vapor-air mixture.

Conditions to avoid: Air sensitive. Exposure to air. Heat sensitive.

Incompatible materials:

Hazardous Decomposition Products:

Oxidizing agents

No data available

# 11. TOXICOLOGICAL INFORMATION

RTECS Number: UC8320000

Acute Toxicity: No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity: mmo-sat 20 ug/plate(+/-S9)

ate(+/-S9) dns-hmn-hla 100 umol/L

#### Carcinogenicity:

No data available

Group 2B (Possibly carcinogenic NTP: OSHA: IARC: b (Reasonably anticipated to be No data available

carcinogens). to humans).

Reproductive toxicity: No data available

**Routes of Exposure:** Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain. Skin contact may result in sensitization.

Readily absorbed through skin. **Potential Health Effects:** 

Skin and eye contact may result in irritation.

Target organ(s):

May cause damage to organs: Respiratory System

May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

# 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

No data available Fish: Crustacea: No data available No data available Algae:

No data available Persistence and degradability:

Bioaccumulative potential (BCF): <2.5(conc. 34.6 ug/L), <26(conc. 26 ug/L)

Mobillity in soil: No data available 1.41

Partition coefficient:

n-octanol/water (log Pow)

Soil adsorption (Koc):

No data available No data available Henry's Law:

constant (PaM3/mol)

# 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

Dispose of as unused product. Do not re-use empty containers. Disposal of container:

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

# 14. TRANSPORT INFORMATION

DOT (US)

**UN number: Proper Shipping Name:** Class or Division: **Packing Group:** 

UN2047 Dichloropropenes 3 Flammable liquid

IATA

UN number: **Proper Shipping Name:** Class or Division: **Packing Group:** 

UN2047 Dichloropentanes 3 Flammable liquid

**IMDG** 

Class or Division: **UN number: Proper Shipping Name: Packing Group:** 

UN2047 Dichloropropenes 3 Flammable liquid

F-E, S-D EmS number:

100 Pounds (45.4 Kilograms) Reportable Quantitiy:

# 15. REGULATORY INFORMATION

trans-1,3-Dichloropropene TCI AMERICA Page 6 of 6

#### 15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

# **US Federal Regulations**

**CERCLA Hazardous substance and Reportable Quantity:** 

SARA 313: Listed SARA 302: Not Listed

**State Regulations** 

State Right-to-Know

MassachusettsListedNew JerseyNot ListedPennsylvaniaListedCalifornia Proposition 65:Not Listed

Other Information

NFPA Rating: HMIS Classification:

Health:2Health:2Flammability:3Flammability:3Instability:0Physical:0

**International Inventories** 

WHMIS hazard class: B2: Flammable Liquid.

D1B: Materials causing immediate and serious toxic effects. (Toxic)

D2B: Materials causing other toxic effects. (Toxic)

# 16. OTHER INFORMATION

Revision date: 08/15/2016 Revision number: 4

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

TRICHLOROETHYLENE ICSC: 0081 (April 2013)

1,1,2-Trichloroethylene Trichloroethene

Ethylene trichloride
Acetylene trichloride

Tri

Chlorylen

TCE Trilene Trichlor

CAS #: 79-01-6 UN #: 1710

EC Number: 201-167-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces, strong bases or finely divided metals. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Weakness. Nausea. Unconsciousness.	Use closed system.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat. Aspiration hazard! See Inhalation. Cardiac dysrhythmia. Respiratory arrest.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: filter respirator for organic gases and vapours According to UN GHS Criteria adapted to the airborne concentration of the substance and complete protective clothing. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER** May be harmful if swallowed **STORAGE** Causes skin irritation Causes serious eye irritation Separated from metals, strong bases, food and feedstuffs, Suspected of causing genetic defects combustible substances and ignition sources. See Chemical May cause cancer Dangers. Dry. Keep in the dark. Keep in a well-ventilated room. May cause drowsiness or dizziness Cool. May be harmful if swallowed and enters airways Harmful to aquatic life with long lasting effects **PACKAGING Transportation** Do not transport with food and feedstuffs. **UN Classification** UN Hazard Class: 6.1; UN Pack Group: III Marine pollutant.

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.



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#### TRICHLOROETHYLENE ICSC: 0081

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

# Physical dangers

The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

#### Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of phosgene and hydrogen chloride. Decomposes on contact with strong alkali. This produces dichloroacetylene. This increases fire hazard. Reacts violently with finely divided metals. This generates fire and explosion hazard. Slowly decomposed by light in the presence of moisture. This produces corrosive hydrochloric acid.

Formula: C<sub>2</sub>HCl<sub>3</sub> / ClCH=CCl<sub>2</sub>

Molecular mass: 131.4 Boiling point: 87°C Melting point: -86°C

Relative density (water = 1): 1.5 (20°C) Solubility in water, g/100ml at 20°C: 0.1 Vapour pressure, kPa at 20°C: 7.8 Relative vapour density (air = 1): 4.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3

Auto-ignition temperature: 410°C Explosive limits, vol% in air: 7.9 - 100

Octanol/water partition coefficient as log Pow: 2.42

Electrical conductivity: 800 pS/m

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system, liver and kidneys. This may result in impaired functions. Exposure at high concentrations could cause unconsciousness.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system. This may result in fatigue, irritability and mental and memory disturbances. The substance may have effects on the liver, kidneys and immune system. This substance is carcinogenic to humans. Causes toxicity to human reproduction or development.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; 25 ppm as STEL; A2 (suspected human carcinogen); BEI issued.

MAK: skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3B.

EU-OEL: 54.7 mg/m<sup>3</sup>, 10 ppm as TWA; 164.1 mg/m<sup>3</sup>, 30 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

#### ADDITIONAL INFORMATION

# **EC Classification**

Symbol: T; R: 45-36/38-52/53-67; S: 53-45-61

# TRICHLOROFLUOROMETHANE

Trichloromonofluoromethane Fluorotrichloromethane

CFC 11 R 11

CAS #: 75-69-4

EC Number: 200-892-3

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE. Dry skin.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Ventilation.	According to UN GHS Criteria  Transportation UN Classification	
STORAGE		
Separated from incompatible materials. See Chemical Dangers. Cool.		
PACKAGING		
	1	



International Labour Organization



Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission. © ILO and WHO 2021



ICSC: 0047 (July 2002)

#### TRICHLOROFLUOROMETHANE ICSC: 0047

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS GAS OR HIGHLY VOLATILE LIQUID WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The gas is heavier than air. The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

#### Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts with powdered aluminium, powdered zinc, magnesium shavings, lithium shavings and granular barium.

Formula: CCl<sub>3</sub>F Molecular mass: 137.4 Boiling point: 24°C Melting point: -111°C

Relative density (water = 1): 1.49 Solubility in water, g/100ml at 20°C: 0.1 Vapour pressure, kPa at 20°C: 89.0 Relative vapour density (air = 1): 4.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 4.4

Octanol/water partition coefficient as log Pow: 2.53

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

#### Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 5700 mg/m<sup>3</sup>, 1000 ppm; peak limitation category: II(2); pregnancy risk group: C

# **ENVIRONMENT**

Avoid release to the environment because of its impact on the ozone layer.

#### NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

The occupational exposure limit value should not be exceeded during any part of the working exposure.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding

Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

# **ADDITIONAL INFORMATION**

# **EC Classification**

# 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE

CFC 113 R 113

CAS #: 76-13-1

EC Number: 200-936-1

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	ICSC: 0050 (July 2002)
Trichlorotrifluoroethane	
CEC 113	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification
Separated from metals and alloys. See Chemical Dangers. Cool. Ventilation along the floor.	
PACKAGING	



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#### 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS VOLATILE LIQUID WITH CHARACTERISTIC ODOUR.

#### Physical dangers

The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

#### Chemical dangers

Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts violently with powdered metals. This generates fire and explosion hazard. Attacks magnesium and its alloys.

Formula: C<sub>2</sub>Cl<sub>3</sub>F<sub>3</sub> / Cl<sub>2</sub>FCCClF<sub>2</sub>

Molecular mass: 187.4 Boiling point: 48°C Melting point: -36°C

Relative density (water = 1): 1.56 Solubility in water, g/100ml at 20°C: 0.02 Vapour pressure, kPa at 20°C: 36 Relative vapour density (air = 1): 6.5

Relative density of the vapour/air-mixture at 20°C (air = 1): 3.0

ICSC: 0050

Auto-ignition temperature: 680°C

Octanol/water partition coefficient as log Pow: 3.30

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

#### Inhalation risk

On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1000 ppm as TWA; 1250 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 3900 mg/m<sup>3</sup>, 500 ppm; peak limitation category: II(2); pregnancy risk group: D

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer.

#### **NOTES**

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.

Check oxygen content before entering area.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

VINYL CHLORIDE ICSC: 0082 (April 2017)

Chloroethene

Chloroethylene

Vinylchloride Monomer (VCM)

CAS #: 75-01-4

UN #: 1086 (stabilized) EC Number: 200-831-0

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide, water spray. See Notes. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Unconsciousness. Blurred vision. Numbness. Tingling sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Protective gloves. Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. Remove all ignition sources. Remove vapour cloud with fine water spray. NEVER direct water jet on liquid.  STORAGE  Fireproof. Separated from : see Chemical Dangers. Cool. Store only if stabilized. Well closed. Keep in a well-ventilated room. Separated from oxidizing materials.  PACKAGING  According to UN GHS Criteria  DANGER  Extremely flammable gas Contains gas under pressure; may explode if heated May cause drowsiness or dizziness May cause damage to liver through prolonged or repeated exposure Suspected of causing genetic defects May cause cancer  Transportation UN Classification	SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Fireproof. Separated from : see Chemical Dangers. Cool. Store only if stabilized. Well closed. Keep in a well-ventilated room. Separated from oxidizing materials.  Extremely flammable gas Contains gas under pressure; may explode if heated May cause drowsiness or dizziness May cause damage to liver through prolonged or repeated exposure Suspected of causing genetic defects May cause cancer  Transportation	complete protective clothing including self-contained breathing apparatus. Ventilation. Remove all ignition sources. Remove vapour cloud with fine water spray. NEVER direct water jet on	According to UN GHS Criteria
Fireproof. Separated from : see Chemical Dangers. Cool. Store only if stabilized. Well closed. Keep in a well-ventilated room. Separated from oxidizing materials.  May cause drowsiness or dizziness May cause damage to liver through prolonged or repeated exposure Suspected of causing genetic defects May cause cancer  PACKAGING  Transportation	STORAGE	Extremely flammable gas
Transportation	only if stabilized. Well closed. Keep in a well-ventilated room.	May cause drowsiness or dizziness May cause damage to liver through prolonged or repeated exposure Suspected of causing genetic defects
UN Hazard Class: 2.1	PACKAGING	Transportation UN Classification



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#### VINYL CHLORIDE ICSC: 0082

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

# **Physical dangers**

The gas is heavier than air and may travel along the ground; distant ignition possible. Vapours are uninhibited and may polymerize, causing blockage of vents.

#### Chemical dangers

The substance can form explosive peroxides under specific circumstances. The substance readily polymerizes due to heating and under the influence of air, light and on contact with a catalyst, strong oxidizing agents and metals such as copper and aluminium. This generates fire or explosion hazard. Decomposes on burning. This produces toxic and corrosive fumes of hydrogen chloride and phosgene. Attacks iron and steel in the presence of moisture.

Formula: C<sub>2</sub>H<sub>3</sub>Cl / H<sub>2</sub>C=CHCl

Molecular mass: 62.5 Boiling point: -13°C Melting point: -154°C

Relative density (water = 1): 0.9 (liquid)

Density (vapour at 15°C): 8 g/l

Solubility in water, g/l at 25°C: 1.1 (poor) Relative vapour density (air = 1): 2.2 Vapour pressure, kPa at 20°C: 334

Flash point: -78°C c.c.

Auto-ignition temperature: 472°C Explosive limits, vol% in air: 3.6-33

Octanol/water partition coefficient as log Pow: 1.6

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The liquid may cause frostbite. The substance is irritating to the eyes. The substance may cause effects on the central nervous system. This may result in lowering of consciousness, convulsions and seizures. Medical observation is indicated.

#### Inhalation risk

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver, spleen, blood, peripheral blood vessels and tissue and bones of the fingers. Animal tests show that this substance possibly causes toxicity to human reproduction or development. This substance is carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 ppm as TWA; A1 (confirmed human carcinogen).

EU-OEL: 2.6 mg/m<sup>3</sup>, 1 ppm as TWA. MAK: carcinogen category: 1

# **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to ground water contamination.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Large fires of this material are practically inextinguishable: use water spray or fog.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: F+, T; R: 45-12; S: 53-45; Note: D

**BIPHENYL** ICSC: 0106 (October 2006)

Diphenyl Phenylbenzene

Dibenzene

CAS #: 92-52-4 UN #: 3077

EC Number: 202-163-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Finely dispersed	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Nausea. Vomiting.	Avoid inhalation of dust and mist. Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).	
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING
Separated from food and feedstuffs and oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	Causes eye irritation May cause damage to liver and nervous system through prolonged or repeated exposure if inhaled Very toxic to aquatic life
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 9; UN Pack Group: III



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10/26/21, 12:27 PM ICSC 0106 - BIPHENYL

BIPHENYL ICSC: 0106

# **PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance

WHITE CRYSTALS OR FLAKES WITH CHARACTERISTIC ODOUR.

Physical dangers

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

Chemical dangers

Reacts with oxidants.

Formula: C<sub>12</sub>H<sub>10</sub> / C<sub>6</sub>H<sub>5</sub>C<sub>6</sub>H<sub>5</sub> Molecular mass: 154.2 Boiling point: 256°C Melting point: 70°C

Relative density (water = 1): 1.04 Solubility in water, g/100ml at 20°C: 0.0004

Vapour pressure, Pa at 25°C: 1.19 Relative vapour density (air = 1): 5.3

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 113°C c.c.

Auto-ignition temperature: 540°C

Explosive limits, vol% in air: 0.6 (at 111°C) - 5.8 (at 166°C) Octanol/water partition coefficient as log Pow: 3.16/4.09

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver and nervous system. This may result in impaired functions.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.2 ppm as TWA.

MAK: skin absorption (H); carcinogen category: 3

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in plants. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xi, N; R: 36/37/38-50/53; S: (2)-23-60-61

# 1,2,4,5-TETRACHLOROBENZENE

Benzene tetrachloride s-Tetrachlorobenzene

CAS #: 95-94-3	
EC Number: 202-466-2	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with oxidizing agents.	NO open flames.	Use powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: P2 filter respirator for harmful particles. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Separated from strong oxidants.	
PACKAGING	





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ICSC: 0676 (November 2003)

# 1,2,4,5-TETRACHLOROBENZENE ICSC: 0676

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance COLOURLESS CRYSTALS.

Physical dangers

#### Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride. Reacts with strong oxidants.

Formula: C<sub>6</sub>H<sub>2</sub>Cl<sub>4</sub>
Molecular mass: 215.9
Boiling point: 243-246°C
Melting point: 139-140°C
Density: 1.83 g/cm³

Solubility in water, mg/l at 25°C: 2.16 Vapour pressure, Pa at 25°C: 0.7 Relative vapour density (air = 1): 7.4

Flash point: 155°C c.c.

Octanol/water partition coefficient as log Pow: 4.9

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

# Effects of short-term exposure

#### Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying or when dispersed, especially if powdered.

# Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in liver impairment.

# **OCCUPATIONAL EXPOSURE LIMITS**

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

# **NOTES**

Health effects of exposure to the substance have not been investigated adequately.

# **ADDITIONAL INFORMATION**

**EC Classification** 

# 1,2,4-TRICHLOROBENZENE

1,2,4-Trichlorobenzol unsym-Trichlorobenzene

CAS #: 120-82-1 UN #: 2321

EC Number: 204-428-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
l .	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open flames	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat. Burning sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin. Redness. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Sore throat. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. If solid: sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III
STORAGE	
Separated from strong oxidants, acids and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	





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ICSC: 1049 (November 2003)

1,2,4-TRICHLOROBENZENE ICSC: 1049

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID OR WHITE CRYSTALS WITH

CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts violently with oxidants.

Formula: C<sub>6</sub>H<sub>3</sub>Cl<sub>3</sub> Molecular mass: 181.5 Boiling point: 213°C Melting point: 17°C

Relative density (water = 1): 1.5 Solubility in water, mg/l: 34.6 Vapour pressure, Pa at 25°C: 40 Relative vapour density (air = 1): 6.26

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.002

Flash point: 105°C c.c.

Auto-ignition temperature: 571°C

Explosive limits, vol% in air: 2.5-6.6 (at 150°C) Octanol/water partition coefficient as log Pow: 3.98

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as STEL.

MAK: skin absorption (H); carcinogen category: 3.

EU-OEL: 15.1 mg/m<sup>3</sup>, 2 ppm as TWA; 37.8 mg/m<sup>3</sup>, 5 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### **NOTES**

The occupational exposure limit value should not be exceeded during any part of the working exposure. See ICSCs 0344 and 1222.

# ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn, N; R: 22-38-50/53; S: (2)-23-37/39-60-61

# 1,2-DICHLOROBENZENE

ortho-Dichlorobenzene

CAS #: 95-50-1 UN #: 1591

EC Number: 202-425-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Combustible. Above 66°C explosive	NO open flames. Above 66°C use a	Use water spray, powder, foam,
EXPLOSION	vapour/air mixtures may be formed.	closed system and ventilation.	carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Sore throat. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from aluminium, oxidants and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	





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ICSC: 1066 (November 2003)

# 1,2-DICHLOROBENZENE ICSC: 1066

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

ODOUR

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic and corrosive gases including hydrogen chloride. Reacts with aluminium and oxidants. Attacks plastics and rubber.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>
Molecular mass: 147.0
Boiling point: 180-183°C
Melting point: -17°C

Relative density (water = 1): 1.3 Solubility in water: very poor Vapour pressure, kPa at 20°C: 0.16 Relative vapour density (air = 1): 5.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.006

Flash point: 66°C c.c.

Auto-ignition temperature: 648°C Explosive limits, vol% in air: 2.2-9.2

Octanol/water partition coefficient as log Pow: 3.38

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system and liver. Exposure could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and blood.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 25 ppm as TWA; 50 ppm as STEL; A4 (not classifiable as a human carcinogen).

MAK: 61 mg/m<sup>3</sup>, 10 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.

EU-OEL: 122 mg/m<sup>3</sup>, 20 ppm as TWA; 306 mg/m<sup>3</sup>, 50 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn, N; R: 22-36/37/38-50/53; S: (2)-23-60-61

#### 1,2-DIPHENYLHYDRAZINE ICSC: 0263 (April 2005)

Hydrazobenzene Diphenylhydrazine

N,N'-Bianiline

CAS #: 122-66-7

EC Number: 204-563-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open flames	Use water spray, powder, foam, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	
Separated from food and feedstuffs. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	





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1,2-DIPHENYLHYDRAZINE ICSC: 0263

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE-TO-YELLOW CRYSTALS.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic fumes including nitrogen oxides. Reacts with mineral acids. This produces benzidine (see ICSC 0224).

Formula: C<sub>12</sub>H<sub>12</sub>N<sub>2</sub> / C<sub>6</sub>H<sub>5</sub>NHNHC<sub>6</sub>H<sub>5</sub>

Molecular mass: 184.3 Decomposes at 125-131°C Density: 1.16 g/cm³

Solubility in water, g/100ml at 20°C: <0.1 (poor) Octanol/water partition coefficient as log Pow: 2.94

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

The substance can be absorbed into the body by inhalation and by inqestion.

Effects of short-term exposure

May cause mechanical irritation.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

This substance is probably carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: carcinogen category: 2

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### NOTES

Do NOT take working clothes home.

Depending on the degree of exposure, periodic medical examination is suggested.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, N; R: 45-22-50/53; S: 53-45-60-61; Note: E

# 1,3-DICHLOROBENZENE

m-Dichlorobenzene

m-Phenylene dichloride

CAS #: 541-73-1 UN #: 2810

EC Number: 208-792-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	NO open flames. Above 63°C use a	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Nausea. Sore throat. Vomiting. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Provision to contain effluent from fire extinguishing. Separated from strong oxidants, aluminium and food and feedstuffs. Well closed. Store in an area without drain or sewer access.	
PACKAGING	
Do not transport with food and feedstuffs.	
DOMESTIC BOX DECISION	1.00



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ICSC: 1095 (April 2000)

1,3-DICHLOROBENZENE ICSC: 1095

# PHYSICAL & CHEMICAL INFORMATION

# Physical State; Appearance

COLOURLESS LIQUID.

# **Physical dangers**

The vapour is heavier than air.

#### Chemical dangers

Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with aluminium.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> Molecular mass: 147.00 Boiling point: 173°C Melting point: -24.8°C

Relative density (water = 1): 1.288

Solubility in water: none

Vapour pressure, kPa at 25°C: 0.286 Relative vapour density (air = 1): 5.1

Flash point: 63°C

Octanol/water partition coefficient as log Pow: 3.53

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The vapour is irritating to the eyes, skin and respiratory tract. See

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the kidneys and liver. See Notes.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: 12 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); pregnancy risk group: C

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

# **NOTES**

Data on the toxicity of m-dichlorobenzene are limited.

See ICSCs 0037 and 1066.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn, N; R: 22-51/53; S: (2)-61

1,4-DICHLOROBENZENE ICSC: 0037 (May 2018)

p-Dichlorobenzene PDCB

CAS #: 106-46-7 UN #: 3077

EC Number: 203-400-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 66°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	closed system, ventilation and	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Drowsiness. Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  WARNING  Harmful if swallowed  Causes serious eye irritation Suspected of causing cancer Very toxic to aquatic life with long lasting effects  Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III	
STORAGE		
Separated from strong oxidants and food and feedstuffs. Provision to contain effluent from fire extinguishing. Keep in a well-ventilated room. Store in an area without drain or sewer access.		
PACKAGING		
Do not transport with food and feedstuffs. Marine pollutant.		





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# 1,4-DICHLOROBENZENE ICSC: 0037

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

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

Chemical dangers

On combustion, forms toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Upon heating, toxic fumes are formed. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>
Molecular mass: 147
Boiling point: 174°C
Melting point: 53°C
Density: 1.2 g/cm³

Solubility in water, mg/l at 20°C: 49 (practically insoluble)

Vapour pressure, Pa at 20°C: 170 Relative vapour density (air = 1): 5.08

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01

Flash point: 66°C c.c.

Explosive limits, vol% in air: 1.7-5.9

Octanol/water partition coefficient as log Pow: 3.37

Auto-ignition temperature: 640°C Viscosity: 0.73 mPa\*s at 70°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by inqestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, respiratory tract and skin. The substance may cause effects on the blood. This may result in haemolytic anaemia. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver, central nervous system, blood and lungs. This may result in liver function impairment, neuropathy and anaemia. This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 12 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 12 mg/m<sup>3</sup>, 2 ppm as TWA; 60 mg/m<sup>3</sup>, 10 ppm as STEL; (skin)

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

# ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn, N; R: 36-40-50/53; S: (2)-36/37-46-60-61

# 2,3,4,6-TETRACHLOROPHENOL

2,4,5,6-Tetrachlorophenol Phenol, 2,3,4,6-tetrachloro-

CAS #: 58-90-2 UN #: 2020

EC Number: 200-402-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
l .	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INCLOPED Hames	Use water spray, alcohol-resistant foam, dry powder, carbon dioxide.

PREVENT DISPERSION OF DUST!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Shortness of breath. Convulsions.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .	
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Diarrhoea. Headache. Dizziness. Vomiting. Weakness. Convulsions. Muscle spasms. Fever. Sweating. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: chemical protection suit and particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers.	According to UN GHS Criteria	
STORAGE	Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: III	
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.		
PACKAGING		
Do not transport with food and feedstuffs.		



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ICSC: 1089 (October 2005)

#### 2,3,4,6-TETRACHLOROPHENOL ICSC: 1089

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

BROWN SOLID IN VARIOUS FORMS WITH CHARACTERISTIC

ODOUR.

Physical dangers

Chemical dangers

Decomposes on heating. This produces corrosive fumes including hydrogen chloride.

Formula: C<sub>6</sub>H<sub>2</sub>Cl<sub>4</sub>O Molecular mass: 231.9 Melting point: 70°C Density: 1.8 g/cm<sup>3</sup>

Solubility in water, g/100ml at 20°C: 0.1 (very poor)

Flash point: 100°C

Octanol/water partition coefficient as log Pow: 4.45

# **EXPOSURE & HEALTH EFFECTS**

# Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. See Notes.

# Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

# Effects of long-term or repeated exposure

The substance may have effects on the liver. The substance may have effects on the skin. This may result in chloracne. See Notes.

# **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### **NOTES**

2,3,4,6-Tetrachlorophenol is a polychlorophenol which, as a group, has been classified by IARC (1999) as possibly carcinogenic to humans, but the data on this specific substance are inconclusive.

No data are available on this isomer but a mixture of tetrachlorophenols may cause irritation of the skin, eyes and respiratory tract. These substances may cause acute metabolic effects resulting in damage in several organs notably in central nervous system. Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.

Depending on the degree of exposure, periodic medical examination is suggested.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: T, N; R: 25-36/38-50/53; S: (1/2)-26-28-37-45-60-61

## 2,4,5-TRICHLOROPHENOL

2,4,5-TCP

1-Hydroxy-2,4,5-trichlorobenzene

CAS #: 95-95-4 UN #: 2020

EC Number: 202-467-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIKE &	I CONDITIONS (41/25 OTT ITTITATION OF TOYIC	NO open flames. NO contact with strong oxidizing agents.	Use foam, powder, carbon dioxide.

	PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.	
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. To remove substance use polyethylene glycol 300 or vegetable oil. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Diarrhoea. Dizziness. Headache. Vomiting. Fatigue. Sweating.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING Harmful if swallowed
Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	Causes skin irritation Causes serious eye irritation May cause respiratory irritation Very toxic to aquatic life
PACKAGING	Transportation
Do not transport with food and feedstuffs. Marine pollutant.	UN Classification UN Hazard Class: 6.1; UN Pack Group: III
(PS) (ds)	- X



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ICSC: 0879 (April 2014)

## 2,4,5-TRICHLOROPHENOL ICSC: 0879

## **PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance

COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC

ODOUR.

**Physical dangers** 

Chemical dangers

May explode on heating to decomposition. Decomposes on heating and on contact with strong oxidants. This produces toxic and irritating fumes (chlorine, hydrochloric acid). The substance is a weak acid. Reacts in an alkaline medium at high temperatures producing highly toxic chlorinated dioxins.

Formula:  $C_6H_3Cl_3O / C_6H_2Cl_3(OH)$ 

Molecular mass: 197.5 Boiling point: 253°C Melting point: 67°C Density: 1.68 g/cm³

Relative vapour density (air = 1): 6.8 Solubility in water, g/l at 20°C: 1.2 (poor)

Flash point: 133°C c.c.

Vapour pressure, Pa at 25°C: 2.9

Octanol/water partition coefficient as log Pow: 3.7

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by ingestion.

#### Effects of short-term exposure

The substance is severely irritating to the eyes, skin and respiratory tract.

## Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached when dispersed.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. See Notes.

## **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

## **NOTES**

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.

Depending on the degree of exposure, periodic medical examination is suggested.

If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).

Carrier solvents used in commercial formulations may change physical and toxicological properties.

See ICSCs 588, 589, 590 and 1122.

## **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: Xn, N; R: 22-36/38-50/53; S: (2)-26-28-60-61

## 2.4.6-TRICHLOROPHENOL

CAS #: 88-06-2 UN #: 2020

EC Number: 201-795-9

2,4,6-TRICHLOROPHENOL	ICSC: 1122 (November 2019)
2,4,6-TCP	

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.		Use foam, dry powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. To remove substance use polyethylene glycol 300 or vegetable oil. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Vomiting. Burning sensation. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: filter respirator for organic gases and According to UN GHS Criteria particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. **WARNING STORAGE** Harmful if swallowed Causes skin irritation Provision to contain effluent from fire extinguishing. Separated Causes serious eye irritation from strong oxidants and food and feedstuffs. Well closed. Store in May cause respiratory irritation an area without drain or sewer access. Suspected of causing cancer Very toxic to aquatic life **PACKAGING Transportation** Do not transport with food and feedstuffs. UN Classification UN Hazard Class: 6.1; UN Pack Group: III Marine pollutant.





Organization



2,4,6-TRICHLOROPHENOL ICSC: 1122

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC

ODOUR.

Physical dangers

Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride and chlorine. Reacts with strong oxidants.

Formula: C<sub>6</sub>H<sub>3</sub>Cl<sub>3</sub>O / C<sub>6</sub>H<sub>2</sub>Cl<sub>3</sub>OH

Molecular mass: 197.5 Boiling point: 246°C Melting point: 69°C Density (at 25°C): 1.7 g/cm³

Solubility in water, g/l at 20°C: 0.8 (very poor)

Vapour pressure, Pa at 76.5°C: 133

Flash point: 99°C c.c.

Octanol/water partition coefficient as log Pow: 3.7

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body through the skin and by ingestion.

## Effects of short-term exposure

The substance is severely irritating to the eyes, skin and respiratory tract.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached when dispersed.

## Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis including chloracne. The substance may have effects on the liver. This may result in impaired functions. This substance is possibly carcinogenic to humans. Tumours have been detected in experimental animals but may not be relevant to humans.

## **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

## **NOTES**

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans. See ICSCs 0588, 0589, 0590 and 879.

## **ADDITIONAL INFORMATION**

## EC Classification

H302; H315; H319; H351; H400; H410

2,4-DICHLOROPHENOL ICSC: 0438 (May 2010)

2,4-DCP 2,4-Dichlorohydroxybenzene 1-Hydroxy-2,4-dichlorobenzene

CAS #: 120-83-2 UN #: 2020

EC Number: 204-429-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	HAVIC HIMES FOR ASSEST IN A HIRE FINERY	rejectrostatic charnes te n. nv	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Burning sensation behind the breastbone. Shortness of breath. Laboured breathing. Further see Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. See Notes. To remove substance use polyethylene glycol 400 or vegetable oil. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Abdominal pain. Tremor. Convulsions. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	<b>DANGER</b> Harmful if swallowed
Fireproof. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Ventilation along the floor.	Toxic in contact with skin Causes severe skin burns and eye damage Causes damage to central nervous system May cause damage to the respiratory system if inhaled Toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: III
Marks 1	20 N







#### 2,4-DICHLOROPHENOL ICSC: 0438

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR.

## Physical dangers

Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

## Chemical dangers

Decomposes on heating. This produces toxic fumes including chlorine and hydrogen chloride. Decomposes on burning. This produces toxic fumes including phosgene and dioxins. Reacts violently with acids and strong oxidants.

Formula: C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>O Molecular mass: 163.0 Boiling point: 210.0°C Melting point: 45.0°C Density: 1.4 g/cm³

Solubility in water, g/100ml at 20°C: 0.45 (poor)

Vapour pressure, Pa at 20°C: 10 Relative vapour density (air = 1): 5.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 113°C o.c.

Auto-ignition temperature: 500°C

Octanol/water partition coefficient as log Pow: 3.17

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

#### Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. The hot liquid may cause severe skin burns. Exposure to the molten substance may result in extensive skin absorption and rapid death. Inhalation of the vapour may cause lung oedema. See Notes. Medical observation is indicated. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C; when in molten form, however, evaporation will be much faster.

Effects of long-term or repeated exposure

#### OCCUPATIONAL EXPOSURE LIMITS

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

## **NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Isolate contaminated clothing by sealing in a bag or other container.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, N; R: 22-24-34-51/53; S: (1/2)-26-36/37/39-45-61

2,4-XYLENOL ICSC: 0458 (July 2003)

2,4-Dimethylphenol

m-Xylenol

1-Hydroxy-2.4-dimethylbenzene

CAS #: 105-67-9 UN #: 2261

EC Number: 203-321-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.		Use water spray, powder, alcohol- resistant foam, carbon dioxide.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Sore throat. Shortness of breath. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. Pain. Skin burns.	Protective clothing. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Severe burns.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Nausea. Vomiting. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. If liquid: collect leaking liquid in covered plastic containers.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from food and feedstuffs, acid anhydrides, acid chlorides, bases and oxidants.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



Labour Organization





2,4-XYLENOL ICSC: 0458

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

YELLOW-TO-BROWN LIQUID OR COLOURLESS CRYSTALS.

**Physical dangers** 

10/26/21, 12:31 PM

Chemical dangers

Decomposes on burning. This produces toxic gases and irritating fumes. Reacts with acid anhydrides, acid chlorides, bases and oxidants.

Formula:  $C_8H_{10}O / (CH_3)_2C_6H_3OH$ 

Molecular mass: 122.17 Boiling point: 211.5°C Melting point: 25.4-26°C Density: 0.97 g/cm³

Solubility in water, g/100ml at 25°C: 0.79

Vapour pressure, Pa at 20°C: 8

Flash point: >112°C c.c. Auto-ignition temperature: 599°C

Auto-ignition temperature: 599°C Explosive limits, vol% in air: 1.1-6.4

Octanol/water partition coefficient as log Pow: 2.3

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is corrosive to the skin, respiratory tract and eyes. Corrosive on ingestion. Inhalation of the aerosol may cause lung oedema. See Notes.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction and vapour): 1 ppm as TWA; (DSEN); A3 (confirmed animal carcinogen with unknown relevance to humans)

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

#### **NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, N; R: 24/25-34-51/53; S: (1/2)-26-36/37/39-45-61; Note: C

2,4-DINITROPHENOL ICSC: 0464 (June 2015)

Phenol, 2,4-dinitro

1-Hydroxy-2,4-dinitrobenzene

CAS #: 51-28-5

UN #: 1320 (see Notes) EC Number: 200-087-7

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion.	or shock. Use non-sparking handtools. Prevent deposition of dust.	Use water in large amounts. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

	PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest.	
Skin	MAY BE ABSORBED! Redness. Roughness. Yellow staining of the skin. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.	
Eyes	Yellow vision. Redness. Conjunctivitis.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Nausea. Sweating. Severe thirst. Fever. Increased heart rate. Vomiting. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer immediately for medical attention. See Notes.	

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Evacuate danger area! Consult an expert! Personal protection: According to UN GHS Criteria complete protective clothing including self-contained breathing apparatus. Do not allow to dry out. Do NOT let this chemical enter the environment. Sweep spilled substance into containers. Carefully collect remainder. Store and dispose of according to local regulations. **STORAGE** Fireproof. Store in an area without drain or sewer access. **DANGER** Provision to contain effluent from fire extinguishing. Cool. Fatal if swallowed Separated from combustible substances, reducing agents and Toxic in contact with skin food and feedstuffs. May cause damage to organs through prolonged or repeated exposure **PACKAGING** Very toxic to aquatic life Unbreakable packaging. **Transportation** Put breakable packaging into closed unbreakable container. **UN Classification** Do not transport with food and feedstuffs. UN Hazard Class: 4.1; UN Subsidiary Risks: 6.1; UN Pack Group: I Marine pollutant.







2,4-DINITROPHENOL ICSC: 0464

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

CRYSTALS WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

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

Chemical dangers

May decompose explosively on shock, friction or concussion. May explode on heating. Mixtures with alkalis, ammonia and most metals are shock-sensitive. Decomposes on heating. This produces toxic gases including nitrogen oxides. See Notes.

Formula:  $C_6H_4N_2O_5 / C_6H_3(OH)(NO_2)_2$ 

Molecular mass: 184.11 Melting point: 112°C

Relative density (water = 1): 1.68 Solubility in water, g/l: 6 (poor) Relative vapour density (air = 1): 6.36

Octanol/water partition coefficient as log Pow: 1.67 (estimated)

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body through the skin and by ingestion.

#### Effects of short-term exposure

The substance may be irritating to the eyes and skin.

#### Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the metabolism. This may result in cataract, cardiovascular disorders and nervous system impairment.

## **OCCUPATIONAL EXPOSURE LIMITS**

## **ENVIRONMENT**

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Use all available methods for reducing body temperature.

Because of its explosive properties, the compound is used in the form of a water paste.

UN 0076 applies to the dry compound or wetted with less than 15% water (Hazard class 1, Subsidiary Risks 6.1). UN 1320 applies to compound wetted with no less than 15% water

CAS 25550-58-7 applies to unspecified isomers of dinitrophenol.

#### ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T, N; R: 23/24/25-33-50; S: (1/2)-28-37-45-61

2,4-DINITROTOLUENE ICSC: 0727 (April 2005)

1-Methyl-2,4-dinitrobenzene 2,4-DNT

CAS #: 121-14-2 UN #: 3454

EC Number: 204-450-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	dispersed particles form explosive	dust explosion-proof electrical equipment and lighting. Prevent	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.  Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II  Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.	SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-	including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according	Transportation UN Classification
oxidants and strong reducing agents. Well closed. Keep in a well-	STORAGE	UN Hazard Class: 6.1; UN Pack Group: II
	oxidants and strong reducing agents. Well closed. Keep in a well-	
PACKAGING	PACKAGING	
Do not transport with food and feedstuffs.	Do not transport with food and feedstuffs.	



Labour Organization



Organization



2,4-DINITROTOLUENE ICSC: 0727

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

#### **Physical dangers**

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

### Chemical dangers

May explode on heating. Decomposes on heating. This produces toxic and corrosive fumes including nitrogen oxides even in the absence of air. Reacts with reducing agents, strong bases and oxidants. This generates explosion hazard.

Formula:  $C_7H_6N_2O_4 / C_6H_3CH_3(NO_2)_2$ 

Molecular mass: 182.1
Decomposes at >250°C
Melting point: 71°C
Density: 1.52 g/cm³
Solubility in water: very poor
Vapour pressure, Pa at 25°C: 0.02
Relative vapour density (air = 1): 6.28

Flash point: 169°C c.c.

Octanol/water partition coefficient as log Pow: 1.98

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

#### Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. This substance is possibly carcinogenic to humans.

## **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home.

UN number for molten form: UN1600, TEC (R) 61GT1-II.

#### ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T, N; R: 45-23/24/25-48/22-62-68-51/53; S: 53-45-61; Note: E

2,6-DINITROTOLUENE ICSC: 0728 (April 2005)

1-Methyl-2,6-dinitrobenzene 2,6-DNT

CAS #: 606-20-2 UN #: 3454

EC Number: 210-106-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1 111/L C	dispersed particles form explosive	dust explosion-proof electrical equipment and lighting. Prevent	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: II
Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-ventilated room.	
PACKAGING	
Do not transport with food and feedstuffs.	





Organization



2,6-DINITROTOLUENE ICSC: 0728

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

YELLOW OR BROWN-TO-RED CRYSTALS WITH CHARACTERISTIC ODOUR.

## Physical dangers

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

#### Chemical dangers

May explode on heating. Decomposes on heating. This produces toxic and corrosive fumes including nitrogen oxides even in the absence of air Reacts with reducing agents, strong bases and oxidants. This generates explosion hazard.

Formula:  $C_7H_6N_2O_4 / C_6H_3CH_3(NO_2)_2$ 

Molecular mass: 182.1 Decomposes at 285°C Melting point: 66°C

Relative density (water = 1): 1.283 (liquid)

Solubility in water: very poor Vapour pressure, Pa at 20°C: 2.4 Relative vapour density (air = 1): 6.28

Flash point: 207°C c.c.

Octanol/water partition coefficient as log Pow: 2.05

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

#### Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

## OCCUPATIONAL EXPOSURE LIMITS

## **ENVIRONMENT**

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home.

UN number for molten form: UN1600.

See ICSC 0465.

## ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T; R: 45-23/24/25-48/22-62-68-52/53; S: 53-45-61; Note: E

2-Chloronaphthalene

beta-Chloronaphthalene bete-Naphthyl chloride

CAS #: 91-58-7 UN #: 3077

EC Number: 202-079-9

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, dry powder, carbon dioxide.

	PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.	
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).	
Ingestion	Sore throat. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Seek medical attention if you feel unwell.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  WARNING  May be harmful if swallowed  Toxic to aquatic life
STORAGE	Transportation UN Classification
Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.	UN Hazard Class: 9; UN Pack Group: III
PACKAGING	





Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission. © ILO and WHO 2021



ICSC: 1708 (March 2009)

## 2-Chloronaphthalene ICSC: 1708

## PHYSICAL & CHEMICAL INFORMATION

## Physical State; Appearance

WHITE CRYSTALLINE POWDER.

**Physical dangers** 

### Chemical dangers

Decomposes on heating. This produces toxic and corrosive gases including hydrogen chloride. Reacts with strong oxidants.

Formula: C<sub>10</sub>H<sub>7</sub>Cl Molecular mass: 162.6 Boiling point at 101kPa: 259°C Melting point: 59.5°C Density: 1.18 g/cm³

Solubility in water, g/100ml: (none) Vapour pressure, Pa at 25°C: 1 Relative vapour density (air = 1): 5.6

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 125°C

Octanol/water partition coefficient as log Pow: 4.2

## **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

## Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in impaired functions.

## **OCCUPATIONAL EXPOSURE LIMITS**

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

## ADDITIONAL INFORMATION

#### **EC Classification**

o-CHLOROPHENOL ICSC: 0849 (March 1999)

2-Chlorophenol 2-Chloro-1-hydroxybenzene 2-Hydroxychlorobenzene

CAS #: 95-57-8 UN #: 2021

EC Number: 202-433-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	\ 0 /	NO open flames. Above 64°C use a	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!					
	SYMPTOMS PREVENTION FIRST AID				
Inhalation	Cough. Shortness of breath. Sore throat. See Ingestion. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.		
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .		
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion	Abdominal pain. Drowsiness. Weakness. Convulsions.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .		

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from strong oxidants and food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	





Organization



o-CHLOROPHENOL ICSC: 0849

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### **Physical dangers**

The vapour is heavier than air.

#### Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes of hydrochloric acid and chlorine. Reacts with oxidants.

Formula: C<sub>6</sub>H<sub>5</sub>ClO / C<sub>6</sub>H<sub>4</sub>ClOH

Molecular mass: 128.6 Boiling point: 175°C Melting point: 9.3-9.8°C Relative density (water = 1): 1.3

Solubility in water, g/100ml at 20°C: 2.85 Vapour pressure, Pa at 20°C: 230 Relative vapour density (air = 1): 4.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08

Flash point: 64°C c.c.

Octanol/water partition coefficient as log Pow: 2.15

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is severely irritating to the eyes, skin and respiratory tract. Inhalation of the aerosol may cause lung oedema. See Notes. The substance may cause effects on the central nervous system.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

## **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

#### **NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

Rest and medical observation are therefore essential.

Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn, N; R: 20/21/22-51/53; S: (2)-28-61; Note: C

## 2-METHYLNAPHTHALENE beta-Methylnaphthalene CAS #: 91-57-6

EC Number: 202-078-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Marine pollutant.	







2-METHYLNAPHTHALENE ICSC: 1276

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

CRYSTALS.

**Physical dangers** 

Chemical dangers

Decomposes on heating. This produces acrid smoke and irritating

fumes.

Formula: C<sub>11</sub>H<sub>10</sub> Molecular mass: 142.2 Boiling point: 241°C Melting point: 35°C

Relative density (water = 1): 1.00 Solubility in water, g/100ml at 25°C: 0.003

Vapour pressure, Pa at °C: 9

Octanol/water partition coefficient as log Pow: 3.86

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

## Effects of long-term or repeated exposure

Repeated or prolonged inhalation may cause effects on the lungs.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen)

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

#### **NOTES**

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

#### ADDITIONAL INFORMATION

## **EC Classification**

o-CRESOL

2-Hydroxy-1-methylbenzene 2-Methylphenol

ortho-Hydroxytoluene

2-Cresol

CAS #: 95-48-7 UN #: 3455

EC Number: 202-423-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Use water spray, foam, powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: chemical protection suit and filter respirator According to UN GHS Criteria for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. **DANGER STORAGE** Toxic if swallowed or in contact with skin Causes severe skin burns and eye damage Separated from strong oxidants and food and feedstuffs. Store in Causes damage to central nervous system and blood an area without drain or sewer access. Provision to contain Causes damage to the nervous system and the blood through effluent from fire extinguishing. prolonged or repeated exposure Toxic to aquatic life **PACKAGING** Transportation **UN Classification** Do not transport with food and feedstuffs. UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II Marine pollutant.





Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
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ICSC: 0030 (November 2008)

10/26/21, 12:34 PM ICSC 0030 - o-CRESOL

o-CRESOL ICSC: 0030

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

**Physical dangers** 

No data.

Chemical dangers

Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C<sub>7</sub>H<sub>8</sub>O / CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>OH

Molecular mass: 108.1 Boiling point: 191°C Melting point: 31°C Density: 1.05 g/cm³

Solubility in water, g/100ml at 25°C: 2.5 (moderate)

Vapour pressure, Pa at 25°C: 33 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 81°C c.c.

Auto-ignition temperature: 555°C Explosive limits, vol% in air: 1.3-?

Octanol/water partition coefficient as log Pow: 1.95

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

#### Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 mg/m<sup>3</sup>, as TWA; (skin); A4 (not classifiable as a human carcinogen).

EU-OEL: 22 mg/m<sup>3</sup>, 5 ppm as TWA.

MAK: 4,5 mg/m<sup>3</sup>, 1 ppm; skin absorption (H); pregnancy risk group: C; peak limitation category: I(1)

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

## **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

2-NITROANILINE ICSC: 0306 (December 2001)

o-Nitroaniline

1-Amino-2-nitrobenzene

C.I. 37025

CAS #: 88-74-4 UN #: 1661

EC Number: 201-855-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
cause fire or explosion. Finely dispersed particles form explosive	combustible substances. Closed system, dust explosion-proof	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

	PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: II
Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs.	







2-NITROANILINE ICSC: 0306

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

ORANGE-YELLOW CRYSTALS.

#### **Physical dangers**

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

### Chemical dangers

On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: C<sub>6</sub>H<sub>6</sub>N<sub>2</sub>O<sub>2</sub>
Molecular mass: 138.1
Boiling point: 284°C
Melting point: 71°C
Density: 1.44 g/cm³

Solubility in water, g/100ml at 25°C: 0.126

Vapour pressure, Pa at 20°C: 4

Flash point: 168°C

Auto-ignition temperature: 521°C

Octanol/water partition coefficient as log Pow: 1.44

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

## Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated. See Notes.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

## **OCCUPATIONAL EXPOSURE LIMITS**

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0307 and 0308.

## ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

2-NITROPHENOL ICSC: 0523 (October 2005)

o-Nitrophenol

2-Hydroxynitrobenzene

o-Hydroxynitrobenzene

CAS #: 88-75-5 UN #: 1663

EC Number: 201-857-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.		Use dry powder, carbon dioxide, water spray, alcohol-resistant foam.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Drowsiness. Nausea. Blue lips, fingernails and skin. Confusion. Convulsions. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Store in an area without drain or sewer access. Separated from strong oxidants, strong bases, strong acids and food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: III
PACKAGING	
Do not transport with food and feedstuffs.	







2-NITROPHENOL ICSC: 0523

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

YELLOW CRYSTALS.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including nitrogen oxides. Reacts with strong acids, strong bases and strong oxidants.

Formula: C<sub>6</sub>H<sub>5</sub>NO<sub>3</sub>
Molecular mass: 139.1
Boiling point: 216°C
Melting point: 45-46°C
Density: 1.49 g/cm³

Solubility in water, g/100ml at 20°C: 0.21 (poor)

Vapour pressure, kPa at 25°C: 0.015

Flash point: 108°C c.c.

Auto-ignition temperature: 550°C

Octanol/water partition coefficient as log Pow: 1.79

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by ingestion.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes and skin. Ingestion could cause effects on the blood. This may result in the formation of methaemoglobin.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly.

Effects of long-term or repeated exposure

#### OCCUPATIONAL EXPOSURE LIMITS

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## **NOTES**

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

## **ADDITIONAL INFORMATION**

**EC Classification** 

#### 3,3'-DICHLOROBENZIDINE ICSC: 0481 (May 2010)

3,3'-Dichlorobiphenyl-4,4'-ylenediamine 4,4'-Diamino-3,3'-dichlorobiphenyl

CAS #: 91-94-1

EC Number: 202-109-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
ı	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open flames	Use fine water spray, dry powder, carbon dioxide.

See EFFE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Cough. Sore throat.	Avoid inhalation of dust. Use local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.	
Skin	Skin  MAY BE ABSORBED!  Protective gloves. Protective clothing.  Remove contaminated clothes. R and then wash skin with water an soap. Seek medical attention if you feel unwell.			
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).	
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER Suspected of causing genetic defects May cause cancer
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access.	May cause caricer May cause respiratory irritation May cause damage to liver through prolonged or repeated exposure if swallowed Toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	
	,







3,3'-DICHLOROBENZIDINE ICSC: 0481

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

GREY-TO-PURPLE CRYSTALS.

Physical dangers

No data.

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes

including nitrogen oxides and hydrogen chloride.

Formula:  $C_6H_3CINH_2C_6H_3CINH_2/C_{12}H_{10}CI_2N_2$ 

Molecular mass: 253.1 Boiling point: 368°C Melting point: 132-133°C Solubility in water: none Auto-ignition temperature: 350°C

Octanol/water partition coefficient as log Pow: 3.51

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the respiratory tract.

#### Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

## Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver. This substance is probably carcinogenic to humans.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 2

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

The substance is combustible but no flash point is available in literature.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T, N; R: 45-21-43-50/53; S: 53-45-60-61; Note: E

m-CRESOL ICSC: 0646 (November 2008)

3-Cresol

3-Methylphenol

3-Hydroxytoluene

1-Hydroxy-3-methylbenzene

CAS #: 108-39-4 UN #: 2076

EC Number: 203-577-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	\ \ \ \ /	NO open flames. Above 86°C use a	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  DANGER
STORAGE	Toxic if swallowed Harmful in contact with skin Fatal if inhaled
Separated from strong oxidants and food and feedstuffs.  Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	Causes severe skin burns and eye damage Causes damage to central nervous system and blood if blood Causes damage to the nervous system and the blood through prolonged or repeated exposure if the blood Toxic to aquatic life
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II
COUNTY IN	V







10/26/21, 12:36 PM ICSC 0646 - m-CRESOL

m-CRESOL ICSC: 0646

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC

ODOUR.

Physical dangers

Chemical dangers

Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C<sub>7</sub>H<sub>8</sub>O / CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>OH

Molecular mass: 108.1 Boiling point: 202°C Melting point: 11-12°C

Relative density (water = 1): 1.03

Solubility in water, g/100ml at 20°C: 2.4 (moderate)

Vapour pressure, Pa at 20°C: 13 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 86°C

Auto-ignition temperature: 575°C Explosive limits, vol% in air: 1.0-?

Octanol/water partition coefficient as log Pow: 1.96

Viscosity: 4.05 mm<sup>2</sup>/s at 50°C

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. Serious local effects by all routes of exposure.

#### Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 mg/m<sup>3</sup>, as TWA; (skin); A4 (not classifiable as a human carcinogen).

EU-OEL: 22 mg/m<sup>3</sup>, 5 ppm as TWA.

MAK: 4,5 mg/m<sup>3</sup>, 1 ppm; skin absorption (H); peak limitation category: I(1); pregnancy risk group: C

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

3-NITROANILINE ICSC: 0307 (December 2001)

m-Nitroaniline
1-Amino-3-nitrobenzene

C.I. 37030

CAS #: 99-09-2 UN #: 1661

EC Number: 202-729-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
cause fire or explosion. Finely dispersed particles form explosive	combustible substances. Closed system, dust explosion-proof	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: II
Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs. Dry.	
PACKAGING	
Do not transport with food and feedstuffs.	





Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
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International Labour Organization

3-NITROANILINE ICSC: 0307

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

YELLOW CRYSTALS.

#### **Physical dangers**

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

### Chemical dangers

On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: C<sub>6</sub>H<sub>6</sub>N<sub>2</sub>O<sub>2</sub>
Molecular mass: 138.1
Decomposes at 306°C
Melting point: 114°C
Density: 1.4 g/cm³

Solubility in water, g/100ml at 25°C: 0.089 Vapour pressure, Pa at 25°C: 0.005

Octanol/water partition coefficient as log Pow: 1.37

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

## Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. Medical observation is indicated. The effects may be delayed. See Notes.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

## **OCCUPATIONAL EXPOSURE LIMITS**

## **ENVIRONMENT**

The substance is harmful to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0306 and 0308.

## ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

DINITRO-o-CRESOL ICSC: 0462 (April 2004)

4,6-Dinitro-ortho-cresol 2-Methyl-4,6-dinitrophenol

DNOC

2,4-Dinitro-ortho-cresol

CAS #: 534-52-1 UN #: 1598

EC Number: 208-601-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with oxidizing agents.	dust explosion-proof electrical	Use water spray, foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Sweating. Fever. Nausea. Shortness of breath. Laboured breathing. Headache. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Yellow staining of the skin. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: II
Separated from strong oxidants and food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	



Labour Organization



Organization



DINITRO-o-CRESOL ICSC: 0462

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

ODOURLESS YELLOW CRYSTALS.

#### Physical dangers

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

### Chemical dangers

Decomposes on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants.

Formula:  $C_7H_6N_2O_5$  /  $CH_3C_6H_2OH(NO_2)_2$ 

Molecular mass: 198.1 Boiling point: 312°C Melting point: 87.5°C Density: 1.58 g/cm³

Solubility in water, g/100ml at 20°C: 0.694 Vapour pressure, Pa at 25°C: 0.016 Relative vapour density (air = 1): 6.8 Auto-ignition temperature: 340°C

Octanol/water partition coefficient as log Pow: 2.56

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

## Effects of short-term exposure

The substance is corrosive to the eyes. The substance is irritating to the skin. The substance may cause effects on the metabolic rate. Exposure at high levels could cause death.

#### Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction and vapour): 0.2 mg/m<sup>3</sup>, as TWA; (skin).

MAK: (vapour and aerosol): skin absorption (H)

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms.

#### **NOTES**

Do NOT take working clothes home.

Technical grade may cause skin sensitization.

## ADDITIONAL INFORMATION

## EC Classification

Symbol: T+, N; R: 26/27/28-38-41-43-44-50/53-68; S: (1/2)-36/37-45-60-61



# TCI AMERICA SAFETY DATA SHEET

Revision number: 2 Revision date: 10/06/2014

## 1. IDENTIFICATION

**Product name:** 4-Bromodiphenyl Ether

Product code: B0637

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Skin Corrosion/Irritation [Category 2]

Eye Damage/Irritation [Category 2A] Aquatic Hazard (Acute) [Category 1] Aquatic Hazard (Long-Term) [Category 1]

Signal word: Warning!

Hazard Statement(s): Causes serious eye irritation

Causes skin irritation Very toxic to aquatic life

Very toxic to aquatic life with long lasting effects

## Pictogram(s) or Symbol(s):





Precautionary Statement(s):

[Prevention] [Response] Wash hands and face thoroughly after handling. Wear protective gloves. Wear eye and face protection. If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical

advice or attention.

[Storage] None [Disposal] None

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: 4-Bromodiphenyl Ether

**Percent:** >98.0%(GC)

Page 2 of 5 4-Bromodiphenyl Ether **TCI AMERICA** 

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**CAS Number:** 101-55-3 Molecular Weight: 249.11 **Chemical Formula:** C<sub>12</sub>H<sub>9</sub>BrO

4-Bromophenyl Phenyl Ether Synonyms:

## 4. FIRST-AID MEASURES

Inhalation: Call emergency medical service. Move victim to fresh air. Give artificial respiration if victim is not breathing.

> Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to

protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. In

case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with Eye contact:

material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. If swallowed, seek medical advice immediately and show

the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Redness. Acute:

No data available Delayed:

Immediate medical attention: If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the

injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves.

#### 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub>, sand, earth, water spray or regular foam Consult with local fire authorities before

attempting large scale fire fighting operations.

Specific hazards arising from the chemical

**Hazardous combustion products:** These products include: Carbon oxides Halogenated compounds

Other specific hazards: Closed containers may explode from heat of a fire.

#### Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

## Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

## 6. ACCIDENTAL RELEASE MEASURES

Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch Personal precautions:

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor Personal protective equipment:

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise Emergency procedures: caution. Do not touch damaged containers or spilled material unless wearing appropriate protective

clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if

needed.

4-Bromodiphenyl Ether TCI AMERICA Page 3 of 5

# 6. ACCIDENTAL RELEASE MEASURES

#### Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

# **Environmental precautions:**

Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

# 7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Avoid contact with skin and eyes. Good general ventilation

should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke.

Keep away from sources of ignition.

Conditions for safe storage: Keep only in the original container in a cool well-ventilated place. Keep away from incompatibles.

Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid

prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

# 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

#### Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

# Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Wear protective gloves.

Eye protection: Splash goggles.

Skin and body protection: Lab coat.

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Coloriess - Very pale yellow

Odor:

Odor threshold:

No data available

No data available

Melting point/freezing point: 18°C (Freezing point) (64°F) pH: No data available 305°C (581°F) No data available Boiling point/range: Vapor pressure: **Decomposition temperature:** No data available No data available Vapor density: No data available Relative density: 1 43 **Dynamic Viscosity:** 

Kinematic Viscosity: No data available

Partition coefficient: No data available Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: 110°C (230°F) Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available

**Upper:** No data available

Solubility(ies):

# 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light. Incompatible materials: Strong oxidizing agents

Hazardous Decomposition Products: No data available

4-Bromodiphenyl Ether TCI AMERICA Page 4 of 5

# 11. TOXICOLOGICAL INFORMATION

**Acute Toxicity:** 

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity: No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.

**Potential Health Effects:** 

Skin and eye contact may result in irritation.

Target organ(s): No data available

# 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability:

Bioaccumulative potential (BCF):

Mobillity in soil:

Partition coefficient:

No data available
No data available
No data available

n-octanol/water (log Pow)

Soil adsorption (Koc):
Henry's Law:
No data available
No data available

constant (PaM³/mol)

# 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

# 14. TRANSPORT INFORMATION

**DOT (US)** Non-hazardous for transportation.

4-Bromodiphenyl Ether TCI AMERICA Page 5 of 5

# 14. TRANSPORT INFORMATION

IATA Non-hazardous for transportation.

**IMDG** Non-hazardous for transportation.

# 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

# **US Federal Regulations**

**CERCLA Hazardous substance and Reportable Quantity:** 

SARA 313: Not Listed SARA 302: Not Listed

# **State Regulations**

State Right-to-Know

MassachusettsNot ListedNew JerseyListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

#### Other Information

NFPA Rating: HMIS Classification:

Health:2Health:2Flammability:1Flammability:1Instability:0Physical:0

#### **International Inventories**

WHMIS hazard class: D2B: Materials causing other toxic effects. (Toxic)

**EC-No**: 202-952-4

# 16. OTHER INFORMATION

Revision date: 10/06/2014 Revision number: 2

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

#### 4-CHLORO-m-CRESOL ICSC: 0131 (June 1997)

p-Chloro-m-cresol 2-Chloro-5-hydroxytoluene

4-Chloro-3-methylphenol

CAS #: 59-50-7 UN #: 2669

EC Number: 200-431-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder.

	PREVENT DISPERS	ON OF DUST! AVOID ALL CON	TACT!
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Severe deep burns.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Dizziness. Shortness of breath. Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: II
Separated from food and feedstuffs. Dry.	
PACKAGING	



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4-CHLORO-m-CRESOL ICSC: 0131

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE OR SLIGHTLY PINK HYGROSCOPIC CRYSTALS OR CRYSTALLINE POWDER.

**Physical dangers** 

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and phosgene.

Formula: C<sub>7</sub>H<sub>7</sub>ClO / C<sub>6</sub>H<sub>3</sub>OHCH<sub>3</sub>Cl

Molecular mass: 142.58 Boiling point: 235°C Melting point: 66°C Density: 1.4 g/cm³

Solubility in water, g/100ml at 20°C: 0.38

Flash point: 118°C

Auto-ignition temperature: 590°C

Octanol/water partition coefficient as log Pow: 3.1

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

# Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

### Inhalation risk

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

# Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK sensitization of skin (SH)

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

### **NOTES**

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn, N; R: 21/22-41-43-50; S: (2)-26-36/37/39-61

4-CHLOROANILINE ICSC: 0026 (October 2001)

Chloroaminobenzene, p-Chloroaniline, p-

CAS #: 106-47-8 UN #: 2018

EC Number: 203-401-0

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open tiames	Use water spray, powder, foam, carbon dioxide.

PREV	ENT DISPERSION OF DUST! ST	RICT HYGIENE! IN ALL CASES	CONSULT A DOCTOR!
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Confusion. Convulsions. Dizziness. Headache. Nausea. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: P3 filter respirator for toxic particles and chemical protection suit. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: II
Separated from strong oxidants and food and feedstuffs.	
PACKAGING	
Do not transport with food and feedstuffs.	



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Labour Organization



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European Commission

# 4-CHLOROANILINE ICSC: 0026

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and nitrogen oxides. Reacts violently with oxidants.

Formula: C<sub>6</sub>H<sub>6</sub>CIN / CIC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>

Molecular mass: 127.6
Boiling point: 232°C
Melting point: 69-72.5°C
Relative density (water = 1): 1.4
Solubility in water, g/100ml at 20°C: 0.39
Vapour pressure, Pa at 20°C: 2
Relative vapour density (air = 1): 4.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 120-123°C o.c.

Auto-ignition temperature: 685°C

Octanol/water partition coefficient as log Pow: 1.8

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

### Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the red blood cells. This may result in lesions of blood cells and the formation of methaemoglobin. Medical observation is indicated. The effects may be delayed.

# Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

# Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the spleen. Tumours have been detected in experimental animals but may not be relevant to humans. See Notes.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); sensitization of skin (SH); carcinogen category: 2

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

#### ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T, N; R: 45-23/24/25-43-50/53; S: 53-45-60-61; Note: E



# Safety Data Sheet 26075X4

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

# **SECTION 1: Identification**

#### 1.1. Identification

Product form : Substance

Substance name : 4-Chlorodiphenyl ether

CAS No : 7005-72-3
Product code : 2607-5-X4
Formula : C12H9CIO

Synonyms : 1-Chloro-4-phenoxybenzene

Other means of identification : MFCD00055431

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Laboratory chemicals

Manufacture of substances
Scientific research and development

# 1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.

P.O. Box 309

Alachua, FL 32615 - United States of America

T (386) 462-0788 - F (386) 462-7097

info@synquestlabs.com - www.synquestlabs.com

#### 1.4. Emergency telephone number

Emergency number : (844) 523-4086 (3E Company - Account 10069)

# SECTION 2: Hazard(s) identification

# 2.1. Classification of the substance or mixture

#### Classification (GHS-US)

Skin Irrit. 2 H315 - Causes skin irritation
Eye Irrit. 2A H319 - Causes serious eye irritation
STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

# 2.2. Label elements

#### **GHS-US** labeling

Hazard pictograms (GHS-US)



GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) : H315 - Causes skin irritation

H319 - Causes serious eye irritation H335 - May cause respiratory irritation

Precautionary statements (GHS-US) : P261 - Avoid breathing fumes, mist, spray, vapors

P264 - Wash skin thoroughly after handling

P271 - Use only outdoors or in a well-ventilated area

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P302+P352 - If on skin: Wash with plenty of soap and water

P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing P312 - Call a POISON CENTER or doctor/physician if you feel unwell

P321 - Specific treatment (see supplemental first aid instructions on this label)

P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed

P405 - Store locked up

P501 - Dispose of contents/container to an approved waste disposal plant

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# Safety Data Sheet

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#### Other hazards

No additional information available

#### **Unknown acute toxicity (GHS US)** 2.4.

Not applicable

#### **SECTION 3: Composition/information on ingredients**

#### **Substance**

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
4-Chlorodiphenyl ether (Main constituent)	(CAS No) 7005-72-3	<= 100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

#### **Mixture**

Not applicable

# **SECTION 4: First aid measures**

# **Description of first aid measures**

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial First-aid measures after inhalation

respiration. Get medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if

present and easy to do. Continue rinsing. Get medical advice/attention.

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse First-aid measures after ingestion

mouth out with water. Get medical advice/attention.

#### Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section Symptoms/injuries

2.2) and/or in section 11.

# Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

# **SECTION 5: Firefighting measures**

# **Extinguishing media**

Suitable extinguishing media Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media

appropriate for surrounding fire.

# Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen chloride.

: Risk of explosion if heated under confinement. Use water spray or fog for cooling exposed Explosion hazard

containers.

# Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection during firefighting Wear gas tight chemically protective clothing in combination with self contained breathing

apparatus. For further information refer to section 8: "Exposure controls/personal protection".

# **SECTION 6: Accidental release measures**

#### Personal precautions, protective equipment and emergency procedures

: Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe gas, fumes, General measures

#### 6.1.1. For non-emergency personnel

**Emergency procedures** : Only qualified personnel equipped with suitable protective equipment may intervene.

# For emergency responders

: Do not attempt to take action without suitable protective equipment. For further information Protective equipment

refer to section 8: "Exposure controls/personal protection".

: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground **Emergency procedures** 

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according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

#### 6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

#### 6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so. Dike for recovery or absorb with appropriate material.

Methods for cleaning up : Take up large spills with pump or vacuum and finish with dry chemical absorbent. Use

explosion-proof equipment. Take up small spills with dry chemical absorbent. Sweep or shovel

spills into appropriate container for disposal. Ventilate area.

Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

#### 6.4. Reference to other sections

No additional information available

# **SECTION 7: Handling and storage**

# 7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good

ventilation of the work station. Do not breathe fumes, mist, spray, vapors. Wear personal

protective equipment. Avoid contact with skin and eyes.

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or

smoke when using this product. Always wash hands after handling the product.

#### 7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep container closed when not in use.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage area : Store in dry, cool, well-ventilated area

#### **SECTION 8: Exposure controls/personal protection**

# 8.1. Control parameters

No additional information available

# 8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers

should be available in the immediate vicinity of any potential exposure.

Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.

Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory

Protection.

Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

# **SECTION 9: Physical and chemical properties**

#### 9.1. Information on basic physical and chemical properties

Physical state : Liquid

Color : No data available
Odor : No data available
Odor threshold : No data available
pH : No data available

Melting point : -8 °C

Freezing point : No data available

Boiling point :  $161 - 162 \,^{\circ}\text{C}$  (@ 19 mm Hg)

Flash point :  $> 110 \, ^{\circ}\text{C}$ 

Relative evaporation rate (butyl acetate=1) : No data available Flammability (solid, gas) : No data available Explosion limits : No data available Explosive properties : No data available Oxidizing properties : No data available Vapor pressure : No data available

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# Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

: No data available Relative density Relative vapor density at 20 °C : No data available Specific gravity / density : 1.193 g/ml (@ 20 °C) Molecular mass 204.652 g/mol Solubility No data available Log Pow : No data available Auto-ignition temperature : No data available Decomposition temperature : No data available Viscosity : No data available Viscosity, kinematic : No data available Viscosity, dynamic : No data available

9.2. Other information

Refractive index : 1.587 (@ 20 °C)

# **SECTION 10: Stability and reactivity**

#### 10.1. Reactivity

No additional information available

#### 10.2. Chemical stability

The product is stable at normal handling and storage conditions.

# 10.3. Possibility of hazardous reactions

No additional information available

#### 10.4. Conditions to avoid

Keep away from heat, sparks and flame.

# 10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

# 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

# SECTION 11: Toxicological information

# 11.1. Information on toxicological effects

Acute toxicity : Not classified

Skin corrosion/irritation : Causes skin irritation.

Serious eye damage/irritation : Causes serious eye irritation.

Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : May cause respiratory irritation.

Specific target organ toxicity (repeated

exposure)

: Not classified

Aspiration hazard : Not classified

# **SECTION 12: Ecological information**

#### 12.1. Toxicity

No additional information available

# 12.2. Persistence and degradability

No additional information available

# 12.3. Bioaccumulative potential

No additional information available

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# Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

#### 12.4. Mobility in soi

No additional information available

#### 12.5. Other adverse effects

No additional information available

## **SECTION 13: Disposal considerations**

#### 13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

# **SECTION 14: Transport information**

#### **Department of Transportation (DOT)**

In accordance with DOT

Transport document description : UN3082 Environmentally hazardous substances, liquid, n.o.s., 9, III

UN-No.(DOT) : UN3082

Proper Shipping Name (DOT) : Environmentally hazardous substances, liquid, n.o.s.

Transport hazard class(es) (DOT) : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203 DOT Packaging Bulk (49 CFR 173.xxx) : 241

DOT Symbols

DOT Special Provisions (49 CFR 172.102)

. III - WIIIIOI Dangei

: G - Identifies PSN requiring a technical name

: 8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies.

146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination.

173 - An appropriate generic entry may be used for this material.

335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging.

IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).

T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)

TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling. TP29 - A portable tank having a minimum test pressure of 1.5 bar (150.0 kPa) may be used provided the calculated test pressure is 1.5 bar or less based on the MAWP of the hazardous materials, as defined in 178.275 of this subchapter, where the test pressure is 1.5 times the MAWP.

DOT Packaging Exceptions (49 CFR 173.xxx) : 155
DOT Quantity Limitations Passenger aircraft/rail : No limit

(49 CFR 173.27)

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# Safety Data Sheet

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DOT Quantity Limitations Cargo aircraft only (49 : No limit

CFR 175.75)

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a

passenger vessel.

Other information : No supplementary information available.

**TDG** 

No additional information available

Transport by sea

UN-No. (IMDG) : 3082

Proper Shipping Name (IMDG) : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

Class (IMDG) : 9 - Miscellaneous dangerous compounds
Packing group (IMDG) : III - substances presenting low danger

Air transport

UN-No. (IATA) : 3082

Proper Shipping Name (IATA) : Environmentally hazardous substance, liquid, n.o.s.

Class (IATA) : 9 - Miscellaneous Dangerous Goods

Packing group (IATA) : III - Minor Danger

# **SECTION 15: Regulatory information**

#### 15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

4-Chlorodiphenyl ether	CAS No 7005-72-3	100%
------------------------	------------------	------

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

# 15.2. International regulations

#### CANADA

No additional information available

#### **EU-Regulations**

No additional information available

#### **National regulations**

No additional information available

# 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

# **SECTION 16: Other information**

# Full text of H-phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

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NFPA health hazard : 2 - Intense or continued exposure could cause temporary

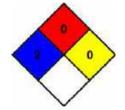
incapacitation or possible residual injury unless prompt

medical attention is given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT

react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

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 offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

11/28/2017 EN (English US) SDS ID: 26075X4 7/7 p-CRESOL

4-Hydroxy-1-methylbenzene 4-Methylphenol

para-Hydroxytoluene

4-Cresol

CAS #: 106-44-5 UN #: 3455

EC Number: 203-398-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		Use water spray, foam, powder, carbon dioxide.

	AVOID ALL CONTACT	! IN ALL CASES CONSULT A D	OCTOR!
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

substance and chemical protection suit. Sweep spilled substance into containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  DANGER Toxic if swallowed or in contact with skin
Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain	
an area without drain or sewer access. Provision to contain	Fatal if inhaled
	Causes severe skin burns and eye damage Causes damage to central nervous system and blood Causes damage to the nervous system and the blood through prolonged or repeated exposure
PACKAGING	Toxic to aquatic life  Transportation
Do not transport with food and feedstuffs. Marine pollutant.	UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II



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ICSC: 0031 (November 2008)

p-CRESOL ICSC: 0031

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

## **Physical dangers**

#### Chemical dangers

Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C<sub>7</sub>H<sub>8</sub>O / CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>OH

Molecular mass: 108.1 Boiling point: 202°C Melting point: 35°C Density: 1.02 g/cm³

Solubility in water, g/100ml at 25°C: 1.9 (moderate)

Vapour pressure, Pa at 25°C: 15 Relative vapour density (air = 1): 1.00

Flash point: 86°C c.c.

Auto-ignition temperature: 555°C Explosive limits, vol% in air: 1.0-?

Octanol/water partition coefficient as log Pow: 1.94

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

### Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 mg/m<sup>3</sup>, as TWA; (skin); A4 (not classifiable as a human carcinogen).

EU-OEL: 22 mg/m<sup>3</sup>, 5 ppm as TWA.

MAK: 4,5 mg/m<sup>3</sup>, 1 ppm; skin absorption (H); peak limitation category: I(1); pregnancy risk group: C

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

4-NITROANILINE ICSC: 0308 (December 2001)

p-Nitroaniline

1-Amino-4-nitrobenzene

C.I. 37035

CAS #: 100-01-6 UN #: 1661

EC Number: 202-810-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
cause fire or explosion. Finely	combustible substances. Closed system, dust explosion-proof electrical equipment and lighting.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

	PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: II
Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs. Dry.	
PACKAGING	
Do not transport with food and feedstuffs.	





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4-NITROANILINE ICSC: 0308

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

YELLOW CRYSTALS OR POWDER.

#### **Physical dangers**

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

#### Chemical dangers

May explode on heating. On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: C<sub>6</sub>H<sub>6</sub>N<sub>2</sub>O<sub>2</sub>
Molecular mass: 138.1
Boiling point: 332°C
Melting point: 148°C
Density: 1.4 g/cm³

Solubility in water, g/100ml at 18.5°C: 0.08 Vapour pressure, Pa at 20°C: 0.2 Relative vapour density (air = 1): 4.8

Flash point: 199°C

Octanol/water partition coefficient as log Pow: 2.66

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

#### Effects of short-term exposure

The substance is mildly irritating to the eyes. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated. See Notes.

#### Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

#### Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 3 mg/m<sup>3</sup>, as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued. MAK: skin absorption (H); carcinogen category: 3

# **ENVIRONMENT**

The substance is harmful to aquatic organisms.

# **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0306 and 0307.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

p-NITROPHENOL ICSC: 0066 (November 1998)

4-Nitrophenol

4-Hydroxynitrobenzene

CAS #: 100-02-7 UN #: 1663

EC Number: 202-811-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	toxic fumes (or gases) in a fire. Finely	dust explosion-proof electrical	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Cough. Burning sensation. Confusion. Convulsions. Dizziness. Headache. Nausea. Sore throat. Unconsciousness. Weakness.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety spectacles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting. See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from combustible substances, reducing agents and food and feedstuffs. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs.	
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p-NITROPHENOL ICSC: 0066

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-PALE-YELLOW CRYSTALS.

**Physical dangers** 

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

Chemical dangers

May explode on heating. Decomposes on heating. This produces toxic fumes including nitrogen oxides. Mixtures with potassium hydroxide are explosive.

Formula: C<sub>6</sub>H<sub>5</sub>NO<sub>3</sub>
Molecular mass: 139.1
Decomposes at 279°C
Melting point: 111-116°C
Density: 1.5 g/cm³

Solubility in water, g/100ml at 20°C: 1.24 Vapour pressure, Pa at 20°C: 0.0032

Flash point: 169°C

Auto-ignition temperature: 490°C

Octanol/water partition coefficient as log Pow: 1.91

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

# Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

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

# Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

# **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms.

#### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn; R: 20/21/22-33; S: (2)-28

ACENAPHTHENE ICSC: 1674 (October 2006)

1,2-Dihydroacenaphthylene 1,8-Ethylenenaphthalene

CAS #: 83-32-9 UN #: 3077

EC Number: 201-469-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Finely dispersed		Use water spray, dry powder, foam, carbon dioxide.

See Notes. PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WA PANING
Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	WARNING Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
	UN Hazard Class: 9; UN Pack Group: III



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# ACENAPHTHENE ICSC: 1674

# PHYSICAL & CHEMICAL INFORMATION

# Physical State; Appearance

WHITE-TO-BEIGE CRYSTALS.

#### **Physical dangers**

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

#### Chemical dangers

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

Formula: C<sub>12</sub>H<sub>10</sub> Molecular mass: 154.2 Boiling point: 279°C Melting point: 95°C Density: 1.2 g/cm³

Solubility in water, g/100ml at 25°C: 0.0004 Vapour pressure, Pa at 25°C: 0.3 Relative vapour density (air = 1): 5.3

Flash point: 135°C o.c.

Auto-ignition temperature: >450 °C

Octanol/water partition coefficient as log Pow: 3.9/4.5

# **EXPOSURE & HEALTH EFFECTS**

# Routes of exposure

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

Effects of short-term exposure

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

See Notes.

#### OCCUPATIONAL EXPOSURE LIMITS

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

# **NOTES**

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

# **ADDITIONAL INFORMATION**

# **EC Classification**

Page 1/4 Printing date 11/23/2015 Reviewed on 01/13/2009

#### 1 Identification

Product identifier

Product name: Acenaphthalene

Stock number: L02159

CAS Number: 208-96-8 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Details of the supplier of the safety da Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.walfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

#### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed. Hazards not otherwise classified No information known.

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS06

Signal word Danger Hazard statements

H301 Toxic if swallowed.

H301 Toxic if swallowed.

Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/nat P501 Dispose of contents/container in accordance with local/regional/national/international regulations. **WHMIS classification** 

D1B - Toxic material causing immediate and serious toxic effects



Classification system

HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1

Flammability = 1

Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

# 3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description: 08-96-8 Acenaphthalene Identification number(s): EC number: 205-917-1

#### 4 First-aid measures

# Description of first aid measures

After inhalation

Anter minatation Supply fresh air. If required, provide artificial respiration. Keep patient warm. Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

(Contd. of page 1)

# Product name: Acenaphthalene

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available. Indication of any immediate medical attention and special treatment needed No further relevant information available.

# 5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters

**Protective equipment:**Wear self-contained respirator.
Wear fully protective impervious suit.

#### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits. Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13. Prevention of secondary hazards: No special measures required.

Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

#### 7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

#### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required. Additional information: No data

Exposure controls

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves

The selection of suitable gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Eye protection: Safety glasses

Body protection: Protective work clothing.

## 9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance: Form: Powder Light brown Not determined Color: Odor: Odor threshold: Not determined

pH-value: Change in condition

Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start: 89-92 °C (192-198 °F) 265-275 °C (509-527 °F) Not determined

Flash point: 122 °C (252 °F) Flammability (solid, gaseous) Not determined. Ignition temperature:
Decomposition temperature: Not determined Not determined Auto igniting: Not determined.

Danger of explosion: Product does not present an explosion hazard.

Not applicable.

(Contd. on page 3)

Vapor density

(Contd. of page 2)

# Product name: Acenaphthalene

Explosion limits: Lower:

Not determined Not determined Upper: Vapor pressure: Density at 20 °C (68 °F): Relative density

Not applicable. 0.899 g/cm³ (7.502 lbs/gal) Not determined.

Not applicable.

Evaporation rate Solubility in / Miscibility with Not applicable. Water: Insoluble Partition coefficient (n-octanol/water): Not determined. Viscosity: dynamic:

Not applicable. Not applicable. No further relevant information available. kinematic: Other information

#### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions No dangerous reactions known

Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

## 11 Toxicological information

Information on toxicological effects Acute toxicity: Harmful if swallowed.

Acute toxicity: Harmful if swallowed.

LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Garcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Other information (about experimental toxicology):
Mutagenic effects have been observed on tests with human lymphocytes.
Bacterial mutagenicity test: Ames Salmonella Typhimurium: Negative
Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Autonomic Nervous System - other (direct) parasympathomimetic.
Lungs, Thorax, or Respiration - respiratory depression
Blood - hemorrhage.
Lungs, Thorax, or Respiration - structural or functional change in trachea or bronchi.

Blood - Hemorrhage.
Lungs, Thorax, or Respiration - structural or functional change in trachea or bronchi.
Lungs, Thorax, or Respiration - bronchiolar dilation
Nutritional and Gross Metabolic - weight loss or decreased weight gain.
Immunological Including Allergic - uncharacterized.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

#### 12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.

Additional academics information.

Additional ecological information:

General notes:

Do not allow material to be released to the environment without proper governmental permits.

Do not allow undiluted product or large quantities to reach ground water, water course or sewage system. Avoid transfer into the environment.

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

Other adverse effects No further relevant information available.

#### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal. Uncleaned packagings:

Recommendation: Disposal must be made according to official regulations.

## 14 Transport information

Not a hazardous material for transportation

**UN-Number** DOT, IMDG, IATA

None

UN proper shipping name DOT, IMDG, IATA

None

Transport hazard class(es)

DOT, ADR, IMDG, IATA

Class None

(Contd. on page 4)

# Product name: Acenaphthalene

		(Contd. of page 3)
Packing group DOT, IMDG, IATA	None	
Environmental hazards:	Not applicable.	
Special precautions for user	Not applicable.	
Transport in bulk according to Annex II of MARPOL73/78 and the IBC	Code Not applicable.	
Transport/Additional information:	Not dangerous according to the above specifications.	
DOT Marine Pollutant (DOT):	No	

#### 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms



Signal word Danger Hazard statements H301 Toxic if swallowed.

H301 Toxic if swallowed.

Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/nat

Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use:

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

#### 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user. Conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / Abbreviations and acronyms:

RID: Reighement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)
ICAO: International Civil Aviation Organization
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization"
ICAO: US Department of Transport association
IATA: International Air Transport Association
IATA: International Air Transport Association
IINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal concentration, 50 percent
LD50: Lethal concentration of Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)

USA

ACETOPHENONE ICSC: 1156 (April 2017)

1-Phenylethanone Phenyl methyl ketone Acetylbenzene

CAS #: 98-86-2

EC Number: 202-708-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSIO		1 '	Use alcohol-resistant foam, powder, carbon dioxide.

PREVENT GENERATION OF MISTS!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Headache. Dizziness. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Nausea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING Harmful if swallowed
Separated from strong oxidants and strong bases. Ventilation along the floor.	May be harmful in contact with skin Causes eye irritation
PACKAGING	Transportation UN Classification





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ACETOPHENONE ICSC: 1156

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID OR WHITE CRYSTALS WITH

CHARACTERISTIC ODOUR.

Physical dangers

No data.

Chemical dangers

Reacts with oxidizing materials and strong bases. This generates fire or

explosion hazard.

Formula: C<sub>8</sub>H<sub>8</sub>O / C<sub>6</sub>H<sub>5</sub>COCH<sub>3</sub>

Molecular mass: 120.1 Boiling point: 202°C Melting point: 20°C Density: 1.03 g/cm³

Solubility in water, g/100ml at 25°C: 0.6 (poor)

Vapour pressure, kPa at 15°C: 0.133 Relative vapour density (air = 1): 4.1

Relative density of the vapour/air-mixture at 20°C (air = 1): 1

Flash point: 77°C c.c.

Auto-ignition temperature: 535°C

Explosive limits, vol% in air: 1 - 5.2 (estimated) Octanol/water partition coefficient as log Pow: 1.58

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance is irritating to the eyes. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA

#### **ENVIRONMENT**

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

# **NOTES**

Use of alcoholic beverages enhances the harmful effect.

# **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: Xn; R: 22-36; S: (2)-26

10/26/21, 12:44 PM ICSC 0011 - ANILINE

ANILINE ICSC: 0011 (April 2014)

Benzeneamine Aminobenzene Phenylamine

CAS #: 62-53-3 UN #: 1547

EC Number: 200-539-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION		ovidizing agents. Above 76°C use a	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! STRICT HYGIENE! See Notes.			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Vomiting. Weakness. Laboured breathing. Convulsions.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Administration of oxygen may be needed. Refer immediately for medical attention. See Notes.
Skin	EASILY ABSORBED! Redness. Further see Inhalation.	Protective gloves. Protective clothing.	Administration of oxygen may be needed. Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention. See Notes.
Eyes	Redness. Pain. Corneal damage.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Administration of oxygen may be needed. Rinse mouth. Do NOT induce vomiting. Rest. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	Toxic if swallowed, in contact with skin or if inhaled Causes damage to red blood cells
Separated from strong oxidants, strong acids and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	Causes damage to the blood through prolonged or repeated exposure Causes serious eye irritation May cause an allergic skin reaction Very toxic to aquatic life
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: II



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10/26/21, 12:44 PM ICSC 0011 - ANILINE

ANILINE ICSC: 0011

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS OILY LIQUID WITH CHARACTERISTIC ODOUR. TURNS BROWN ON EXPOSURE TO AIR OR LIGHT.

Physical dangers

Chemical dangers

Decomposes above 190°C . This produces toxic and corrosive fumes of nitrogen oxides and ammonia and flammable vapours. Reacts with strong acids and strong oxidants. This generates fire and explosion hazard. Attacks copper and its alloys.

Formula: C<sub>6</sub>H<sub>7</sub>N / C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub> Molecular mass: 93.1 Boiling point: 184°C Melting point: -6°C

Relative density (water = 1): 1.02 Solubility in water, g/100ml at 20°C: 3.4 Vapour pressure, Pa at 20°C: 40 Relative vapour density (air = 1): 3.2

Flash point: 76°C c.c.

Auto-ignition temperature: 630°C Explosive limits, vol% in air: 1.2-11.0

Octanol/water partition coefficient as log Pow: 0.94

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin also as a vapour and by ingestion.

#### Effects of short-term exposure

The substance is severely irritating to the eyes. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. See Notes. Exposure could cause haemolysis. This may result in haemolytic anaemia. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air will be reached on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the blood. This may result in haemolytic anaemia.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: 7.7 mg/m<sup>3</sup>, 2 ppm; peak limitation category: II(2); skin absorption (H); sensitization of skin (SH); carcinogen category: 4; pregnancy risk group: C; BAT issued.

EU-OEL: 7,74 mg/m<sup>3</sup>, 2 ppm as TWA; 19,35 mg/m<sup>3</sup>, 5 ppm as STEL; (skin)

#### ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

#### **NOTES**

In case of blue lips, fingernails or skin treatment with 100% oxygen may be needed; the appropriate means with instructions must be available.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Specific treatment with antidotes like methylene blue can not be used for pregnant women and persons with a G6PD enzyme deficiency. These people should avoid all contact.

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

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: T, N; R: 23/24/25-40-41-43-48/23/24/25-68-50; S: (1/2)-26-27-36/37/39-45-46-63-61

**ANTHRACENE** ICSC: 0825 (March 1999) Anthracin Paranaphthalene CAS #: 120-12-7 EC Number: 204-371-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
particles form explosive mixtures in	dust explosion-proof electrical	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST!					
	SYMPTOMS PREVENTION FIRST AID				
Inhalation	Cough. Sore throat.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.		
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.		
Eyes	Redness. Pain.	Wear safety spectacles, face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention .		

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment. Personal protection: P2 filter respirator for harmful particles.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Separated from strong oxidants. Well closed.	ON Glassification
PACKAGING	





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ANTHRACENE ICSC: 0825

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

WHITE CRYSTALS OR FLAKES.

#### **Physical dangers**

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

#### Chemical dangers

Decomposes on heating. Decomposes under the influence of strong oxidants. This produces acrid, toxic fume. This generates fire and explosion hazard.

Formula: C<sub>14</sub>H<sub>10</sub> / (C<sub>6</sub>H<sub>4</sub>CH)<sub>2</sub> Molecular mass: 178.2 Boiling point: 342°C Melting point: 218°C Density: 1.25-1.28 g/cm³

Solubility in water, g/100ml at 20°C: 0.00013 Vapour pressure, Pa at 25°C: 0.08 Relative vapour density (air = 1): 6.15

Flash point: 121°C

Auto-ignition temperature: 538°C Explosive limits, vol% in air: 0.6-?

Octanol/water partition coefficient as log Pow: 4.5 (calculated)

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The substance is mildly irritating to the skin and respiratory tract.

# Inhalation risk

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

# Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light.

# **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

# **NOTES**

# **ADDITIONAL INFORMATION**

EC Classification

**ATRAZINE** ICSC: 0099 (November 2009)

2-Chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine 6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine

CAS #: 1912-24-9 EC Number: 217-617-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion if formulations contain flammable/explosive solvents.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

	PREVENT DISPERSION OF DUST!			
SYMPTOMS PREVENTION FIRST AID				
Inhalation		Use ventilation (not if powder).	Fresh air, rest.	
Skin		Protective gloves.	Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.	
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING
Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.	Causes serious eye irritation May cause damage to liver through prolonged or repeated exposure Toxic to aquatic life
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	



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10/26/21, 12:45 PM ICSC 0099 - ATRAZINE

ATRAZINE ICSC: 0099

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS CRYSTALS.

**Physical dangers** 

No data.

Chemical dangers

Decomposes on heating. This produces toxic fumes including hydrogen

chloride and nitrogen oxides.

Formula: C<sub>8</sub>H<sub>14</sub>ClN<sub>5</sub> Molecular mass: 215.7

Boiling point: No boiling point at normal pressure; decomposes on

heating See Notes.

Melting point: 173-177°C Relative density (water = 1): 1.2

Solubility in water, g/100ml at 25°C: (none) Vapour pressure, Pa at 20°C: (negligible) Octanol/water partition coefficient as log Pow: 2.34

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

The substance is severely irritating to the eyes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in tissue

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 mg/m<sup>3</sup>, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 1 mg/m<sup>3</sup>; peak limitation category: II(2); pregnancy risk group: C

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

# NOTES

Temperature of decomposition is unknown in the literature.

Carrier solvents used in commercial formulations may change physical and toxicological properties.

If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).

#### ADDITIONAL INFORMATION

**EC Classification** 

Symbol: Xn, N; R: 43-48/22-50/53; S: (2)-36/37-60-61

BENZ(a)ANTHRACENE ICSC: 0385 (November 2016)

1,2-Benzoanthracene Benzo(a)anthracene 2,3-Benzphenanthrene

Naphthanthracene

CAS #: 56-55-3 UN #: 3077

EC Number: 200-280-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Finely dispersed	explosion-proof electrical equipment	Use water spray, powder, carbon dioxide, foam. In case of fire in the surroundings, use appropriate extinguishing media.

See EFF	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS PREVENTION FIRST AID			
Inhalation		Use local exhaust or breathing protection.	Fresh air.	
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes		Wear safety goggles, face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).	
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Seek medical attention if you feel unwell.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Wet powder to prevent dusting and ignition. Do NOT let this chemical enter the environment. Vacuum spilled material with specialist equipment. Sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER
Separated from oxidizing materials. Store in an area without drain or sewer access. Well closed.	May cause cancer Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Marine pollutant.	UN Hazard Class: 9; UN Pack Group: III





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BENZ(a)ANTHRACENE ICSC: 0385

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW-BROWN FLUORESCENT FLAKES OR POWDER.

Physical dangers

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

Chemical dangers

Reacts with oxidizing substances.

Formula: C<sub>18</sub>H<sub>12</sub> Molecular mass: 228.3 Sublimation point: 435°C Melting point: 162°C

Relative density (water = 1): 1.274

Solubility in water: none

Vapour pressure, Pa at 20°C: 292

Octanol/water partition coefficient as log Pow: 5.61

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin, by ingestion and through the eyes.

#### Effects of short-term exposure

See Notes.

#### Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

#### Effects of long-term or repeated exposure

This substance is probably carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: A2 (suspected human carcinogen); BEI issued.

MAK skin absorption (H).

MAK: carcinogen category: 2; germ cell mutagen group: 3A

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

### **NOTES**

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

# ADDITIONAL INFORMATION

### **EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

BENZALDEHYDE ICSC: 0102 (April 2006)

Benzoic aldehyde Artificial almond oil Benzenecarbonal

CAS #: 100-52-7 UN #: 1990

EC Number: 202-860-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &		l '	Use water spray, foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest.

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: filter respirator for organic gases and vapours According to UN GHS Criteria adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **STORAGE** WARNING Flammable liquid and vapour Separated from incompatible materials. See Chemical Dangers. Harmful if swallowed or in contact with skin Well closed. Ventilation along the floor. Cool. Store in an area Toxic to aquatic life without drain or sewer access. Keep in the dark. Transportation **PACKAGING UN Classification** UN Hazard Class: 9; UN Pack Group: III





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BENZALDEHYDE ICSC: 0102

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC

ODOUR.

Physical dangers

Chemical dangers

The substance can form explosive peroxides under special conditions. Reacts violently with aluminium, bases, iron, oxidants and phenol. This generates fire and explosion hazard.

Formula: C<sub>7</sub>H<sub>6</sub>O / C<sub>6</sub>H<sub>5</sub>CHO Molecular mass: 106.1 Boiling point: 179°C Melting point: -26°C

Relative density (water = 1): 1.05 Solubility in water at 25°C: poor Vapour pressure, Pa at 26°C: 133 Relative vapour density (air = 1): 3.7

Flash point: 63°C c.c.

Auto-ignition temperature: 192°C Explosive limits, vol% in air: 1.4

Octanol/water partition coefficient as log Pow: 1.48

# **EXPOSURE & HEALTH EFFECTS**

# Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

## Effects of short-term exposure

The substance is irritating to the eyes.

# Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

The substance is harmful to aquatic organisms.

#### **NOTES**

Rinse contaminated clothing with plenty of water because of fire hazard.

Check for peroxides prior to distillation; eliminate if found.

# ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn; R: 22; S: (2)-24

BENZIDINE ICSC: 0224 (November 2009)

(1,1'-Biphenyl)-4,4'-diamine 4,4'-Diaminobiphenyl

p-Diaminodiphenyl

Biphenyl-4,4'-ylenediamine

CAS #: 92-87-5 UN #: 1885

EC Number: 202-199-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open tiames	Use water spray, foam, powder, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use closed system and ventilation.	Fresh air, rest.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

CLASSIFICATION & LABELLING
According to UN GHS Criteria
V V V
DANGER Harmful if swallowed Suspected of causing genetic defects May cause cancer
Very toxic to aquatic life with long lasting effects
Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II





Organization

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BENZIDINE ICSC: 0224

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS OR REDDISH CRYSTALLINE POWDER. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

**Physical dangers** 

No data.

Chemical dangers

Decomposes on heating and on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants, especially nitric acid.

Formula:  $C_{12}H_{12}N_2 / NH_2C_6H_4-C_6H_4NH_2$ 

Molecular mass: 184.2 Boiling point: 401°C Melting point: 120°C Density: 1.3 g/cm³

Solubility in water, g/100ml at 25°C: <0.05 (very poor)

Relative vapour density (air = 1): 6.4

Octanol/water partition coefficient as log Pow: 1.34

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

Effects of short-term exposure

#### Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

This substance is carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: A1 (confirmed human carcinogen); (skin).

MAK: carcinogen category: 1. MAK skin absorption (H)

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

# **NOTES**

Do NOT take working clothes home.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, N; R: 45-22-50/53; S: 53-45-60-61; Note: E

BENZO(a)PYRENE ICSC: 0104 (April 2014)

Benz(a)pyrene 3,4-Benzopyrene Benzo(d,e,f)chrysene

CAS #: 50-32-8 UN #: 3077

EC Number: 200-028-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

See Notes. AVOID ALL CONTACT! PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use closed system and ventilation.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	<b>DANGER</b> May cause an allergic skin reaction
Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access. Cool. Dry.	May cause cancer May cause genetic defects May damage fertility or the unborn child Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Marine pollutant.	UN Hazard Class: 9; UN Pack Group: III
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BENZO(a)PYRENE ICSC: 0104

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance PALE YELLOW CRYSTALS.

**Physical dangers** 

Chemical dangers

Reacts with strong oxidants. Decomposes on heating. This produces

toxic fumes.

Formula: C<sub>20</sub>H<sub>12</sub> Molecular mass: 252.3 Boiling point: 496°C Melting point: 178.1°C Density (at 20°C): 1.4 g/cm³

Solubility in water, g/100ml at 20°C: < 0.1 (poor)

Vapour pressure at 20°C: negligible

Octanol/water partition coefficient as log Pow: 6.04

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

Exposure mainly occurs via inhalation.

Effects of short-term exposure

See Notes.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. May cause toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: A2 (suspected human carcinogen); BEI issued.

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 2

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, plants and molluscs. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Do NOT take working clothes home.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

## ADDITIONAL INFORMATION

**EC Classification** 

Symbol: T, N; R: 45-46-60-61-43-50/53; S: 53-45-60-61

# BENZO(b)FLUORANTHENE

Benz(e)acephenanthrylene

2,3-Benzofluoroanthene Benzo(e)fluoranthene

3,4-Benzofluoranthene

CAS #: 205-99-2

EC Number: 205-911-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION		l .	In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.	
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	





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ICSC: 0720 (March 1999)

# BENZO(b)FLUORANTHENE ICSC: 0720

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance COLOURLESS CRYSTALS.

**Physical dangers** 

Chemical dangers

Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: C<sub>20</sub>H<sub>12</sub> Molecular mass: 252.3 Boiling point: 481°C Melting point: 168°C Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.12

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

#### Inhalation risk

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

# Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

# **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

#### **NOTES**

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

# BENZO(ghi)PERYLENE ICSC: 0739 (October 1999)

1,12-Benzoperylene

1,12-Benzperylene

CAS #: 191-24-2

EC Number: 205-883-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST!						
	SYMPTOMS PREVENTION FIRST AID					
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.			
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.			
Eyes		Wear safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.			
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	- Transportation
Well closed.	UN Classification
PACKAGING	
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BENZO(ghi)PERYLENE ICSC: 0739

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

PALE YELLOW-GREEN CRYSTALS.

Physical dangers

Chemical dangers

Upon heating, toxic fumes are formed. Decomposes on heating. This

produces toxic fumes.

Formula: C<sub>22</sub>H<sub>12</sub>
Molecular mass: 276.3
Boiling point: 550°C
Melting point: 278°C
Density: 1.3 g/cm³
Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.58

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

Inhalation risk

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

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

# **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

# **NOTES**

Benzo(ghi)perylene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

# **ADDITIONAL INFORMATION**

**EC Classification** 

# BENZO(k)FLUORANTHENE

Dibenzo(b,jk)fluorene 8,9-Benzofluoranthene

11,12-Benzofluoranthene

CAS #: 207-08-9

EC Number: 205-916-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!						
	SYMPTOMS PREVENTION FIRST AID					
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.			
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.			
Eyes		Wear safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.			
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Provision to contain effluent from fire extinguishing. Well closed.	ON Glassification
PACKAGING	





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ICSC: 0721 (March 1999)

BENZO(k)FLUORANTHENE ICSC: 0721

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

YELLOW CRYSTALS.

Physical dangers

Chemical dangers

Upon heating, toxic fumes are formed. Decomposes on heating. This

produces toxic fumes.

Formula: C<sub>20</sub>H<sub>12</sub> Molecular mass: 252.3 Boiling point: 480°C Melting point: 217°C Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.84

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

Inhalation risk

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

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

#### **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and fish.

# **NOTES**

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

#### ADDITIONAL INFORMATION

## **EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61

**BENZOIC ACID** ICSC: 0103 (October 1999)

Benzenecarboxylic acid Phenyl carboxylic acid

CAS #: 65-85-0

EC Number: 200-618-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	particles form explosive mixtures in		Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Burning sensation. Itching.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: protective clothing and face shield. Sweep spilled substance into covered plastic containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
PACKAGING	





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BENZOIC ACID ICSC: 0103

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

WHITE CRYSTALS OR POWDER.

#### **Physical dangers**

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

## Chemical dangers

The solution in water is a weak acid. Reacts with oxidants.

Formula: C<sub>7</sub>H<sub>6</sub>O<sub>2</sub> / C<sub>6</sub>H<sub>5</sub>COOH

Molecular mass: 122.1 Boiling point: 249°C Melting point: 122°C See Notes.

Density: 1.3 g/cm³
Solubility in water, g/100ml at 20°C: 0.29
Vapour pressure, Pa at 25°C: 0.1
Relative vapour density (air = 1): 4.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1

Flash point: 121°C c.c.

Auto-ignition temperature: 570°C

Octanol/water partition coefficient as log Pow: 1.87

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. Exposure could cause a non-allergic rash on contact.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

#### **OCCUPATIONAL EXPOSURE LIMITS**

MAK: (respirable fraction): 0.5 mg/m³, 0.1 ppm; peak limitation category: II(4); skin absorption (H); pregnancy risk group: C

# **ENVIRONMENT**

# **NOTES**

The substance begins to sublime at 100°C.

# **ADDITIONAL INFORMATION**

# **EC Classification**

BENZYL ALCOHOL ICSC: 0833 (April 2000)

Benzenemethanol Phenyl carbinol alpha-Hydroxytoluene Benzoyl alcohol

Phenyl methanol CAS #: 100-51-6

EC Number: 202-859-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, AFFF, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Headache.	Use ventilation.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Drowsiness. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification
Separated from strong oxidants.	
PACKAGING	





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BENZYL ALCOHOL ICSC: 0833

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Reacts with strong oxidants. Attacks some forms of plastic. On combustion, forms toxic gases including carbon monoxide.

Formula: C<sub>7</sub>H<sub>8</sub>O / C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>OH

Molecular mass: 108.1 Boiling point: 205°C Melting point: -15°C

Relative density (water = 1): 1.04 Solubility in water, g/100ml: 4 Vapour pressure, Pa at 20°C: 13.2 Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 93°C c.c.

Auto-ignition temperature: 436°C Explosive limits, vol% in air: 1.3-13

Octanol/water partition coefficient as log Pow: 1.1

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

#### Effects of short-term exposure

The aerosol is irritating to the eyes and skin. The substance may cause effects on the nervous system.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: 22 mg/m<sup>3</sup>, 5 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: C

# **ENVIRONMENT**

The substance is toxic to aquatic organisms.

# **NOTES**

# **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn; R: 20/22; S: (2)-26

# **Matrix Scientific**

# PO BOX 25067

COLUMBIA, SC 29224-5067

Telephone: 803-788-9494 Fax: 803-788-9419

# SAFETY DATA SHEET

Transportation Emergency: 3E Co. (5025) 800-451-8346

# 1. Product Identification

Name Bis(2-chloroethoxy)methane
Catalog Number 007514
CAS Registry Number [111-91-1]
Company Matrix Scientific

Physical Address 131 Pontiac Business Center Drive

Elgin, SC 29045

USA

**Telephone/Fax** (803)788-9494/(803)788-9419

# 2. Hazard Identification

**Hazardous Ingredients** Bis(2-chloroethoxy)methane

# GHS label elements, including precautionary statements

Pictogram



Signal word WARNING

Haza	rd s	taten	nent	S	)
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H302 Harmful if swallowed H315 Causes skin irritation

H317 May cause an allergic skin reaction

H319 Causes serious eye irritation H319 Causes serious eye irritation

H332 Harmful if inhaled

H335 May cause respiratory irritation

# Precautionary statement(s)

P233 Keep container tightly closed.

P261 Avoid breathing dust/fume/ gas/mist/vapours/spray.

P264 Wash ... thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove

contact lenses if present and easy to do - continue rinsing.

# 3. Composition, Information or Ingredients

Last Updated 8/15/2018

# 4. First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Immediately flush eyes with

clean, running water for at least 15 minutes while keeping eyes open. Cool

water may be used. Seek medical attention.

**Skin Contact:** After contact with skin, wash with generous quantities of running water.

> Gently and thoroughly wash affected area with running water and nonabrasive soap. Cool water may be used. Cover the affected area with emollient. Seek medical attention. Wash any contaminated clothing prior to

Inhalation: Remove the victim from the source of exposure to fresh, uncontaminated

air. If victim's breathing is difficult, administer oxygen. Seek medical

attention.

Ingestion: Do NOT induce vomiting. Give water to victim to drink. Seek medical

attention.

# 5. Fire-Fighting Measures

Extinguishing media:

Special fire fighting

procedures:

Carbon dioxide, dry chemical powder, alcohol or polymer foam.

Wear self-contained breathing apparatus and protective clothing to prevent

contact with skin and eyes.

Unusual fire and explosion hazards/ decomposition of

product: Emits toxic fumes under fire conditions.

# 6. Accidental Release Measures

Steps to be taken if material is spilled or otherwise released into the environment - Wear Appropriate respirator, impervious boots and heavy rubber (or otherwise impervious) gloves. Scoop up solid material or absorb liquid material and place into appropriate container. Ventilate area and wash affected spill area after pickup is complete. Wash skin immediately with plenty of water. Place solid or absorbed material into containers and close for disposal.

# 7. Handling and Storage

Avoid prolonged exposure.

Use caution when handling.

Exposure to any chemical should be limited.

Do not breath dust or vapor.

Have safety shower and eve wash available.

Do not get in eyes, on skin or on clothing.

Keep container tightly closed.

Store in a cool, dry, well-ventilated place.

2 Last Updated 8/15/2018 Ensure adequate ventilation during use.

Use only in a chemical fume hood.

To the best of our knowledge, the health hazards of this product have not been fully investigated.

This product is provided solely for the purpose of research and development.

# 8. Exposure Controls and Personal Protection

Wear Protective safety goggles.

Wear chemical-resistant gloves.

Wear protective clothing and chemical resistant boots.

Ensure ventilation during use.

After contact with skin, wash immediately.

# 9. Physical and Chemical Properties

Appearance: liquid

**Molecular Formula:** C5H10Cl2O2 **Molecular Weight:** 173.04

**Boiling point (C):** 112°/20mm(217°)

Melting point (C): -32° Density (g/ml): 1.23 Index of refraction: 1.45

# 10. Stability and Reactivity

**Incompatibilities:** Strong oxidizing agents

Strong acids and bases

**Hazard Decomposition Products** 

Carbon carbon monoxide

carbon dioxide

Chlorine hydrogen chloride

# 11. Toxicological Information

# **Acute effects:**

Irritant

May be harmful by ingestion and inhalation.

Material is irritating to mucous membranes and upper respiratory tract.

To the best of our knowledge, the toxicological properties of this product have not been fully investigated or determined.

# 12. Ecological Information

**Mobility:** Data not known

Persistence and

degradability:No data availableCumulative potential:No data available

3 Last Updated 8/15/2018

Other adverse effects: No data available

# 13. <u>Disposal Considerations</u>

Absent other actions demanded by federal or local regulations - Dissolve or mix the material with a combustible solvent and burn in a requlated, chemical incinerator equipped with after burner and scrubber.

Observe all federal, state and local laws.

# 14. Transport Information

**Shipping Name** Classed non-hazardous for shipment

# 15. Regulatory Information

Adhere to all Federal, State and local regulations.

# 16. Other Information

The information contained herein is accurate to the best of our knowledge, but is not meant to be complete and is included only as a guide. The end user is responsible for any damage resulting from handling or from contact with this product.

4 Last Updated 8/15/2018

# BIS(2-CHLOROETHYL) ETHER

Dichloroethyl ether 2,2'-Dichloroethyl ether 1,1'-Oxybis(2-chloro)ethane sym-Dichloroethyl ether Diethylene glycol dichloride

CAS #: 111-44-4 UN #: 1916

EC Number: 203-870-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
<b>EXPLOSION</b>	I SS I DANIUGINO NAUDILINAL MISTILIAS	smoking. Above 55°C use a closed	Use water spray, foam, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water.

	PREVENT GENERATION OF MISTS!			
SYMPTOMS P		PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat. Nausea. Vomiting. Burning sensation. Laboured breathing. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.	
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .	
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Nausea. Vomiting. Burning sensation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Rest. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit. Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 3; UN Pack Group: II
Fireproof. Separated from food and feedstuffs. See Chemical Dangers. Keep in the dark. Well closed.	,
PACKAGING	
Do not transport with food and feedstuffs. Marine pollutant.	



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ICSC: 0417 (April 2000)

## |BIS(2-CHLOROETHYL) ETHER ICSC: 0417

# PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

CLEAR COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

#### **Physical dangers**

The vapour is heavier than air.

#### Chemical dangers

The substance can form explosive peroxides on exposure to air and light. Decomposes on burning. Decomposes on contact with water. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with chlorosulfonic acid and oleum.

Formula: C<sub>4</sub>H<sub>8</sub>Cl<sub>2</sub>O / (CICH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>O

Molecular mass: 143.02 Boiling point: 178°C Melting point: -50°C

Relative density (water = 1): 1.22 Vapour pressure, kPa at 25°C: 0.206 Relative vapour density (air = 1): 4.9

Flash point: 55°C c.c.

Auto-ignition temperature: 369°C Explosive limits, vol% in air: 2.7-?

Octanol/water partition coefficient as log Pow: 1.29

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

# Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. Inhalation of the vapour may cause lung oedema. See Notes. Exposure far above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen). MAK: 59 mg/m<sup>3</sup>, 10 ppm; peak limitation category: I(1); skin absorption (H)

# **ENVIRONMENT**

# **NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort

Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

Check for peroxides prior to distillation; eliminate if found.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T+; R: 10-26/27/28-40; S: (1/2)-7/9-27-28-36/37-45

# DICHLOROISOPROPYL ETHER

Bis(2-chloro-1-methylethyl) ether 2,2'-Oxybis(1-chloropropane)
Dichlorodiisopropyl ether

CAS #: 108-60-1 UN #: 2490

EC Number: 203-598-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION		closed system and ventilation	Use water spray, foam, alcohol- resistant foam, dry powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust.	Fresh air, rest.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.  Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: II
Cool. Keep in the dark. Separated from incompatible materials. See Chemical Dangers.	
PACKAGING	





Organization

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ICSC: 0435 (November 2003)

# DICHLOROISOPROPYL ETHER ICSC: 0435

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-BROWN OILY LIQUID.

**Physical dangers** 

Chemical dangers

The substance can form explosive peroxides on standing in contact with air. Reacts with halogens, strong acids and strong oxidants.

Decomposes on burning. This produces toxic fumes.

Formula: C<sub>6</sub>H<sub>12</sub>Cl<sub>2</sub>O / (CICH<sub>2</sub>C(CH<sub>3</sub>)H)<sub>2</sub>O

Molecular mass: 171.1 Boiling point: 187°C Melting point: -97 - -102°C Relative density (water = 1): 1.1

Solubility in water, g/100ml at 20°C: 0.2 (poor)

Vapour pressure, Pa at 20°C: 75 Relative vapour density (air = 1): 6

Flash point: 85°C o.c.

Octanol/water partition coefficient as log Pow: 2.14/2.58

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

# Effects of short-term exposure

See Notes.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

#### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking.

# OCCUPATIONAL EXPOSURE LIMITS

# **ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

# **NOTES**

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

# **ADDITIONAL INFORMATION**

# **EC Classification**

# **BUTYL BENZYL PHTHALATE**

Benzyl butyl phthalate

1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester BBP

CAS #: 85-68-7 UN #: 3082

EC Number: 201-622-7

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open flames	Use alcohol-resistant foam, powder, carbon dioxide, water spray.

See EFFEC	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF (PREGNANT) WOMEN!		
SYMPTOMS PREVENTION		PREVENTION	FIRST AID
Inhalation		Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.  Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III  PACKAGING  PACKAGING	SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
STORAGE  Store in an area without drain or sewer access. Separated from strong oxidants.	adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of	Transportation
strong oxidants.	STORAGE	UN Hazard Class: 9; UN Pack Group: III
PACKAGING	· '	
	PACKAGING	
Marine pollutant.	Marine pollutant.	





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ICSC: 0834 (October 2005)

BUTYL BENZYL PHTHALATE ICSC: 0834

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance COLOURLESS OILY LIQUID.

Physical dangers

Chemical dangers

Decomposes on burning. This produces toxic fumes. Reacts with

oxidants.

Formula:  $1,2-C_6H_4(COOCH_2C_6H_5)(COOC_4H_9) / C_{19}H_{20}O_4$ 

Molecular mass: 312.4 Boiling point: 370°C Melting point: -35°C

Relative density (water = 1): 1.1 Solubility in water, mg/l: 0.71 (very poor) Vapour pressure at 20°C: negligible Relative vapour density (air = 1): 10.8

Flash point: 198°C

Auto-ignition temperature: 425°C

Octanol/water partition coefficient as log Pow: 4.77

# **EXPOSURE & HEALTH EFFECTS**

# Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

#### Inhalation risk

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

# Effects of long-term or repeated exposure

Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: (inhalable fraction): 20 mg/m<sup>3</sup>; peak limitation category: II(2); pregnancy risk group: C

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

# **NOTES**

#### ADDITIONAL INFORMATION

EC Classification

Symbol: T, N; R: 61-62-50/53; S: 45-53-60-61

CAPROLACTAM ICSC: 0118 (November 2009)

Hexahydro-2H-azepin-2-one Aminocaproic lactam epsilon-Caprolactam

CAS #: 105-60-2

EC Number: 203-313-2

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INO open flames	Use foam, powder, carbon dioxide, water in large amounts.

	PREVENT DISPERSION OF DUST!			
SYMPTOMS PREVENTION FIRST AID		FIRST AID		
Inhalation	Cough. Abdominal cramps. Dizziness. Headache. Confusion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.	
Ingestion	Nausea. Vomiting. Abdominal pain. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Let solidify. Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.	According to UN GHS Criteria
STORAGE	WARNING
Separated from strong oxidants. Dry.	Harmful if swallowed Causes skin and eye irritation May cause drowsiness or dizziness
PACKAGING	Transportation UN Classification





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CAPROLACTAM ICSC: 0118

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE HYGROSCOPIC CRYSTALS OR FLAKES.

**Physical dangers** 

No data.

Chemical dangers

Decomposes on heating. This produces toxic fumes including nitrogen oxides and ammonia. Reacts violently with strong oxidants. This produces toxic fumes.

Formula: C<sub>6</sub>H<sub>11</sub>NO Molecular mass: 113.2 Boiling point: 267°C Melting point: 70°C

Relative density (water = 1): 1.02

Solubility in water: good

Vapour pressure, Pa at 25°C: 0.26 Relative vapour density (air = 1): 3.91

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 125°C o.c.

Auto-ignition temperature: 375°C Explosive limits, vol% in air: 1.4-8

Octanol/water partition coefficient as log Pow: -0.19

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol.

#### Effects of short-term exposure

The substance is irritating to the skin, eyes and respiratory tract. The substance may cause effects on the central nervous system.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

## Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system and liver.

#### OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m<sup>3</sup>, as TWA; A5 (not suspected as a human carcinogen).

MAK: (inhalable fraction): 5 mg/m<sup>3</sup>; peak limitation category: I(2); pregnancy risk group: C.

EU-OEL: 10 mg/m<sup>3</sup> as TWA; 40 mg/m<sup>3</sup> as STEL

# **ENVIRONMENT**

This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

# **NOTES**

The substance is usually used, stored and transported in liquefied (molten) form at about 80°C.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn; R: 20/22-36/37/38; S: (2)





#### 1 Identification

Product identifier

Product name: Carbazole Stock number: L03718

CAS Number: 86-74-8 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Details of the supplier of the safety da Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.walfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

#### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS08 Health hazard

Carc. 2 H351 Suspected of causing cancer. Hazards not otherwise classified No information known.

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



GHS08

Signal word Warning

Hazard statements
H351 Suspected of causing cancer.

Precautionary statements
P281 Use personal protective equipment as required.
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P308+P313 IF exposed or concerned: Get medical advice/attention.

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations. **WHMIS classification** 

D2A - Very toxic material causing other toxic effects



Classification system

HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

# 3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description: 86-74-8 Carbazole Identification number(s): EC number: 201-696-0

#### 4 First-aid measures

# Description of first aid measures

After inhalation

Anter minatation Supply fresh air. If required, provide artificial respiration. Keep patient warm. Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

(Contd. on page 2)

(Contd. of page 1)

#### Product name: Carbazole

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available. Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture

If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide

Nitrogen oxides (NOx)

Advice for firefighters

Protective equipment:
Wear self-contained respirator.

Wear fully protective impervious suit.

#### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away.

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling See Section 8 for information on personal protection equipment. See Section 13 for disposal information.

#### 7 Handling and storage

Handling Precautions for safe handling

Precautions for sale nandmig Keep container tightly sealed. Store in cool, dry place in tightly closed containers. Ensure good ventilation at the workplace. Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:

Keep container tightly sealed. Store in cool, dry conditions in well sealed containers. **Specific end use(s)** No further relevant information available.

#### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Penetration time of glove material (in minutes) Not determined

Eye protection: Safety glasses

Body protection: Protective work clothing.

# 9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance:

Form: Color: Powder White to pale brown

Odor: Odorless Odor threshold: Not determined.

Change in condition

pH-value:

240-246 °C (464-475 °F) 354-356 °C (669-673 °F) Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start: Not determined

Flash point:

220 °C (428 °F) Not determined.

Not applicable

Flammability (solid, gaseous) Ignition temperature: Decomposition temperature:

Not determined Not determined

(Contd. on page 3)

Page 3/4 Printing date 11/23/2015 Reviewed on 04/02/2013

#### Product name: Carbazole

(Contd. of page 2) Auto igniting: Not determined.

Danger of explosion: Explosion limits: Not determined. Lower: Not determined Upper: Not determined Vapor pressure: Density at 20 °C (68 °F): Relative density

Not applicable. 1.15 g/cm³ (9.597 lbs/gal) Not determined.

Vapor density Not applicable. Evaporation rate Solubility in / Miscibility with Not applicable. Insoluble Partition coefficient (n-octanol/water): Not determined. Viscosity: dynamic: Not applicable. kinematic:

Not applicable. Not applicable. No further relevant information available. Other information

# 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents

Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents Hazardous decomposition products: Carbon monoxide and carbon dioxide Nitrogen oxides

# 11 Toxicological information

Information on toxicological effects

Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance. LD/LC50 values that are relevant for classification: No data

Skin irritation or corrosion: May cause irritation Eye irritation or corrosion: May cause irritation

Sensitization: No sensitizing effects known.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.

Carcinogenicity:
Suspected of causing cancer.
IARC-3: Not classifiable as to carcinogenicity to humans.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.

Specific target organ system toxicity - single exposure: No effects known.

Aspiration hazard: No effects known.

Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

#### 12 Ecological information

Aquatic toxicity: No further relevant information available.

Persistence and degradability No further relevant information available.

Bioaccumulative potential No further relevant information available.

Mobility in soil No further relevant information available.

Ecotoxical effects:

Remark: Very toxic for aquatic organisms
Additional ecological information:

General notes:

Do not allow material to be released to the environment without proper governmental permits.

Do not allow product to reach ground water, water course or sewage system, even in small quantities. Danger to drinking water if even extremely small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

May cause long lasting harmful effects to aquatic life. Avoid transfer into the environment.

Very toxic for aquatic organisms

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

Other adverse effects No further relevant information available.

#### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:

Recommendation: Disposal must be made according to official regulations.

# 14 Transport information

UN-Number DOT, IMDG, IATA

UN3077

UN proper shipping name DOT

Environmentally hazardous substances, solid, n.o.s. (Carbazole) ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Carbazole) ĪMDG, IATA

(Contd. on page 4)

# Product name: Carbazole (Contd. of page 3) Transport hazard class(es) DOT, IMDG allb. Class Label 9 Miscellaneous dangerous substances and articles. Class (M7) Miscellaneous dangerous substances and articles IATA Class 9 Miscellaneous dangerous substances and articles. Label Packing group DOT, IMDG, IATA Ш Environmental hazards: Special marking (ADR) Symbol (fish and tree) Special marking (IATA): Symbol (fish and tree) Special precautions for user Warning: Miscellaneous dangerous substances and articles Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable. Transport/Additional information: Marine Pollutant (DOT): No UN "Model Regulation": UN3077, Environmentally hazardous substances, solid, n.o.s. (Carbazole), 9, III

# 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms



Signal word Warning Hazard statements H351 Suspected of causing cancer.

Precautionary statements
P281 Use personal protective equipment as required.
P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood. P308+P313 IF exposed or concerned: Get medical advice/attention. P405 Store locked up.

Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory. All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed. California Proposition 65

Prop 65 - Chemicals known to cause cancer

86-74-8 Carbazole

Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed. Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

#### Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the use Department issuing SDS: Global Marketing Department Date of preparation / last revision 11/23/2015 / Abbreviations and acronyms:

ADR: Accord européen sur le transport des manchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Mantime Code for Dangerous Goods by Road) IMDG: International Mantime Code for Dangerous Goods by Road) IMDG: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances CAS: Chemical Abstracts Service (division of the American Chemical Society) HMIS: Hazardous Materials Information System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada) LC50: Lethal concentration, 50 percent

LD50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

LP50: Lethal concentration Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

CHRYSENE ICSC: 1672 (October 2006)

Benzo[a]phenanthrene 1,2-Benzophenanthrene

1,2,5,6-Dibenzonaphthalene

CAS #: 218-01-9 UN #: 3077

EC Number: 205-923-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Compustible. Finely dispersed		Use water spray, dry powder, foam, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING Suspected of causing cancer
Separated from strong oxidants. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	Very toxic to aquatic life Toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III



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CHRYSENE ICSC: 1672

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-BEIGE CRYSTALS OR POWDER.

**Physical dangers** 

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

Chemical dangers

Decomposes on burning. This produces toxic fumes. Reacts violently with strong oxidants.

Formula: C<sub>18</sub>H<sub>12</sub>
Molecular mass: 228.3
Boiling point: 448°C
Melting point: 254 - 256°C
Density: 1.3 g/cm³

Solubility in water: very poor Octanol/water partition coefficient as log Pow: 5.9

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

Effects of short-term exposure

# Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

#### Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: skin absorption (H); carcinogen category: 2

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised not to let the chemical enter into the environment.

# **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures.

Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

# ADDITIONAL INFORMATION

# **EC Classification**

Symbol: T, N; R: 45-68-50/53; S: 53-45-60-61

# DI(2-ETHYLHEXYL) PHTHALATE

Dioctylphthalate DOP; DEHP

Bis-(2-ethylhexyl)phthalate

CAS #: 117-81-7

EC Number: 204-211-0

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INC) open flames	Use water spray, foam, powder, carbon dioxide.

PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Diarrhoea. Nausea.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Separated from strong oxidants, acids, alkalis and nitrates. Cool. Dry. Well closed.	
PACKAGING	



International Labour Organization



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ICSC: 0271 (October 2001)

# DI(2-ETHYLHEXYL) PHTHALATE ICSC: 0271

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-LIGHT COLOURED VISCOUS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers

Decomposes on heating. This produces irritating fumes. Reacts with strong oxidants, acids, alkalis and nitrates.

Formula:  $C_{24}H_{38}O_4 / C_6H_4(COOC_8H_{17})_2$ 

Molecular mass: 390.6 Boiling point: 385°C Melting point: -50°C

Relative density (water = 1): 0.986

Solubility in water: none

Vapour pressure, kPa at 20°C: 0.001 Relative vapour density (air = 1): 13.45

Flash point: 215°C o.c.

Auto-ignition temperature: 350°C

Octanol/water partition coefficient as log Pow: 5.03

# **EXPOSURE & HEALTH EFFECTS**

# Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract.

#### Inhalation risk

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

#### Effects of long-term or repeated exposure

The substance may have effects on the testes. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 mg/m<sup>3</sup>, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: (inhalable fraction): 2 mg/m<sup>3</sup>; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

#### **ENVIRONMENT**

Bioaccumulation of this chemical may occur in seafood.

#### **NOTES**

# **ADDITIONAL INFORMATION**

# EC Classification

Symbol: T; R: 60-61; S: 53-45

### DIBENZO(a,h)ANTHRACENE

Combustible.

1,2:5,6-Dibenzanthracene

CAS #: 53-70-3 UN #: 3077

**EXPLOSION** 

EC Number: 200-181-8

LC Number: 200-101-0				
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING	
FIRE &	0 1 171	NO 5		

NO open flames.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria	
STORAGE	DANGER	
Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	May cause cancer Very toxic to aquatic life with long lasting effects	
PACKAGING	Transportation UN Classification	
Marine pollutant.	UN Hazard Class: 9; UN Pack Group: III	





Organization

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ICSC: 0431 (November 2016)

Use water spray, powder.

DIBENZO(a,h)ANTHRACENE ICSC: 0431

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS CRYSTALLINE POWDER.

Physical dangers

**Chemical dangers** 

Formula: C<sub>22</sub>H<sub>14</sub>
Molecular mass: 278.4
Boiling point: 524°C
Melting point: 267°C

Relative density (water = 1): 1.28

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.5

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

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

### Effects of short-term exposure

See Notes.

### Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

### Effects of long-term or repeated exposure

The substance may have effects on the skin. This may result in photosensitization. This substance is probably carcinogenic to humans.

### **OCCUPATIONAL EXPOSURE LIMITS**

MAK: carcinogen category: 2; germ cell mutagen group: 3A; skin absorption (H)

### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur along the food chain. It is strongly advised not to let the chemical enter into the environment.

### **NOTES**

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

### ADDITIONAL INFORMATION

### **EC Classification**

Symbol: T, N; R: 45-50/53; S: 53-45-60-61







### 1 Identification

Product identifier

Product name: Dibenzofuran Stock number: A16521, L06756

CAS Number: 132-64-9 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

Thermo Fisher Scientific S. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech @alfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified according to the Globally Harmonized System (GHS). **Hazards not otherwise classified** No information known.

I abel elements

GHS label elements Not applicable Hazard pictograms Not applicable Signal word Not applicable Hazard statements Not applicable WHMIS classification Not controlled Classification system HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1 Flammability = 1

TINITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment PBT: Not applicable.

vPvB: Not applicable.

### 3 Composition/information on ingredients

Chemical characterization: Substances CAS# Description: 132-64-9 Dibenzofuran Identification number(s): EC number: 205-071-3

### 4 First-aid measures

### Description of first aid measures

After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

### 5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dióxide Advice for firefighters

Protective equipment:

Wear self-contained respirator. Wear fully protective impervious suit.

# 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Pick up mechanically.

Prevention of secondary hazards: No special measure's required.

(Contd. on page 2)

Safety Data Sheet per OSHA HazCom 2012

Page 2/4 Printing date 11/23/2015 Reviewed on 04/06/2007

(Contd. of page 1)

### Product name: Dibenzofuran

Reference to other sections

See Section 7 for information on safe handling See Section 8 for information on personal protection equipment. See Section 13 for disposal information.

### 7 Handling and storage

Handling

Representations for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage
Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required.

Additional information: No data

Exposure controls

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves

Impervious gloves

Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Eye protection: Safety glasses
Body protection: Protective work clothing.

### 9 Physical and chemical properties

Information on basic physical and chemical properties General Information

Appearance: Form: Crystalline powder White Color: Odor: Not determined Odor threshold: Not determined

pH-value: Not applicable.

Change in condition

81-85 °C (178-185 °F) Not determined Not determined Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start:

Not applicable Not determined. Flash point: Flammability (solid, gaseous) Ignition temperature: Decomposition temperature: Not determined Not determined Auto igniting: Not determined

Danger of explosion: Explosion limits: Product does not present an explosion hazard.

Lower:
Lower:
Upper:
Vapor pressure:
Density at 20 °C (68 °F):
Relative density Not determined Not determined

Not applicable. 1.089 g/cm³ (9.088 lbs/gal) Not determined.

Vapor density Not applicable. vapor density Evaporation rate Solubility in / Miscibility with Not applicable. Not determined Partition coefficient (n-octanol/water): Not determined. Viscosity: dynamic: Not applicable.

kinematic: Not applicable. Other information No further relevant information available.

### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions No dangerous reactions known Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents

### Product name: Dibenzofuran

Hazardous decomposition products: Carbon monoxide and carbon dioxide

(Contd. of page 2)

### 11 Toxicological information

Information on toxicological effects

Acute toxicity: No effects known. LD/LC50 values that are relevant for classification: No data

Skin irritation or corrosion: May cause irritation Eye irritation or corrosion: May cause irritation

Sensitization: No sensitizing effects known.

Germ cell mutagenicity: No effects known.

Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known. Specific target organ system toxicity - single exposure: No effects known. Aspiration hazard: No effects known.

Subacute to chronic toxicity: No effects known.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

### 12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.

Footoxical affects:

Remark: Toxic for aquatic organisms Additional ecological information:

General notes:

Do not allow material to be released to the environment without proper governmental permits.

Toxic for aquatic organisms

Do not allow product to reach ground water, water course or sewage system.

Danger to drinking water if even small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

Toxic to aquatic life.

Note to aquatic life. May cause long lasting harmful effects to aquatic life. Avoid transfer into the environment.

Results of PBT and vPvB assessment PBT: Not applicable.

vPvB: Not applicable

Other adverse effects No further relevant information available.

### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:

Recommendation: Disposal must be made according to official regulations.

14	Transport	information

**UN-Number** DOT, IMDG, IATA

UN proper shipping name DOT

Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran) ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenzofuran) ĪMDG, IATA

UN3077

Transport hazard class(es)

DOT, IMDG



Label

Class

Class Label

9 Miscellaneous dangerous substances and articles.

Packing group DOT, IMDG, IATA

Environmental hazards:

Special marking (ADR): Special marking (IATA):

Special precautions for user

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable. Transport/Additional information:

DOT Marine Pollutant (DOT): UN "Model Regulation":

No

Ш

Symbol (fish and tree) Symbol (fish and tree)

UN3077, Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran), 9, III

9 Miscellaneous dangerous substances and articles.

(M7) Miscellaneous dangerous substances and articles

Warning: Miscellaneous dangerous substances and articles

### Product name: Dibenzofuran

(Contd. of page 3)

### 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements Not applicable Hazard pictograms Not applicable Signal word Not applicable Hazard statements Not applicable Hazard statements Not applicable National regulations of this product are listed in the U.S. Environmental Protection Agency Toxic Substan

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory. All components of this product are listed on the Canadian Domestic Substances List (DSL).

### SARA Section 313 (specific toxic chemical listings)

### 132-64-9 Dibenzofuran

132-64-9 | Dibenzofuran

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:
For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed. market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

### 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the use Department issuing SDS: Global Marketing Department Date of preparation / last revision 11/23/2015 / - Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Martime Code for Dangerous Goods by Road) IMDG: International Martime Code for Dangerous Goods by Road) IMDG: International Air Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

LP50: Lethal dose, 50 percent

LP50: Lethal dose, 50 percent

LP50: Accompany Persistent and very Bioaccumulative

ACGIH: American Conference of Governmental Industrial Hygienists (USA)

NTP: National Toxicology Program (USA)

MTP: National Toxicology Program (USA)

MTP: National Toxicology Program (USA)

USA

### DIBUTYL PHTHALATE ICSC: 0036 (July 2002)

1,2-Benzenedicarboxylic acid dibutyl ester

Di-n-butyl phthalate

CAS #: 84-74-2 UN #: 3082

EC Number: 201-557-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use foam, dry powder, carbon dioxide.

PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in vermiculite, sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Separated from strong oxidants.	UN Hazard Class: 9; UN Pack Group: III
PACKAGING	



Labour Organization



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DIBUTYL PHTHALATE ICSC: 0036

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW VISCOUS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Decomposes on burning. This produces toxic and irritating fumes (phthalic anhydride - see ICSC 0315). Reacts with strong oxidants.

Formula:  $C_{16}H_{22}O_4 / C_6H_4(COOC_4H_9)_2$ 

Molecular mass: 278.3 Boiling point: 340°C Melting point: -35°C

Relative density (water = 1): 1.05 Solubility in water, g/100ml at 25°C: 0.001 Vapour pressure, kPa at 20°C: <0.01 Relative vapour density (air = 1): 9.58

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 157°C c.c.

Auto-ignition temperature: 402°C

Explosive limits, vol% in air: 0.5-~2.5 (at 235°C) Octanol/water partition coefficient as log Pow: 4.72

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

### Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

### Effects of long-term or repeated exposure

Animal tests show that this substance possibly causes toxicity to human reproduction or development.

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 mg/m<sup>3</sup>, as TWA.

MAK: 0.58 mg/m<sup>3</sup>, 0.05 ppm; peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

### **ENVIRONMENT**

The substance is toxic to aquatic organisms.

### **NOTES**

### **ADDITIONAL INFORMATION**

EC Classification

Symbol: T, N; R: 61-62-50; S: 53-45-61

## DIETHYL PHTHALATE ICSC: 0258 (March 2001)

1,2-Benzenedicarboxylic acid diethyl ester DEP

CAS #: 84-66-2

EC Number: 201-550-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	INCLOPED Hames	Use alcohol-resistant foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Lethargy.	Use ventilation. Use local exhaust.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

CLASSIFICATION & LABELLING
According to UN GHS Criteria  Transportation UN Classification





Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.
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DIETHYL PHTHALATE ICSC: 0258

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance COLOURLESS OILY LIQUID.

Physical dangers

Chemical dangers

Decomposes on heating and on burning. This produces toxic fumes and gases (phthalic anhydride - see ICSC 0315). Attacks some plastics.

Formula:  $C_6H_4(COOC_2H_5)_2 / C_{12}H_{14}O_4$ 

Molecular mass: 222.3
Boiling point: 295°C
Melting point: -67 - -44°C
Relative density (water = 1): 1.1
Solubility in water at 25°C: none
Relative vapour density (air = 1): 7.7

Flash point: 117°C c.c.

Auto-ignition temperature: 457°C Explosive limits, vol% in air: 0.7-?

Octanol/water partition coefficient as log Pow: 2.47

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

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

Effects of short-term exposure

### Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 mg/m<sup>3</sup>, as TWA; A4 (not classifiable as a human carcinogen)

### **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to fish.

### **NOTES**

### ADDITIONAL INFORMATION

**EC Classification** 

### DIMETHYL PHTHALATE ICSC: 0261 (October 2005)

Dimethyl 1,2-benzenedicarboxylate

Phthalic acid dimethyl ester

1,2-Benzenedicarboxylic acid, dimethyl ester

DMP

CAS #: 131-11-3

EC Number: 205-011-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	INC) open flames	Use water spray, foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Store in an area without drain or sewer access.	
PACKAGING	
	1





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https://www.ilo.org/dyn/icsc/showcard.display?p\_lang=en&p\_card\_id=0261&p\_version=2

DIMETHYL PHTHALATE ICSC: 0261

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance COLOURLESS OILY LIQUID.

Physical dangers

Chemical dangers

Decomposes on burning. This produces irritating fumes.

Formula: C<sub>6</sub>H<sub>4</sub>(COOCH<sub>3</sub>)<sub>2</sub> / C<sub>10</sub>H<sub>10</sub>O<sub>4</sub>

Molecular mass: 194.2 Boiling point: 284°C Melting point: 5.5°C

Relative density (water = 1): 1.19 Solubility in water, g/100ml at 20°C: 0.43 Vapour pressure, Pa at 20°C: 0.8 Relative vapour density (air = 1): 6.69

Flash point: 146°C c.c.

Auto-ignition temperature: 490°C

Explosive limits, vol% in air: 0.9 (at 180°C) - 8.0 (at 109°C) Octanol/water partition coefficient as log Pow: 1.47/2.12

### **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

Inhalation risk

A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of short-term exposure

Effects of long-term or repeated exposure

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 mg/m<sup>3</sup>, as TWA

### **ENVIRONMENT**

The substance is harmful to aquatic organisms.

### **NOTES**

Other melting points: ≈0°C (commercial product).

### **ADDITIONAL INFORMATION**

**EC Classification** 





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1 Identification

Product identifier

Product name: Di-n-octyl phthalate

Stock number: 41522 CAS Number: 117-84-0 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

Thermo Fisher Scientific S. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech @alfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified according to the Globally Harmonized System (GHS). **Hazards not otherwise classified** No information known.

I abel elements

GHS label elements Not applicable Hazard pictograms Not applicable Signal word Not applicable Hazard statements Not applicable WHMIS classification Not controlled Classification system HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1 Flammability = 1

TINITY 1 Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment PBT: Not applicable.

vPvB: Not applicable.

### 3 Composition/information on ingredients

Chemical characterization: Substances CAS# Description:
117-84-0 Di-n-octyl phthalate Identification number(s): EC number: 204-214-7

### 4 First-aid measures

Description of first aid measures

After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

### 5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dióxide Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation

Environmental precautions: Do not allow product to reach sewage system or any water course.

Methods and material for containment and cleaning up: Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Prevention of secondary hazards: No special measure's required.

(Contd. on page 2)

(Contd. of page 1)

### Product name: Di-n-octyl phthalate

Reference to other sections

See Section 7 for information on safe handling See Section 8 for information on personal protection equipment. See Section 13 for disposal information.

### 7 Handling and storage

Handling

Precautions for safe handling Keep container tightly sealed. Store in cool, dry place in tightly closed containers.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage
Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed. Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

### Components with limit values that require monitoring at the workplace:

117-84-0 Di-n-octyl phthalate (100.0%)

EL (Canada) Long-term value: 5 mg/m3

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.

Wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Recommended filter device for short term use:

Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).

Protection of hands:

Protection of hands:

Impervious gloves
Check protection of nands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Nitrile rubber, NBR

Penetration time of glove material (in minutes) 480 Glove thickness 0.2 mm

Eye protection: Safety glasses
Body protection: Protective work clothing.

### 9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance: Form: Color:

Liquid

Colorless to pale yellow Odor: Odor threshold: Not determined

Not determined pH-value: Not determined.

Change in condition Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start: -25 °C (-13 °F) 380 °C (716 °F) Not determined

219 °C (426 °F) Flammability (solid, gaseous) Ignition temperature: Decomposition temperature: Not detèrmined Not determined Not determined Auto igniting: Not determined

Not determined.

Danger of explosion: Explosion limits:

Lower: Not determined Upper: Vapor pressure at 220 °C (428 °F): Density at 20 °C (68 °F): Relative density Vapor density Not determined 5.32 hPa (4 mm Hg) 0.98 g/cm³ (8.178 lbs/gal)

Not determined. Not determined. Evaporation rate Solubility in / Miscibility with Not determined.

Not miscible or difficult to mix Water:

Partition coefficient (n-octanol/water): Not determined. Viscosity.

dynamic: Not determined Not determined.

kinematic: Other information No further relevant information available.

USA

### Product name: Di-n-octyl phthalate

(Contd. of page 2)

### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

### 11 Toxicological information

Information on toxicological effects

Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance. LD/LC50 values that are relevant for classification: No data

Skin irritation or corrosion: May cause irritation Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substances.

Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

### 12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.

Additional ecological information:

General notes: Avoid transfer into the environment. Results of PBT and vPvB assessment PBT: Not applicable.

vPvB: Not applicable

Other adverse effects No further relevant information available.

### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:

Recommendation: Disposal must be made according to official regulations.

### 14 Transport information **UN-Number**

DOT, ADN, IMDG, IATA

Not applicable

UN proper shipping name DOT, ADN, IMDG, IATA

Transport hazard class(es)

DOT, ADR, ADN, IMDG, IATA

Class

Packing group DOT, IMDG, IATA Not applicable

Environmental hazards:

Not applicable.

Special precautions for user

Not applicable.

Not applicable

Not applicable

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

Transport/Additional information:

DOT

Hazardous substance: 5000 lbs, 2270 kg Marine Pollutant (DOT). No

UN "Model Regulation":

### 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements Not applicable Hazard pictograms Not applicable Signal word Not applicable

Hazard statements Not applicable

Hăzard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

(Contd. on page 4)

Safety Data Sheet per OSHA HazCom 2012

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### Product name: Di-n-octyl phthalate

(Contd. of page 3)
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information
Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user. Conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the use Department issuing SDS: Global Marketing Department Date of preparation / last revision 11/23/2015 / Abbreviations and acronyms:

ADR: Accord européen sur le transportation

EINECS: European Inventory of Existing Commercial Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Information System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal dose, 50 percent

LD50: Lethal dose, 50 percent

LP50: Lethal dose, 50 percent

LP50: Lethal dose, 50 percent

LP50: Armerican Conference of Governmental Industrial Hygienists (USA)

OSHA: Occupational Safety and Health Administration (USA)

NTP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

USA



# Safety Data Sheet per OSHA HazCom 2012

Alfa Aesar

### 1 Identification

Product identifier

Product name: Fluoranthene

Stock number: A17230

**CAS Number:** 206-44-0 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier: Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

Thermo Fisher Scientific S. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech @alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed.



GHS08 Health hazard

Muta. 2 H341 Suspected of causing genetic defects. **Hazards not otherwise classified** No information known.

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms





GHS06 GHS08

Signal word Danger Hazard statements

H301 Toxic if swallowed. H341 Suspected of causing genetic defects.

Precautionary statements

P281 Use personal protective equipment as required.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...

P308+P313 IF exposed or concerned: Get medical advice/attention.

P321 Specific treatment (see on this label).

Store locked up.

Dispose of contents/container in accordance with local/regional/nai

P501 Dispose of contents/container in accordance with local/regional/national/international regulations. **WHMIS classification** 

D1B - Toxic material causing immediate and serious toxic effects D2B - Toxic material causing other toxic effects



Classification system HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

### 3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description: 206-44-0 Fluoranthene Identification number(s): EC number: 205-912-4

### 4 First-aid measures

Description of first aid measures

After inhalation Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice.

(Contd. of page 1)

### Product name: Fluoranthene

After skin contact

Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.
Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available. Indication of any immediate medical attention and special treatment needed No further relevant information available.

### 5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters Protective equipment:

Wear self-contained respirator. Wear fully protective impervious suit.

### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away

Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.

Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

### 7 Handling and storage

Handling Precautions for safe handling

Keep container tightly sealed. Store in cool, dry place in tightly closed containers. Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Requirements to be met by storerooms and receptacles: No special requirements. Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed. Store in cool, dry conditions in well sealed containers. **Specific end use(s)** No further relevant information available.

### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required. Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:

Protection of hands:

Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Eye protection: Safety glasses
Body protection: Protective work clothing.

### 9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance: Form:

Crystalline Color: Yellow Not determined Odor: Odor threshold: Not determined. pH-value: Not applicable.

Change in condition Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start: 107-110 °C (225-230 °F) Not determined Not determined

Not applicable Flammability (solid, gaseous) Not de'termined. Ignition temperature: Not determined

### Product name: Fluoranthene

(Contd. of page 2) Decomposition temperature: Not determined

Auto igniting: Not determined.

Danger of explosion: Explosion limits: Product does not present an explosion hazard.

Lower: Not determined Upper: Vapor pressure: Density: Relative density Not determined Not applicable. Not determined Not determined. Vapor density Evaporation rate Not applicable. Not applicable. Solubility in / Miscibility with

Water: Insoluble
Partition coefficient (n-octanol/water): Not determined. Viscosity: dynamic: Not applicable.

Not applicable. No further relevant information available. kinematic: Other information

### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions No dangerous reactions known

Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents

Hazardous decomposition products: Carbon monoxide and carbon dioxide

### 11 Toxicological information

Information on toxicological effects
Acute toxicity: Harmful if swallowed.
LD/LC50 values that are relevant for classification: No data

LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Irritant to skin and mucous membranes.
Eye irritation or corrosion: Irritating effect.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: Suspected of causing genetic defects.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity a repeated exposure: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known. Specific target organ system toxicity - single exposure: No effects known. Aspiration hazard: No effects known.

Aspiration nazaro: No effects known.
Other information (about experimental toxicology):
Tumorigenic effects have been observed on tests with laboratory animals.
Mutagenic effects have been observed on tests with bacteria.
Mutagenic effects have been observed on tests with human lymphocytes.
Mutagenic effects have been observed on tests with laboratory animals.

Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals: Kidney, Ureter, Bladder - changes in tubules (including acute renal failure, acute tubular necrosis).
Blood - normocytic anemia.
Blood - changes in leukocyte (WBC) count.

Skin and Appendages - tumors.
Tumorigenic - equivocal tumorigenic agent by RTECS criteria.
Tumorigenic - tumors at site of application.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

### 12 Ecological information

Aquatic toxicity: No further relevant information available.

Persistence and degradability No further relevant information available.

Bioaccumulative potential No further relevant information available.

Mobility in soil No further relevant information available.

Additional ecological information:

General notes:

Do not allow material to be released to the environment without proper governmental permits. Do not allow undiluted product or large quantities to reach ground water, water course or sewage system. Avoid transfer into the environment.

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

Other adverse effects No further relevant information available.

### 13 Disposal considerations

Waste treatment methods Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

### 14 Transport information

Not a hazardous material for transportation.

**UN-Number** DOT, IMDG, IATA

UN proper shipping name DOT, IMDG, IATA

None None

(Contd. on page 4)

### Product name: Fluoranthene (Contd. of page 3) Transport hazard class(es) DOT, ADR, IMDG, IATA Class None Packing group DOT, IMDG, IATA None Environmental hazards: Not applicable. Special precautions for user Not applicable. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable. Transport/Additional information: Not dangerous according to the above specifications. DOT Hazardous substance: Marine Pollutant (DOT). 100 lbs, 45.4 kg

### 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms





GHS06 GHS08

Signal word Danger Hazard statements H301 Toxic if swallowed.

H301 Toxic if swallowed.
H341 Suspected of causing genetic defects.

Precautionary statements
P281 Use personal protective equipment as required.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/...
P308+P313 IF exposed or concerned: Get medical advice/attention.
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of enterty/container in accordance with local/regional/not

National regulations.

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).

### SARA Section 313 (specific toxic chemical listings)

206-44-0 Fluoranthene

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use:

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

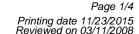
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed. Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

### 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user. conformance with this Material Safety Data Sheet, or in conDepartment issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
IEINECS: European Invenitory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
VPVB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

USA





Alfa Aesar

1 Identification

Product identifier

Product name: Fluorene Stock number: A13871

CAS Number: 86-73-7 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

Thermo Fisher Scientific S. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech @alfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

The substance is not classified according to the Globally Harmonized System (GHS). **Hazards not otherwise classified** No information known.

I abel elements

GHS label elements Not applicable Hazard pictograms Not applicable Signal word Not applicable Hazard statements Not applicable WHMIS classification Not controlled

Classification system HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1 Flammability = 1
This is a second of the sec

Other hazards

Results of PBT and vPvB assessment PBT: Not applicable.

vPvB: Not applicable.

### 3 Composition/information on ingredients

Chemical characterization: Substances CAS# Description: 86-73-7 Fluorene Identification number(s): EC number: 201-695-5

### 4 First-aid measures

Description of first aid measures

After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

### 5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam. Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dióxide Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation

Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up: Pick up mechanically.

Prevention of secondary hazards: No special measure's required.

(Contd. on page 2)

Safety Data Sheet per OSHA HazCom 2012

Page 2/4 Printing date 11/23/2015 Reviewed on 03/11/2008

(Contd. of page 1)

### Product name: Fluorene

Reference to other sections

See Section 7 for information on safe handling See Section 8 for information on personal protection equipment. See Section 13 for disposal information.

### 7 Handling and storage

Handling

Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace: Not required.

Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an exponentially appropriate working equipment

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Penetration time of glove material (in minutes) Not determined

Eye protection: Safety glasses Body protection: Protective work clothing.

### 9 Physical and chemical properties

# Information on basic physical and chemical properties

General Information

Appearance: Form:

Powder Color: White

Odor: Not determined Odor threshold: Not determined.

pH-value: Not applicable.

Change in condition

112-115 °C (234-239 °F) 295 °C (563 °F)

Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start: Not determined 151 °C (304 °F) Flash point:

Flammability (solid, gaseous) Not detèrmined Ignition temperature: Decomposition temperature: Not determined Not determined Auto igniting: Not determined

Danger of explosion: Explosion limits: Product does not present an explosion hazard.

Lower:
Lower:
Upper:
Vapor pressure:
Density at 20 °C (68 °F): Not determined Not determined

Not applicable. 1.202 g/cm³ (10.031 lbs/gal)

Relative density Not determined. Vapor density Evaporation rate Not applicable. Not applicable. Solubility in / Miscibility with

Water: Insoluble Partition coefficient (n-octanol/water): Not determined. Viscosity:

Not applicable. kinematic: Not applicable.

No further relevant information available. Other information

### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions No dangerous reactions known Conditions to avoid No further relevant information available. Incompatible materials: Oxidizing agents

(Contd. on page 3)

### Product name: Fluorene

### Hazardous decomposition products: Carbon monoxide and carbon dioxide

(Contd. of page 2)

### 11 Toxicological information

Information on toxicological effects

Acute toxicity: No effects known. LD/LC50 values that are relevant for classification: No data

Skin irritation or corrosion: Irritant to skin and mucous membranes.
Eye irritation or corrosion: Irritating effect.

Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known. Specific target organ system toxicity - single exposure: No effects known. Aspiration hazard: No effects known.

Subacute to chronic toxicity: No effects known.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

### 12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.

Ecotoxical effects:

Remark: Very toxic for aquatic organisms
Additional ecological information:

General notes:

Do not allow product to reach ground water, water course or sewage system.

Do not allow material to be released to the environment without proper governmental permits.

Danger to drinking water if even small quantities leak into the ground.

Also poisonous for fish and plankton in water bodies.

May cause long lasting harmful effects to aquatic life. Avoid transfer into the environment.

Very toxic for aquatic organisms

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

Other adverse effects No further relevant information available.

### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Trans	port info	ormation
	P 0	a

DOT, IMDG, IATA UN3077 UN proper shipping name Environmentally hazardous substances, solid, n.o.s. (Fluorene) ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluorene) ĪMDG, IATA

Transport hazard class(es)

DOT, IMDG

**UN-Number** 



Class 9 Miscellaneous dangerous substances and articles. Label Class 9 (M7) Miscellaneous dangerous substances and articles Label



Class 9 Miscellaneous dangerous substances and articles.

Packing group DOT, IMDG, IATA

Environmental hazards:

Symbol (fish and tree) Symbol (fish and tree) Special marking (ADR): Special marking (IATA):

Special precautions for user Warning: Miscellaneous dangerous substances and articles

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

Transport/Additional information:

DOT

Marine Pollutant (DOT): No

UN "Model Regulation": UN3077, Environmentally hazardous substances, solid, n.o.s. (Fluorene), 9, III

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USA

Page 4/4 Printing date 11/23/2015 Reviewed on 03/11/2008

### Product name: Fluorene

(Contd. of page 3)

### 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use:

For use only by technically qualified individuals.

This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

### 16 Other information

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Conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the use Department issuing SDS: Global Marketing Department Date of preparation / last revision 11/23/2015 / - Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods DOT: US Department of Transport also codes DOT: US Department of Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)

HMIS: Hazardous Materials Information System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

LP50: Lethal dose, 50 percent

LP50: Lethal formation and Lethal Administration (USA)

NSHA: Occupational Safety and Health Administration (USA)

NSHA: Occupational Safety and Health Administration (USA)

NSP: National Toxicology Program (USA)

IARC: International Agency for Research on Cancer

EPA: Environmental Protection Agency (USA)

IISA

### **HEXACHLOROBUTADIENE**

1,1,2,3,4,4-Hexachloro-1,3-butadiene

Perchlorobutadiene

CAS #: 87-68-3 UN #: 2279

EC Number: 201-765-5

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Burning sensation. Cough. Sore throat. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	MAY BE ABSORBED! Pain. Redness. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Pain. Redness. Severe deep burns. Loss of vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Burning sensation. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: III
Separated from food and feedstuffs. Well closed. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	
PACKAGING	
Do not transport with food and feedstuffs. Severe marine pollutant.	
VACE CALC	V



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ICSC: 0896 (August 1997)

### HEXACHLOROBUTADIENE ICSC: 0896

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Attacks rubber and some forms of plastic.

Formula: C<sub>4</sub>Cl<sub>6</sub> / CCl<sub>2</sub>=CClCCl=CCl<sub>2</sub>

Molecular mass: 260.8 Boiling point: 212°C Melting point: -18°C

Relative density (water = 1): 1.68 Solubility in water: none

Vapour pressure, Pa at 20°C: 20 Relative vapour density (air = 1): 9.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 90°C

Auto-ignition temperature: 610°C

Octanol/water partition coefficient as log Pow: 4.90

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The liquid is corrosive. The substance may cause effects on the kidneys.

### Inhalation risk

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

### Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. May cause genetic damage in humans.

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.02 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 0.22 mg/m<sup>3</sup>, 0.02 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

### **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

### **NOTES**

### **ADDITIONAL INFORMATION**

### **EC Classification**

### **HEXACHLOROCYCLOPENTADIENE**

1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene Perchlorocyclopentadiene

CAS #: 77-47-4 UN #: 2646

EC Number: 201-029-3

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

	AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat. Headache. Diarrhoea. Dizziness. Nausea. Vomiting. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Redness. Pain. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain. Blurred vision. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Burning sensation. Shock or collapse. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	UN Hazard Class: 6.1; UN Pack Group: I
Store in an area without drain or sewer access. Dry. Well closed. Ventilation along the floor.	
PACKAGING	



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ICSC: 1096 (October 2005)

### **HEXACHLOROCYCLOPENTADIENE**

### PHYSICAL & CHEMICAL INFORMATION

### Physical State; Appearance

OILY YELLOW-TO-GREEN LIQUID WITH PUNGENT ODOUR.

### **Physical dangers**

The vapour is heavier than air.

### Chemical dangers

Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride and phosgene. Reacts with moist air. This produces hydrogen chloride (see ICSC 0163). Attacks many metals in the presence of water. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: C<sub>5</sub>Cl<sub>6</sub>
Molecular mass: 272.7
Boiling point: 239°C
Melting point: -9°C

Relative density (water = 1): 1.7 Solubility in water, g/100ml at 25°C: 0.2 Vapour pressure, Pa at 20°C: 10.7 Relative vapour density (air = 1): 9.4

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

ICSC: 1096

Octanol/water partition coefficient as log Pow: 4/5

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

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

### Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema. See Notes. The substance may cause effects on the kidneys and liver. This may result in tissue lesions. The effects may be delayed. Medical observation is indicated.

### Inhalation risk

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

Effects of long-term or repeated exposure

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.01 ppm as TWA; A4 (not classifiable as a human carcinogen). MAK skin absorption (H)

### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

### **NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical

Rest and medical observation are therefore essential.

Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

### **ADDITIONAL INFORMATION**

### **EC Classification**

Symbol: T+, N; R: 22-24-26-34-50/53; S: (1/2)-25-39-45-53-60-61

### **HEXACHLOROETHANE** ICSC: 0051 (November 2010)

Perchloroethane Carbon hexachloride

CAS #: 67-72-1 UN #: 3077;(NOS) EC Number: 200-666-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER
Separated from strong oxidants, alkali metals and food and feedstuffs. See Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	Harmful if swallowed May cause drowsiness or dizziness Causes damage to the central nervous system, the kidneys and the liver through prolonged or repeated exposure Very toxic to aquatic life
PACKAGING	Transportation UN Classification
	UN Hazard Class: 9; UN Pack Group: III





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### HEXACHLOROETHANE ICSC: 0051

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Decomposes above 300°C . This produces toxic and corrosive fumes of phosgene (see ICSC 0007) and hydrogen chloride (see ICSC 0163). Reacts with zinc, aluminium powder and sodium. Reacts violently with alkali metals and strong oxidants.

Formula: C<sub>2</sub>Cl<sub>6</sub> / Cl<sub>3</sub>CCCl<sub>3</sub>

Molecular mass: 236.7

Sublimation point: 183-185°C

Relative density (water = 1): 2.1

Solubility in water: none

Vapour pressure, Pa at 20°C: 53

Relative vapour density (air = 1): 8.2 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Octanol/water partition coefficient as log Pow: 3.9

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

The substance can be absorbed into the body by ingestion.

### Effects of short-term exposure

The vapour is irritating to the eyes.

### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

### Effects of long-term or repeated exposure

The substance may have effects on the liver and kidneys. The substance may have effects on the central nervous system. This may result in ataxia and tremors. Tumours have been detected in experimental animals but may not be relevant to humans.

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 9.8 mg/m<sup>3</sup>, 1 ppm; skin absorption (H); peak limitation category: II(2); pregnancy risk group: C; carcinogen category: 3

### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

### **NOTES**

Use of alcoholic beverages enhances the harmful effect.

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

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

### **ADDITIONAL INFORMATION**

### **EC Classification**

### **HEXACHLOROBENZENE**

Perchlorobenzene

нсв

Pentachlorophenylchloride

Phenyl perchloryl

CAS #: 118-74-1 UN #: 2729

EC Number: 204-273-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	INC) open flames	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: chemical protection suit and particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria  Transportation	
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: III	
Separated from food and feedstuffs. Well closed.		
PACKAGING		
Do not transport with food and feedstuffs.		





Organization

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ICSC: 0895 (March 1999)

HEXACHLOROBENZENE ICSC: 0895

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-WHITE SOLID IN VARIOUS FORMS.

**Physical dangers** 

Chemical dangers

Decomposes on heating. This produces toxic fumes.

Formula: C<sub>6</sub>Cl<sub>6</sub>

Molecular mass: 284.8 Boiling point: 323-326°C Melting point: 231°C Density: 1.21 g/cm³

Solubility in water, g/100ml at 20°C: 0.0000005

Vapour pressure, Pa at 20°C: 0.001 Relative vapour density (air = 1): 9.8

Flash point: 242°C c.c.

Octanol/water partition coefficient as log Pow: 5.5/6.2

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

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

### Effects of short-term exposure

### Inhalation risk

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

### Effects of long-term or repeated exposure

The substance may have effects on the liver and nervous system. This may result in impaired functions of organs and skin lesions. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.002 mg/m<sup>3</sup>, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: skin absorption (H); carcinogen category: 4; pregnancy risk group: D

### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in plants and fish. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

### **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home.

### ADDITIONAL INFORMATION

### **EC Classification**

Symbol: T, N; R: 45-48/25-50/53; S: 53-45-60-61; Note: E

### INDENO(1,2,3-cd)PYRENE ICSC: 0730 (March 1999) o-Phenylenepyrene 2,3-Phenylenepyrene

CAS #: 193-39-5

EC Number: 205-893-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	





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### INDENO(1,2,3-cd)PYRENE ICSC: 0730

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

YELLOW CRYSTALS.

Physical dangers

Chemical dangers

Upon heating, toxic fumes are formed. Decomposes on heating. This

produces toxic fumes.

Formula: C<sub>22</sub>H<sub>12</sub> Molecular mass: 276.3 Boiling point: 536°C Melting point: 164°C Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.58

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

### Inhalation risk

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

for the interpretation and use of the information contained in this

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

### **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); carcinogen category: 2

### **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.

### **NOTES**

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

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material.

**ISOPHORONE** ICSC: 0169 (October 2000)

1,1,3-Trimethyl-3-cyclohexene-5-one 3,5,5-Trimethylcyclohex-2-enone

Isoacetophorone

CAS #: 78-59-1

EC Number: 201-126-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
1		l '	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Sore throat. Cough. Dizziness. Headache. Nausea. Shortness of breath.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain. Blurred vision.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation	
STORAGE	UN Classification	
Separated from strong oxidants, strong bases and amines.		
PACKAGING		





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ISOPHORONE ICSC: 0169

### PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Reacts with strong oxidants, strong bases and amines.

Formula: C<sub>9</sub>H<sub>14</sub>O Molecular mass: 138.2 Boiling point: 215°C Melting point: -8°C

Relative density (water = 1): 0.92 Solubility in water, g/100ml at 25°C: 1.2 Vapour pressure, Pa at 20°C: 40 Relative vapour density (air = 1): 4.8 Flash point: 84°C c.c.

Auto-ignition temperature: 460°C Explosive limits, vol% in air: 0.8-3.8

Octanol/water partition coefficient as log Pow: 1.67

### **EXPOSURE & HEALTH EFFECTS**

### Routes of exposure

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

### Effects of short-term exposure

The substance and the vapour are irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system.

### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at  $20^{\circ}\text{C}$ .

Effects of long-term or repeated exposure

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 11 mg/m<sup>3</sup>, 2 ppm; peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

### **ENVIRONMENT**

### **NOTES**

The occupational exposure limit value should not be exceeded during any part of the working exposure.

### **ADDITIONAL INFORMATION**

### EC Classification

Symbol: Xn; R: 21/22-36/37-40; S: (2)-13-23-36/37/39-46

NAPHTHALENE ICSC: 0667 (June 2015)

Naphthene

CAS #: 91-20-3

UN #: 1334 (solid) UN #: 2304 (molten)

EC Number: 202-049-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Combustible. Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.		Use water spray, powder, foam, carbon dioxide.

	PREVENT DISPERSION OF DUST!				
	SYMPTOMS PREVENTION FIRST AID				
Inhalation	Headache. Weakness. Sweating. Nausea. Vomiting. Further see Ingestion.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air. Refer for medical attention.		
Skin	See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.		
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).		
Ingestion	Abdominal pain. Diarrhoea. Sweating. Headache. Fever. Jaundice. Weakness. Dark-coloured urine. Symptoms may be delayed.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.		

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: filter respirator for organic gases and vapours According to UN GHS Criteria adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. **WARNING STORAGE** Flammable solid Harmful if swallowed Separated from strong oxidants and food and feedstuffs. Store in May be harmful in contact with skin an area without drain or sewer access. Provision to contain Suspected of causing cancer effluent from fire extinguishing. Very toxic to aquatic life with long lasting effects **PACKAGING** Transportation UN Classification Do not transport with food and feedstuffs. UN Hazard Class: 4.1; UN Pack Group: III Marine pollutant.



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NAPHTHALENE ICSC: 0667

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

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

Chemical dangers

On combustion, forms irritating and toxic gases. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: C<sub>10</sub>H<sub>8</sub> Molecular mass: 128.18 Boiling point: 218°C Sublimes at room temperature

Melting point: 80°C Density: 1.16 g/cm³

Solubility in water at 20°C: very poor Vapour pressure, Pa at 25°C: 11 Relative vapour density (air = 1): 4.42

Flash point: 80°C c.c.

Auto-ignition temperature: 540°C Explosive limits, vol% in air: 0.9-5.9

Octanol/water partition coefficient as log Pow: 3.35

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance may cause effects on the blood. This may result in lesions of blood cells (haemolysis). See Notes. The effects may be delayed. Ingestion could cause death. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

## Effects of long-term or repeated exposure

The substance may have effects on the blood. This may result in chronic haemolytic anaemia. The substance may have effects on the eyes. This may result in development of cataract. This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 10 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

EU-OEL: 50 mg/m<sup>3</sup>, 10 ppm as TWA.

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur along the food chain, for example in fish.

# **NOTES**

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: Xn, N; R: 22-40-50/53; S: (1/2)-26-36/37/39-45-46-60-61

NITROBENZENE ICSC: 0065 (April 2006)

CAS #: 98-95-3 UN #: 1662

EC Number: 202-716-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 88°C explosive vapour/air mixtures may be formed. Risk of fire and explosion. See Chemical Dangers.	NO open flames. Above 88°C use a closed system and ventilation.	Use water spray, alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Headache. Blue lips, fingernails and skin. Blue lips, fingernails and skin. Dizziness. Nausea. Weakness. Confusion. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .	
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .	

## SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Personal protection: complete protective clothing including self-According to UN GHS Criteria contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. **DANGER STORAGE** Harmful if swallowed Toxic in contact with skin or if inhaled Separated from combustible substances, reducing agents, strong Suspected of causing cancer oxidants, strong acids and food and feedstuffs. Store in an area Suspected of damaging fertility or the unborn child without drain or sewer access. May cause damage to blood cells Harmful to aquatic life with long lasting effects Transportation **PACKAGING UN Classification** UN Hazard Class: 6.1; UN Pack Group: II Do not transport with food and feedstuffs.



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## NITROBENZENE ICSC: 0065

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

PALE YELLOW OILY LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers

On combustion, forms toxic and corrosive fumes including nitrogen oxides. Reacts violently with strong oxidants and reducing agents. This generates fire and explosion hazard. Reacts violently with strong acids and nitrogen oxides. This generates explosion hazard.

Formula: C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub> Molecular mass: 123.1 Boiling point: 211°C Melting point: 5°C

Relative density (water = 1): 1.2 Solubility in water, g/100ml: 0.2 Vapour pressure, Pa at 20°C: 20 Relative vapour density (air = 1): 4.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Flash point: 88°C c.c.

Auto-ignition temperature: 480°C Explosive limits, vol% in air: 1.8-40

Octanol/water partition coefficient as log Pow: 1.86

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance may cause effects on the blood. This may result in the formation of methaemoglobin. Exposure could cause lowering of consciousness. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

## Effects of long-term or repeated exposure

The substance may have effects on the blood, spleen and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 0.51 mg/m<sup>3</sup>, 0.1 ppm; peak limitation category: II(4); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 1 mg/m<sup>3</sup>, 0.2 ppm as TWA; (skin)

## **ENVIRONMENT**

The substance is harmful to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Use of alcoholic beverages enhances the harmful effect.

Depending on the degree of exposure, periodic medical examination is suggested.

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home.

## **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: T, N; R: 23/24/25-40-48/23/24-51/53-62; S: (1/2)-28-36/37-45-61

# N-NITROSODIMETHYLAMINE

Dimethylnitrosamine N-Methyl-N-nitrosomethylamine

DMN

CAS #: 62-75-9 UN #: 2810

EC Number: 200-549-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Sore throat. Cough. Nausea. Diarrhoea. Vomiting. Headache. Weakness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
Eyes	Pain. Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal cramps. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1; UN Pack Group: I
Separated from strong oxidants and food and feedstuffs. Cool. Keep in the dark. Well closed.	
PACKAGING	
Do not transport with food and feedstuffs. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	



International Labour Organization



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ICSC: 0525 (March 2001)

**N-NITROSODIMETHYLAMINE** ICSC: 0525

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

YELLOW OILY LIQUID.

Physical dangers

Chemical dangers

Decomposes on heating. This produces nitrogen oxides. Reacts with

strong oxidants and strong bases.

Formula:  $C_2H_6N_2O / (CH_3)_2NN=O$ 

Molecular mass: 74.1 Boiling point: 151°C

Relative density (water = 1): 1.0 Solubility in water: very good Vapour pressure, Pa at 20°C: 360 Relative vapour density (air = 1): 2.56

Flash point: 61°C

Octanol/water partition coefficient as log Pow: -0.57

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

## Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the liver. This may result in jaundice. The effects may be delayed. See Notes. Medical observation is indicated.

#### Inhalation risk

No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

## Effects of long-term or repeated exposure

The substance may have effects on the liver. This may result in liver function impairment and cirrhosis. This substance is probably carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: skin absorption (H); carcinogen category: 2

## **ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

# **NOTES**

The symptoms of jaundice do not become manifest until some hours have passed.

TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T+, N; R: 45-25-26-48/25-51/53; S: 53-45-61; Note: E



# TCI AMERICA SAFETY DATA SHEET

Revision number: 3 Revision date: 10/17/2016

## 1. IDENTIFICATION

Product name: N-Nitrosodipropylamine

Product code: N0444

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International) Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

# 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 4]

Germ Cell Mutagenicity [Category 2] Carcinogenicity [Category 2] Toxic to Reproduction [Category 2]

Specific Target Organ Toxicity (Single Exposure) [Category 2]

Aquatic Hazard (Acute) [Category 2] Aquatic Hazard (Long-Term) [Category 2]

Signal word: Warning!

Hazard Statement(s): Harmful if swallowed

Suspected of causing cancer Suspected of causing genetic defects

Suspected of damaging fertility or the unborn child

Toxic to aquatic life

Toxic to aquatic life with long lasting effects May cause damage to organs: Liver

#### Pictogram(s) or Symbol(s):







Precautionary Statement(s):

[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Do not breathe fume, mist, vapors or spray. Wash all exposed skin thoroughly after handling.

[Response] If swallowed: Immedia

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If exposed: Call a poison center or doctor. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison

center or doctor.

[Storage] Store locked up.
[Disposal] Dispose of conte

Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

N-Nitrosodipropylamine TCI AMERICA Page 2 of 6

## 2. HAZARD(S) IDENTIFICATION

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: N-Nitrosodipropylamine

 $\begin{array}{lll} \textbf{Percent:} & > 98.0\% (GC) \\ \textbf{CAS Number:} & 621-64-7 \\ \textbf{Molecular Weight:} & 130.19 \\ \textbf{Chemical Formula:} & C_6H_{14}N_2O \\ \end{array}$ 

Synonyms: Dipropylnitrosamine

# 4. FIRST-AID MEASURES

Inhalation: Call emergency medical service. Effects of exposure (inhalation) to substance may be delayed. Inhalation

of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are

aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Effects of exposure (skin contact) to substance may be

delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Eye contact: If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water,

occasionally lifting the lower and upper eyelids. If eye irritation persists get medical advice/attention. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat

symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Effects of exposure (ingestion) to substance may be delayed. If swallowed, seek

medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: No data available

**Delayed:** May cause heritable genetic damage in humans. Possibly carcinogenic to humans.

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is harmful. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub>, water spray, or alcohol-resistant foam. Consult with local fire authorities before

attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Nitrogen oxides Other specific hazards: Closed containers may explode from heat of a fire.

## Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

## Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

# 6. ACCIDENTAL RELEASE MEASURES

N-Nitrosodipropylamine TCI AMERICA Page 3 of 6

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Splash goggles. Wear protective clothing (chemical resistant suit and chemical resist

Splash goggles. Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

nitrile)

Emergency procedures: Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always

shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move

away. Prevent entry into sewers, basements or confined areas; dike if needed.

#### Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

#### **Environmental precautions:**

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

#### 7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest.

Avoid contact with skin and eyes. Avoid contact - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Avoid exposure - obtain special instructions before use. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face

protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from

incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent

leakage. Avoid prolonged storage periods.

Storage incompatibilities: Store away from oxidizing agents

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

#### Appropriate engineering controls:

Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

## Personal protective equipment

**Respiratory protection:** Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Wear protective gloves. Eye protection: Splash goggles.

**Skin and body protection:** Wear protective clothing (chemical resistant suit and chemical resistant boots).

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Color: Pale yellow - Yellow
Odor: No data available
Odor threshold: No data available

Melting point/freezing point: No data available pH: No data available Boiling point/range: 113°C (235°F)/5.3kPa Vapor pressure: 0.01kPa/20°C No data available No data available **Decomposition temperature:** Vapor density: Relative density: 0.92 **Dynamic Viscosity:** No data available

Kinematic Viscosity: No data available

Partition coefficient: 1.36 Evaporation rate: No data available n-octanol/water (log Pow) (Butyl Acetate = 1)

N-Nitrosodipropylamine TCI AMERICA Page 4 of 6

9. PHYSICAL AND CHEMICAL PROPERTIES

Flash point: 100°C (212°F) Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

Water: Soluble

Soluble: Many organic solvents

# 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials:

Hazardous Decomposition Products:

Oxidizing agents

No data available

# 11. TOXICOLOGICAL INFORMATION

RTECS Number: JL9700000

**Acute Toxicity:** 

orl-rat LD50:480 mg/kg scu-rat LD50:487 mg/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

dnd-hmn-kdy 10 mmol/L dns-hmn-hla 100 umol/L

dns-hmn-lvr 1800 umol/L

Carcinogenicity:

orl-rat TDLo:660 mg/kg/60W-l scu-ham TD:143 mg/kg/38W-l

IARC: Group 2B (Possibly carcinogenic NTP: b (Reasonably anticipated to be OSHA: No data available

to humans) . carcinogens).

Reproductive toxicity:

No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irritatation. May be harmful if inhaled or ingested.

Target organ(s):

May cause damage to organs: Liver

# 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available
Crustacea: No data available
Algae: No data available

N-Nitrosodipropylamine TCI AMERICA Page 5 of 6

12. ECOLOGICAL INFORMATION

Persistence and degradability:

Bioaccumulative potential (BCF):

Mobillity in soil:

No data available

No data available

Partition coefficient: 1.36

n-octanol/water (log Pow)
Soil adsorption (Koc): 130
Henry's Law: 0.5
constant (PaM³/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3082 Environmentally hazardous substance, liquid, 9 Miscellaneous hazardous III

n.o.s. material

IATA

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3082 Environmentally hazardous substance, liquid, 9 Miscellaneous hazardous III

n.o.s. material

**IMDG** 

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3082 Environmentally hazardous substance, liquid, 9 Miscellaneous hazardous III

n.o.s. material

EmS number: F-A, S-F

# 15. REGULATORY INFORMATION

# Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

# **US Federal Regulations**

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Listed SARA 302: Not Listed

**State Regulations** 

State Right-to-Know

MassachusettsListedNew JerseyNot ListedPennsylvaniaListedCalifornia Proposition 65:Listed

Other Information

NFPA Rating: HMIS Classification:

N-Nitrosodipropylamine TCI AMERICA Page 6 of 6

# 15. REGULATORY INFORMATION

**International Inventories** 

WHMIS hazard class: D2A: Materials causing other toxic effects. (Very Toxic)

D2B: Materials causing other toxic effects. (Toxic)

**EC-No**: 210-698-0

## 16. OTHER INFORMATION

Revision date: 10/17/2016 Revision number: 3

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

# N-NITROSODIPHENYLAMINE

Diphenylnitrosamine

N-Nitroso-N-phenyl benzenamine

N-nitroso-N-phenylaniline Nitrous diphenylamide

CAS #: 86-30-6

EC Number: 201-663-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
l .	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria
STORAGE	Transportation
Separated from strong oxidants. Store in an area without drain or sewer access.	UN Classification
PACKAGING	
	1





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ICSC: 0526 (November 2003)

# N-NITROSODIPHENYLAMINE ICSC: 0526

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

YELLOW FLAKES.

Physical dangers

Chemical dangers

Decomposes on burning. This produces nitrogen oxides. Reacts

vigorously with oxidants.

Formula: C<sub>12</sub>H<sub>10</sub>N<sub>2</sub>O Molecular mass: 198.2 Boiling point: 101°C Melting point: 66.5°C Density: 1.23 g/cm³ Solubility in water: none

Octanol/water partition coefficient as log Pow: 2.57/3.13

## **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

Inhalation risk

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

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: carcinogen category: 3

## **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

# **ADDITIONAL INFORMATION**

EC Classification

PENTACHLOROPHENOL ICSC: 0069 (August 2003)

CAS #: 87-86-5 UN #: 3155

EC Number: 201-778-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Liquid formulations containing organic solvents may be flammable.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Cough. Dizziness. Drowsiness. Headache. Fever. Laboured breathing. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Redness. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention . Wear protective gloves when administering first aid.	
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal cramps. Diarrhoea. Nausea. Unconsciousness. Vomiting. Weakness. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Give one or two glasses of water to drink. Refer for medical attention.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit and filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Keep in a well-ventilated room.	
PACKAGING	
Do not transport with food and feedstuffs. Severe marine pollutant.	
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Labour Organization



Organization

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PENTACHLOROPHENOL ICSC: 0069

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE CRYSTALS OR SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

Decomposes above 200°C . This produces toxic and corrosive fumes including dioxins. Reacts violently with strong oxidants.

Formula: C<sub>6</sub>Cl<sub>5</sub>OH Molecular mass: 266.4 Decomposes at 309°C Melting point: 191°C Density: 1.98 g/cm³

Solubility in water, g/100ml at 20°C: 0.001 Vapour pressure, Pa at 20°C: 0.02 Relative vapour density (air = 1): 9.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00

Octanol/water partition coefficient as log Pow: 5.01

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

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

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the cardiovascular system. This may result in cardiac disorders and heart failure.

#### Inhalation risk

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

## Effects of long-term or repeated exposure

The substance may have effects on the central nervous system, kidneys, liver, lungs, immune system and thyroid. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.5 mg/m<sup>3</sup>, as TWA; 1 mg/m<sup>3</sup> as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: skin absorption (H); carcinogen category: 2

## **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

# **NOTES**

The commercial product may contain very toxic impurities (dioxins).

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

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T+, N; R: 24/25-26-36/37/38-40-50/53; S: (1/2)-22-36/37-45-52-60-61





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1 Identification

Product identifier

Product name: Phenanthrene

Stock number: L01921

CAS Number: 85-01-8 EC number:

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Manufacturer/Supplier:

Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

Thermo Fisher Scientific S. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech @alfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

#### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS07

Acute Tox. 4 H302 Harmful if swallowed.

Hazards not otherwise classified No information known.

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



Signal word Warning

Hazard statements
H302 Harmful if swallowed.

Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/.../if you feel unwell.

P330 Rinse mouth.

Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)



Health (acute effects) = 1

Flammability = 1

Flammability = 1

Flammability = 1

Physical Hazard = 1

Other hazards Results of PBT and vPvB assessment PBT: Not applicable. vPvB: Not applicable.

# 3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description: 85-01-8 Phenanthrene Identification number(s): EC number: 201-581-5

#### 4 First-aid measures

# Description of first aid measures

After inhalation

Supply fresh air. If required, provide artificial respiration. Keep patient warm. Seek immediate medical advice.

After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor. After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available. Indication of any immediate medical attention and special treatment needed No further relevant information available.

## 5 Fire-fighting measures

Extinguishing media

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

(Contd. on page 2)

(Contd. of page 1)

## Product name: Phenanthrene

Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Advice for firefighters Protective equipment:

Wear self-contained respirator. Wear fully protective impervious suit.

## 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

Wear protective equipment. Keep unprotected persons away Ensure adequate ventilation

Environmental precautions: Do not allow product to reach sewage system or any water course.

Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.

Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

#### 7 Handling and storage

Handling Precautions for safe handling

Keep container tightly sealed. Store in cool, dry place in tightly closed containers. Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Storage
Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Store away from oxidizing agents.

Further information about storage conditions:

Keep container tightly sealed. Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

#### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: No data

Exposure controls

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an exponentially appropriate working equipment.

wash hands before breaks and at the end of work.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Recommended filter device for short term use:

Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if airpurifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.

Protection of hands:

Impervious glosses

Impervious gloves

Check protective gloves prior to each use for their proper condition.

The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Nitrile rubber, NBR

Penetration time of glove material (in minutes) 480
Glove thickness 0.11 mm
Eye protection: Safety glasses
Body protection: Protective work clothing.

#### 9 Physical and chemical properties

Information on basic physical and chemical properties General Information

Appearance: Form:

pH-value:

Crystalline powder or flakes White to pale brown

Color: Odor: Not determined Odor threshold: Not determined

Change in condition

Melting point/Melting range: Boiling point/Boiling range: 97-101 °C (207-214 °F) 340 °C (644 °F)

Sublimation temperature / start: Not determined 171 °C (340 °F) Flash point: Flammability (solid, gaseous) Ignition temperature: Not determined. Not determined

Decomposition temperature: Not determined Auto igniting: Not determined

Danger of explosion: Explosion limits: Lower:

Not determined. Not determined

Not applicable.

(Contd. on page 3)

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(Contd. of page 2)

Product name: Phenanthrene

Not determined Not applicable.

0.98 g/cm³ (8.178 lbs/gal) Not determined.

Upper: Vapor pressure: Density at 20 °C (68 °F): Relative density Vapor density Not applicable. Not applicable. Evaporation rate Solubility in / Miscibility with

Water:

Partition coefficient (n-octanol/water): Not determined. Viscosity:

dynamic: Not applicable. kinematic:

Not applicable. No further relevant information available. Other information

Insoluble

#### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents

Conditions to avoid No further relevant information available.

Incompatible materials: Oxidizing agents

Hazardous decomposition products: Carbon monoxide and carbon dioxide

# 11 Toxicological information

#### Information on toxicological effects

Acute toxicity:
Harmful if swallowed.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

#### LD/LC50 values that are relevant for classification:

Oral LD50 1800 mg/kg (rat)

Skin irritation or corrosion: May cause irritation

Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.

Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance. No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

# 12 Ecological information

Aquatic toxicity: No further relevant information available.

Persistence and degradability No further relevant information available.

Bioaccumulative potential No further relevant information available.

Mobility in soil No further relevant information available.

Ecotoxical effects:

Remark: Very toxic for aquatic organisms
Additional ecological information:

General notes: Do not allow product to reach ground water, water course or sewage system, even in small quantities.

Danger to drinking water if even extremely small quantities leak into the ground. Also poisonous for fish and plankton in water bodies. May cause long lasting harmful effects to aquatic life.

Avoid transfer into the environment.

Very toxic for aquatic organisms
Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable

Other adverse effects No further relevant information available.

## 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:

Recommendation: Disposal must be made according to official regulations.

# 14 Transport information

**UN-Number** 

DOT, IMDG, IATA

UN proper shipping name

IMDG, IATA

Environmentally hazardous substances, solid, n.o.s. (Phenanthrene) ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Phenanthrene)

Transport hazard class(es)

DOT, IMDG



Class 9 Miscellaneous dangerous substances and articles.

UN3077

(Contd. on page 4)

# Product name: Phenanthrene (Contd. of page 3) I ahel 9 9 (M7) Miscellaneous dangerous substances and articles Class IATA Class 9 Miscellaneous dangerous substances and articles. I abel Packing group DOT, IMDG, IATA Ш Environmental hazards: Special marking (ADR): Special marking (IATA): Symbol (fish and tree) Symbol (fish and tree) Warning: Miscellaneous dangerous substances and articles F-A,S-F Special precautions for user EMS Number: Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable. Transport/Additional information: Marine Pollutant (DOT): UN "Model Regulation": UN3077, Environmentally hazardous substances, solid, n.o.s. (Phenanthrene), 9,

## 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms



Signal word Warning Hazard statements

Hazara statements
H302 Harmful if swallowed.

Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/.../if you feel unwell.

P330 Rinse mouth.

Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory. All components of this product are listed on the Canadian Domestic Substances List (DSL)

SARA Section 313 (specific toxic chemical listings)

# 85-01-8 Phenanthrene

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitations of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the

market and use must be observed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed. Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

## 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

# Department issuing SDS: Global Marketing Department

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Information System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
VPWB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

USA

10/26/21, 1:03 PM ICSC 0070 - PHENOL

PHENOL ICSC: 0070 (April 2017)

Carbolic acid Phenic acid Hydroxybenzene

CAS #: 108-95-2 UN #: 1671

EC Number: 203-632-7

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Vapour/air mixtures may be formed	isimna ayinizina anenis Anave 79 C.	Use water spray, alcohol-resistant foam, powder, carbon dioxide.

AVOID ALL CONTACT! FIRST AID: USE PERSONAL PROTECTION. IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Burning sensation. Cough. Dizziness. Headache. Shortness of breath. Laboured breathing. Unconsciousness. Symptoms may be delayed. See Notes.	Avoid inhalation of dust and mist. Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED! Serious skin burns. Numbness. Convulsions. Collapse. Unconsciousness.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. To remove substance use polyethylene glycol 300 or vegetable oil. Refer immediately for medical attention.
Eyes	Pain. Redness. Loss of vision. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Sore throat. Burns in mouth and throat. Convulsions. Abdominal pain. Diarrhoea. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	Toxic if swallowed or in contact with skin Causes severe skin burns and eye damage
Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Dry. Well closed. Store only in original container. Keep in a well-ventilated room. Store in an area without drain or sewer access.	Suspected of causing genetic defects Causes damage to central nervous system, the heart and kidneys Causes damage to organs through prolonged or repeated exposure May cause respiratory irritation Toxic to aquatic life
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: II

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10/26/21, 1:03 PM ICSC 0070 - PHENOL

PHENOL ICSC: 0070

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

COLOURLESS-TO-YELLOW OR LIGHT PINK CRYSTALS WITH CHARACTERISTIC ODOUR.

**Physical dangers** 

Chemical dangers

The solution in water is a weak acid. Reacts with oxidants. This generates fire and explosion hazard.

Formula: C<sub>6</sub>H<sub>6</sub>O / C<sub>6</sub>H<sub>5</sub>OH Molecular mass: 94.1 Boiling point: 182°C Melting point: 41°C Density: 1.06 g/cm³

Solubility in water, g/l at 20°C: 84 (moderate)

Vapour pressure, Pa at 20°C: 47 Relative vapour density (air = 1): 3.2

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0

Flash point: 79°C c.c.

Auto-ignition temperature: 715°C Explosive limits, vol% in air: 1.3-9.5

Octanol/water partition coefficient as log Pow: 1.46

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

Serious local effects by all routes of exposure.

#### Effects of short-term exposure

The substance and the vapour are corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation of the vapour may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. See Notes. The substance may cause effects on the central nervous system, heart and kidneys. This may result in convulsions, coma, cardiac disorders, respiratory failure and collapse. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

#### Effects of long-term or repeated exposure

The substance may have effects on the liver, kidneys and nervous system.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued. MAK: skin absorption (H); carcinogen category: 3; germ cell mutagen group: 3B.

EU-OEL: 8 mg/m<sup>3</sup>, 2 ppm as TWA; 16 mg/m<sup>3</sup>, 4 ppm as STEL; (skin)

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms.

## **NOTES**

Other UN numbers: 2312 (molten); 2821 (solution).

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

#### ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T, C, Xn; R: 23/24/25-34-48/20/21/22-68; S: (1/2)-24/25-26-28-36/37/39-45

PYRENE ICSC: 1474 (November 2003)

Benzo (d,e,f) phenanthrene

beta-Pyrene

10/26/21, 1:03 PM

CAS #: 129-00-0

EC Number: 204-927-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	, ,	INO open liarnes, NO sparks and NO	Use water spray, carbon dioxide, dry powder, alcohol-resistant foam, polymer foam.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Avoid inhalation of dust.	Fresh air, rest.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification
Separated from strong oxidants. Keep in a well-ventilated room.	
PACKAGING	
Do not transport with food and feedstuffs.	





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10/26/21, 1:03 PM ICSC 1474 - PYRENE

PYRENE ICSC: 1474

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

PALE YELLOW OR COLOURLESS SOLID IN VARIOUS FORMS.

Physical dangers

Chemical dangers

Decomposes on heating. This produces irritating fumes.

Formula: C<sub>16</sub>H<sub>10</sub>
Molecular mass: 202.26
Boiling point: 404°C
Melting point: 151°C
Density: 1.27 g/cm³

Solubility in water, mg/l at 25°C: 0.135 Vapour pressure, Pa at ?°C: 0.08

Octanol/water partition coefficient as log Pow: 4.88

# **EXPOSURE & HEALTH EFFECTS**

# Routes of exposure

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

#### Effects of short-term exposure

Exposure to sun may enhance the irritating effect of this substance. This may result in chronic skin discoloration.

## Inhalation risk

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

Effects of long-term or repeated exposure

## **OCCUPATIONAL EXPOSURE LIMITS**

MAK skin absorption (H)

## **ENVIRONMENT**

Bioaccumulation of this chemical may occur in crustacea, fish, milk, algae and molluscs. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles.

However, pyrene may be encountered as a laboratory chemical in its pure form.

Health effects of exposure to the substance have not been investigated adequately.

See ICSC 1415.

# **ADDITIONAL INFORMATION**

**EC Classification** 

# ALUMINIUM POWDER (pyrophoric)

CAS #: 7429-90-5 UN #: 1396 (uncoated) EC Number: 231-072-3

ALUMINIUM POWDER (pyrophoric)	ICSC: 0988 (November 2019)
Aluminum powder	
CAS #: 7429 90 5	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	dispersed particles form explosive mixtures in air. Risk of fire and	NO contact with acids, alcohol, oxidizing agents or water. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, special powder. NO water. NO carbon dioxide, foam.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

CLASSIFICATION & LABELLING
According to UN GHS Criteria
DANGER Catches fire spontaneously if exposed to air In contact with water releases flammable gases
Transportation UN Classification
UN Hazard Class: 4.3; UN Pack Group: II





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## ALUMINIUM POWDER (pyrophoric)

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

SILVERY-WHITE-TO-GREY POWDER.

#### **Physical dangers**

Ignites in air when finely divided. Dust explosion possible if in powder or granular form, mixed with air.

#### Chemical dangers

Reacts with water and alcohols. Reacts violently with oxidants, strong acids, strong bases, chlorinated hydrocarbons and halogens. This generates fire and explosion hazard.

Formula: Al Atomic mass: 27.0 Boiling point: 2327°C Melting point: 660°C Density: 2.7 g/cm³ Solubility in water: reaction

Auto-ignition temperature: 400°C (powder)

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

## Inhalation risk

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

ICSC: 0988

## Effects of long-term or repeated exposure

Repeated or prolonged inhalation of dust particles may cause effects on the lungs. The substance may have effects on the nervous system. This may result in impaired functions.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 1 mg/m<sup>3</sup>, as TWA; A4 (not classifiable as a human carcinogen).

MAK: (inhalable fraction): 4 mg/m<sup>3</sup>; (respirable fraction): 1.5 mg/m<sup>3</sup>; pregnancy risk group: D

## **ENVIRONMENT**

## **NOTES**

Other UN number: UN1309 Aluminium powder, coated, Hazard class 4.1, Pack group II.

# **ADDITIONAL INFORMATION**

## **EC Classification**

H250; H261 / H228; H261

ANTIMONY ICSC: 0775 (October 2006)
Antimony black

Antimony regulus Stibium

CAS #: 7440-36-0 UN #: 2871

EC Number: 231-146-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with acids or halogens.	NO open flames. NO contact with oxidizing agents, halogens or acids. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!				
	FIRST AID			
Inhalation	Cough. See Ingestion.  Use local exhaust or breathing protection.		Fresh air, rest.	
Skin	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.		
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Separated from oxidants, acids, halogens and food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: III
PACKAGING	
Do not transport with food and feedstuffs.	





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European Commission ANTIMONY ICSC: 0775

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

SILVER-WHITE LUSTROUS HARD BRITTLE LUMPS OR DARK GREY POWDER.

# Physical dangers

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

#### Chemical dangers

On combustion, forms toxic fumes of antimony oxides (see ICSC 0012). Reacts violently with oxidants, acids, halogens and powdered metals. This generates fire and explosion hazard. Contact with acids may generate toxic gas (stibine - see ICSC 0776).

Formula: Sb Atomic mass: 121.8 Boiling point: 1635 °C Melting point: 630 °C Density: 6.7 g/cm³ Solubility in water: none

## **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol.

#### Effects of short-term exposure

May cause mechanical irritation to the eyes.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

## Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis especially when the skin is exposed to fumes. The substance may have effects on the lungs. This may result in pneumoconiosis.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.5 mg/m<sup>3</sup>, as TWA.

MAK: (including its inorganic compounds, except stibine): carcinogen category: 2; germ cell mutagen group: 3A

## **ENVIRONMENT**

# **NOTES**

Other boiling points: 1325°C, 1440°C, 1587 °C, 1750°C.

The recommendations on this card apply only to metallic antimony.

See ICSCs 0012, 0220, 0776 and 1224.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

ARSENIC ICSC: 0013 (June 2011)

Grey arsenic

CAS #: 7440-38-2 UN #: 1558

EC Number: 231-148-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	of fire and explosion on contact with	, , , ,	Use water spray, powder, foam, carbon dioxide.

PREVE	PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
SYMPTOMS PREVENTION		PREVENTION	FIRST AID	
Inhalation	See Ingestion.	Use closed system and ventilation.	Fresh air, rest. Seek medical attention if you feel unwell.	
Skin	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.		
Eyes	Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).		
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting. Weakness. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer immediately for medical attention.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER Toxic if swallowed
Separated from strong oxidants, acids, halogens and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	May cause cancer Suspected of damaging fertility or the unborn child Causes damage to the gastrointestinal tract if swallowed Causes damage to organs through prolonged or repeated exposure Toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
Do not transport with food and feedstuffs.	UN Hazard Class: 6.1; UN Pack Group: II
CM-4002W17 10954W12973	



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ARSENIC ICSC: 0013

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

BRITTLE GREY METALLIC-LOOKING CRYSTALS.

**Physical dangers** 

No data.

Chemical dangers

Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens. This generates fire and explosion hazard. Reacts with reducing agents. This produces toxic and flammable arsine gas (See ICSC 0222).

Formula: As Atomic mass: 74.9 Sublimation point: 613°C Density: 5.7 g/cm³ Solubility in water: none Auto-ignition temperature: 180°C

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

#### Effects of short-term exposure

The substance may cause effects on the gastrointestinal tract. This may result in severe gastroenteritis, loss of fluids and electrolytes, cardiac disorders, shock and convulsions. Exposure far above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

#### Effects of long-term or repeated exposure

The substance may have effects on the skin, mucous membranes, peripheral nervous system, liver and bone marrow. This may result in pigmentation disorders, hyperkeratosis, perforation of the nasal septum, neuropathy, anaemia and liver impairment. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3A

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

The substance is combustible but no flash point is available in literature.

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T, N; R: 23/25-50/53; S: (1/2)-20/21-28-45-60-61

**BARIUM** ICSC: 1052 (October 1999)

CAS #: 7440-39-3 UN #: 1400

EC Number: 231-149-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
cause fire or explosion. Finely dispersed particles form explosive	IL JOSEA SYSTEM ALIST EXPLOSION-PROOF	Use special powder, dry sand. NO water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	FIRST AID	
Inhalation	alation Cough. Sore throat.  Use local exhaust or breathing protection.		Fresh air, rest. Refer for medical attention.
Skin	Redness. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .	
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Do not eat, drink, or smoke during work.		Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: chemical protection suit including self- contained breathing apparatus. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation	
STORAGE	UN Classification UN Hazard Class: 4.3; UN Pack Group: II	
Separated from halogenated solvents, strong oxidants and acids. Dry. Keep under inert gas, oil or oxygen-free liquid.		
PACKAGING		





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BARIUM ICSC: 1052

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

YELLOWISH-TO-WHITE LUSTROUS SOLID IN VARIOUS FORMS.

#### Physical dangers

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

## Chemical dangers

The substance, if in powder form, may ignite spontaneously on contact with air. The substance is a strong reducing agent. It reacts violently with oxidants and acids. Reacts violently with halogenated solvents. Reacts with water. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Ba Atomic mass: 137.3 Boiling point: 1640°C Melting point: 725°C Density: 3.6 g/cm³ Solubility in water: reaction

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by ingestion.

#### Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

Effects of long-term or repeated exposure

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.5 mg/m<sup>3</sup>, as TWA; A4 (not classifiable as a human carcinogen).

MAK: (as Ba, inhalable fraction): 0.5 mg/m<sup>3</sup>; peak limitation category: II(8); pregnancy risk group: D.

EU-OEL: (as Ba): 0.5 mg/m<sup>3</sup> as TWA

## **ENVIRONMENT**

#### **NOTES**

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

## **ADDITIONAL INFORMATION**

#### **EC Classification**

BERYLLIUM ICSC: 0226 (November 2016)

Glucinium

CAS #: 7440-41-7 UN #: 1567

EC Number: 231-150-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	toxic fumes (or gases) in a fire. Finely		Use fine water spray, dry powder, dry sand. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!					
	SYMPTOMS PREVENTION FIRST AID				
Inhalation	Cough. Laboured breathing. Shortness of breath. Sore throat. Symptoms may be delayed. See Notes.	Use closed system.	Fresh air, rest. Half-upright position. Refer for medical attention.		
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Wear protective gloves when administering first aid.		
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER Flammable solid Fatal if inhaled
Provision to contain effluent from fire extinguishing. Separated from strong acids, bases, chlorinated solvents and food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access.	May cause allergy or asthma symptoms or breathing difficulties if inhaled May cause an allergic skin reaction May cause cancer Causes damage to lungs if inhaled Causes damage to the lungs through prolonged or repeated
PACKAGING	exposure  May cause long lasting harmful effects to aquatic life
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 4.1; UN Pack Group: II



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BERYLLIUM ICSC: 0226

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

GREY SOLID IN VARIOUS FORMS.

### **Physical dangers**

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

## Chemical dangers

Reacts with strong acids and strong bases. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Mixtures with some chlorinated solvents, such as carbon tetrachloride and trichloroethylene are shock-sensitive. On combustion, forms toxic fumes including beryllium oxide (see ICSC 1325).

Formula: Be
Atomic mass: 9.0
Boiling point: >2400°C
Melting point: 1287°C
Density: 1.9 g/cm³
Solubility in water: insoluble

## **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

The substance can be absorbed into the body in hazardous amounts by inhalation of its aerosol and by ingestion.

#### Effects of short-term exposure

The substance is irritating to the respiratory tract. Inhalation of dust or fume may cause chemical pneumonitis. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

#### Effects of long-term or repeated exposure

Sensitization to the substance, through repeated or prolonged inhalation or skin contact, may result in serious granulomatous lung disease (chronic beryllium disease). This substance is carcinogenic to humans.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction): 0.00005 mg/m<sup>3</sup>, as TWA; A1 (confirmed human carcinogen); (skin); (SEN).

MAK: sensitization of respiratory tract and skin (SAH); carcinogen category: 1.

EU-OEL: (inhalable fraction): 0.0002 mg/m<sup>3</sup> as TWA; (skin and respiratory sensitizer); (see Notes)

## **ENVIRONMENT**

The substance may cause long-term effects in the aquatic environment.

#### **NOTES**

The substance is combustible but no flash point is available in literature.

The symptoms of acute pneumonitis following a massive short-term exposure do not become manifest until 3 days.

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

Isolate contaminated clothing by sealing in a bag or other container.

An EU-OEL of 0.0006 mg/m<sup>3</sup> is allowed until 11 July 2026.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T+; R: 49-25-26-36/37/38-43-48/23; S: 53-45; Note: E

CADMIUM ICSC: 0020 (April 2005)

CAS #: 7440-43-9 UN #: 2570

EC Number: 231-152-8

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
with air. Gives off irritating or toxic fumes (or gases) in a fire. Finely	NO open flames, NO sparks and NO smoking. NO contact with heat or acids. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand. Use special powder. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation
STORAGE	UN Classification UN Hazard Class: 6.1
Fireproof. Dry. Keep under inert gas. Separated from ignition sources, oxidants, acids and food and feedstuffs.	
PACKAGING	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.	





Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission. © ILO and WHO 2021



10/26/21, 1:36 PM ICSC 0020 - CADMIUM

CADMIUM ICSC: 0020

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER.
MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C. TARNISHES
ON EXPOSURE TO MOIST AIR.

Physical dangers

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

Chemical dangers

Reacts with acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). The dust reacts with oxidants, hydrogen azide, zinc, selenium and tellurium. This generates fire and explosion hazard.

Formula: Cd Atomic mass: 112.4 Boiling point: 765°C Melting point: 321°C Density: 8.6 g/cm³ Solubility in water: none

Auto-ignition temperature: 250°C (cadmium metal dust)

#### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

#### Effects of short-term exposure

The fume is irritating to the respiratory tract. Inhalation of fumes may cause lung oedema. See Notes. Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

#### Effects of long-term or repeated exposure

Repeated or prolonged inhalation of dust particles may cause effects on the lungs. The substance may have effects on the kidneys. This may result in kidney impairment. This substance is carcinogenic to humans.

## OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.01 mg/m<sup>3</sup>, as TWA; A2 (suspected human carcinogen); BEI issued.

MAK: (including its inorganic compounds, inhalable fraction): skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3A

EU-OEL: (inhalable fraction): 0.001 mg/m<sup>3</sup> as TWA; (see Notes)

## **ENVIRONMENT**

#### **NOTES**

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxide and halons.

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Do NOT take working clothes home.

UN numbers and packing group will vary according to the physical form of the substance.

An EU-OEL of 0.004 mg/m<sup>3</sup> is allowed until 11 July 2027.

# ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: T+, N; R: 45-26-48/23/25-62-63-68-50/53; S: 53-45-60-61; Note: E

# CALCIUM POWDER (pyrophoric)

CAS #: 7440-70-2 UN #: 1855

EC Number: 231-179-5

CALCIUM POWDER (pyrophoric)	ICSC: 1192 (November 2019)
Calcicat	

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
spontaneously on contact with air.	incompatible substances. PREVENT	NO water. Use special powder, dry sand. NO other agents. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact with water.

PREVENT DISPERSION OF DUST! IN ALL CASES CONSULT A DOCTOR!			
SYMPTOMS PREVENTION FIRST AID			
Inhalation	Sore throat. Cough. Burning sensation. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	Redness. Pain. Serious skin burns.	Protective gloves. Protective clothing.	Rinse contaminated clothes (fire hazard) with plenty of water. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Burns.	Wear safety goggles or face shield.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burning sensation. Abdominal pain. Abdominal cramps. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: complete protective clothing including self-contained breathing apparatus. Consult an expert! Remove all ignition sources. Cover the spilled material with dry sand or dry powder. Do NOT absorb in saw-dust or other combustible absorbents. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER
Fireproof. Dry. Well closed. Keep under inert gas. Separated from incompatible materials. See Chemical Dangers.	Catches fire spontaneously if exposed to air In contact with water releases flammable gases which may ignite spontaneously
PACKAGING	Causes severe skin burns and eye damage
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	Transportation UN Classification UN Hazard Class: 4.2; UN Pack Group: I
VANA LA	128 V





# CALCIUM POWDER (pyrophoric) ICSC: 1192

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

SILVERY-WHITE-TO-GREY POWDER.

**Physical dangers** 

Ignites in air when finely divided.

Chemical dangers

The substance is a strong reducing agent. Reacts with moisture, water, alcohols, halogens and many other substances. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: Ca
Atomic mass: 40.1
Boiling point: 1484°C
Melting point: 837-841°C
Density (at 20°C): 1,54 g/cm³
Solubility in water: reaction
Vapour pressure: negligible

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

Serious local effects by all routes of exposure.

Effects of short-term exposure

The substance is corrosive to the eyes, skin and respiratory tract.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis.

# **OCCUPATIONAL EXPOSURE LIMITS**

#### **ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

# **NOTES**

Reacts violently with fire extinguishing agents such as water, foam, halons and carbon dioxide.

Do NOT take working clothes home.

Health effects of exposure to the substance have not been investigated adequately.

#### ADDITIONAL INFORMATION

**EC Classification** 

H261

CHROMIUM	ICSC: 0029 (October 2004)
Chrome	
CAS #: 7440-47-3	
EC Number: 231-157-5	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions.	I CVCTAM GLICT AVNIACIAN NYAAT	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.	
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.	
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
PACKAGING	







CHROMIUM ICSC: 0029

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

GREY POWDER.

## **Physical dangers**

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

#### Chemical dangers

Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances, causing fire and explosion hazard.

Formula: Cr Atomic mass: 52.0 Boiling point: 2642°C Melting point: 1900°C Density: 7.15 g/cm³ Solubility in water: none

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of short-term exposure

May cause mechanical irritation to the eyes and respiratory tract.

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (as Cr(0), inhalable fraction): 0.5 mg/m<sup>3</sup>, as TWA

## **ENVIRONMENT**

## **NOTES**

The surface of the chromium particles is oxidized to chromium(III)oxide in air. See ICSC 1531.

# **ADDITIONAL INFORMATION**

**EC Classification** 

COBALT ICSC: 0782 (April 2004)

CAS #: 7440-48-4 EC Number: 231-158-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	form explosive mixtures in air. Risk of		Use special powder, dry sand. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!				
	SYMPTOMS PREVENTION FIRST AID			
Inhalation	Cough. Shortness of breath. Sore throat. Wheezing.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.	
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.	
Ingestion	Abdominal pain. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  Transportation UN Classification
STORAGE	
Separated from strong oxidants.	
PACKAGING	
	1







10/26/21, 1:36 PM ICSC 0782 - COBALT

COBALT ICSC: 0782

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

SILVER-GREY POWDER.

Physical dangers

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

Chemical dangers

The substance, when finely divided, may ignite spontaneously on contact with air and acetylene. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: Co Atomic mass: 58.9 Boiling point: 2870°C Melting point: 1493°C Density: 8.9 g/cm³ Solubility in water: none

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

The fume is irritating to the respiratory tract.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

## Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation may cause asthma. Repeated or prolonged inhalation may cause effects on the lungs. This substance is possibly carcinogenic to humans.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction): 0.02 mg/m³, as TWA; (DSEN); (RSEN); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: (inhalable fraction): skin absorption (H); sensitization of respiratory tract and skin (SAH); carcinogen category: 2; germ cell mutagen group: 3A

#### **ENVIRONMENT**

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish and molluscs.

# **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Anyone who has shown symptoms of asthma due to this substance should avoid all further contact.

Do NOT take working clothes home.

## **ADDITIONAL INFORMATION**

# **EC Classification**

Symbol: Xn; R: 42/43-53; S: (2)-22-24-37-61

COPPER ICSC: 0240 (November 2016)

CAS #: 7440-50-8 UN #: 3089

EC Number: 231-159-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
I FIRE OL	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames.	Use special powder, dry sand. NO other agents. Water may be ineffective.

PREVENT DISPERSION OF DUST!					
	SYMPTOMS	PREVENTION	FIRST AID		
Inhalation	Cough. Headache. Shortness of breath. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.		
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.		
Eyes	Redness. Pain.	Wear safety goggles.	Rinse with plenty of water (remove contact lenses if easily possible).		
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .		

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria	
STORAGE	DANGER	
See Chemical Dangers.	Flammable solid Harmful if swallowed Very toxic to aquatic life with long lasting effects	
PACKAGING	Transportation - UN Classification	
	UN Hazard Class: 4.1; UN Pack Group: II	





ICSC 0240 - COPPER 10/26/21, 1:37 PM

**COPPER** ICSC: 0240

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

SOLID IN VARIOUS FORMS. TURNS GREEN ON EXPOSURE TO MOIST AIR.

**Physical dangers** 

No data.

Chemical dangers

Mixtures with acetylenic compounds, ethylene oxide and azides are shock-sensitive. Reacts with strong oxidants such as chlorates, bromates and iodates. This generates explosion hazard.

Formula: Cu Atomic mass: 63.5 Boiling point: 2595°C Melting point: 1083°C

Relative density (water = 1): 8.9

Solubility in water: none

Octanol/water partition coefficient as log Pow: -0.57 (calculated)

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

#### Effects of short-term exposure

Inhalation of fumes may cause metal fume fever. See Notes.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

## Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Ingestion may cause effects on the liver.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (fume, as Cu): 0.2 mg/m<sup>3</sup>, as TWA.

TLV: (dust and mists, as Cu): 1 mg/m<sup>3</sup>, as TWA.

MAK: (respirable fraction): 0.01 mg/m<sup>3</sup>; peak limitation category: II(2); pregnancy risk group: C

## **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain.

## **NOTES**

The symptoms of metal fume fever do not become manifest until a few hours have passed. UN 3089 refers to METAL POWDERS, FLAMMABLE, (n.o.s.)

# **ADDITIONAL INFORMATION**

#### **EC Classification**



Safety Data Sheet acc. to OSHA HCS

Page 1/5 Printing date 11/07/2017 Revision date 11/06/2017 Version 1

1 Identification

Product identifier

Product name: Iron powder

Stock number: 00170 CAS Number: 7439-89-6 EC number: 231-096-4

Relevant identified uses of the substance or mixture and uses advised against. Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet Manufacturer/Supplier:

Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

30 Bond Street Ward Hill, MA 01835-8099 Tel: 800-343-0660 Fax: 800-322-4757 Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number: During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

#### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



GHS02 Flame

Flam. Sol. 1 H228 Flammable solid.



Eye Irrit. 2A H319 Causes serious eye irritation. STOT SE 3 H335 May cause respiratory irritation.

Hazards not otherwise classified No information known.

Label elements

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms





GHS02 GHS07

Signal word Danger Hazard statements

H228 Flammable solid. H319 Causes serious eve irritation. H335 May cause respiratory irritation. **Precautionary statements** 

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.

Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification

B4 - Flammable solid D2B - Toxic material causing other toxic effects



Classification system

HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



Health (acute effects) = 1 Flammability = 3

ACTIVITY Physical Hazard = 1

Other hazards Results of PBT and vPvB assessment PBT: Not applicable.

vPvB: Not applicable.

# 3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description: 7439-89-6 Iron Concentration: ≤100% Identification number(s): EC number: 231-096-4

## Product name: Iron powder

(Contd. of page 1)

#### 4 First-aid measures

Description of first aid measures

After inhalation Supply fresh air. If required, provide artificial respiration. Keep patient warm.

Seek immediate medical advice. After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.

After swallowing Seek medical treatment.

Information for doctor

Most important symptoms and effects, both acute and delayed Causes serious eye irritation.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

#### 5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Special powder for metal fires. Do not use water.

For safety reasons unsuitable extinguishing agents Water Special hazards arising from the substance or mixture If this product is involved in a fire, the following can be released:

Iron oxides
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

#### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up: Ensure adequate ventilation.
Prevention of secondary hazards: Keep away from ignition sources.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
Protective Action Criteria for Chemicals
PAC-1: 3.2 mg/m3
PAC-2: 35 mg/m3
PAC-3: 150 mg/m3

# 7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

Information about protection against explosions and fires: Protect against electrostatic charges.

Conditions for safe storage, including any incompatibilities

Requirements to be met by storerooms and receptacles: Store in a cool location. Information about storage in one common storage facility: Do not store together with acids. Store away from oxidizing agents. Further information about storage conditions:

Keep container tightly sealed. Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

## 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

7439-89-6 Iron (100.0%)

EV (Canada)

Long-term value: 1\* 5\*\* mg/m³ as iron;\*salts, water-soluble;\*\*welding fume

TLV (Canada) Long-term value: 5 mg/m³

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Remove all soiled and contaminated clothing immediately.

Wash hands before breaks and at the end of work.

Wash hands before breaks and at the end of work.
Avoid contact with the eyes.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
Maintain an ergonomically appropriate respirator when high concentrations are present.
Recommended filter device for short term use:
Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if airpurifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.

(Contd. on p

#### Product name: Iron powder

Protection of hands:

(Contd. of page 2)

Version 1

Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Nitrile rubber, NBR
Protection time of the contract o

Penetration time of glove material (in minutes) 480

Glove thickness: 0.11 mm

Eye protection: Safety glasses with side shields / NIOSH (US) or EN 166(EU) Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties General Information

Appearance: Form: Powder Odor: Odor threshold: Not determined

pH-value:

Change in condition
Melting point/Melting range:
Boiling point/Boiling range:
Sublimation temperature / start:
Flammability (solid, gaseous)
Ignition temperature:
Decomposition temperature:
Auto igniting:

Auto igniting: Danger of explosion: Explosion limits: Lower: Upper:

Vapor pressure: Density at 20 °C (68 °F):

Bulk density at 20 °C (68 °F): Relative density Vapor density Evaporation rate Solubility in / Miscibility with

Water: Not determined Partition coefficient (n-octanol/water): Not determined. Viscosity: dynamic:

kinematic: Other information

Not determined

Not applicable

1538 °C (2800 °F) 2740 °C (4964 °F) Not determined Highly flammable. Not determined Not determined Not determined. Not determined.

Not determined Not determined Not applicable 7.87 g/cm³ (65.675 lbs/gal)

Not determined. Not applicable. Not applicable.

2900 kg/m<sup>3</sup>

Not applicable.

Not applicable. No further relevant information available.

#### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents

Conditions to avoid No further relevant information available.

Incompatible materials:

Oxidizing agents Hazardous decomposition products: Iron oxides

# 11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance

LD/LC50 values that are relevant for classification:

Oral LD50 30000 mg/kg (rat)

Skin irritation or corrosion: May cause irritation Eye irritation or corrosion: May cause irritation Sensitization: No sensitizing effects known.

Germ cell muitagenicity: No effects known.

Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.

Specific target organ system toxicity - single exposure: May cause respiratory irritation.

Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

# 12 Ecological information

Toxicity

Aquatic toxicity: No further relevant information available.

Persistence and degradability No further relevant information available.

Bioaccumulative potential No further relevant information available.

Mobility in soil No further relevant information available.

Additional ecological information:

General notes: Avoid transfer into the environment.

(Contd. on page 4)

(Contd. of page 3)

# Product name: Iron powder

Results of PBT and vPvB assessment PBT: Not applicable. vPvB: Not applicable.

Other adverse effects No further relevant information available

## 13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

1	4	T	ra	ns	p	0	rt	in	fo	rr	na	ti	0	n

14 Transport Information	
UN-Number DOT, IMDG, IATA	UN3089
UN proper shipping name DOT ADR IMDG, IATA	Metal powders, flammable, n.o.s. (Iron) 3089 Metal powders, flammable, n.o.s. METAL POWDER, FLAMMABLE, N.O.S. (Iron)

#### Transport hazard class(es)

DOT



4.1 Flammable solids, self-reactive substances and solid desensitised explosives 4.1 Class Label



Class 4.1 (F3) Flammable solids, self-reactive substances and solid desensitised

explosíves 4.1 Label IMDG, IATA



4.1 Flammable solids, self-reactive substances and solid desensitised explosives 4.1 Class Label

Packing group DOT, ADR, IMDG, IATA

Environmental hazards: Not applicable.

Warning: Flammable solids, self-reactive substances and solid desensitised Special precautions for user

explosive F-G,S-G EMS Number:

Heavy metals and their salts (including their organometallic compounds), powdered metals Segregation groups

Stowage Category Handling Code Segregation Code

B
H1 Keep as dry as reasonably practicable
SG17 Stow "separated from" class 5.1
SG25 Stow "separated from" goods of classes 2.1 and 3.
SG26 In addition: from goods of classes 2.1 and 3 when stowed on deck of a containership a minimum distance of two container spaces athwartship shall be maintained, when stowed on ro-ro ships a distance of 6 m athwartship shall be

maintained

# Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

## Transport/Additional information:

DOT

Quantity limitations On passenger aircraft/rail: 15 kg On cargo aircraft only: 50 kg

Marine Pollutant (DOT):

**IMDG** 

Limited quantities (LQ) Excepted quantities (EQ)

1 kg Code: E2 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 500 g

UN "Model Regulation": UN 3089 METAL POWDERS, FLAMMABLE, N.O.S., 4.1, II

# 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms





Signal word Danger Hazard statements H228 Flammable solid. H319 Causes serious eye irritation.

(Contd. on page 5)

(Contd. of page 4)

LISA

#### Product name: Iron powder

H335 May cause respiratory irritation.

Precautionary statements

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P261 Avoid breathing dust/fume/gas/mist/vapors/spray

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P405 Store locked up.

Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations

National regulations

National regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed.

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed. market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user. Conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation/Revision: Print date, revision date and version number are in the header of each page.

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement conceming the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Information System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal doncentration, 50 percent
LD50: Lethal doncentration, 50 percent
LD50: Lethal dose, 50 percent
LD50: Lethal dose, 50 percent
CSYHC: Substances of Very High Concern
VPUS: very Persistent and very Bloaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)
Flam. Soil 1: Flammable solids - Category 1
Eye Init. 24: Serious eye damage/eye irritation - Category 2A
STOT SE 3: Specific target organ toxicity (single exposure) - Category 3

10/26/21, 1:40 PM ICSC 0052 - LEAD

LEAD ICSC: 0052 (November 2019)

Plumbum

CAS #: 7439-92-1 UN #: 3077 (n.o.s.) EC Number: 231-100-4

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!						
	SYMPTOMS	PREVENTION	FIRST AID			
Inhalation	Cough. Metallic taste. Abdominal pain. Headache. Confusion. Drowsiness. Unconsciousness. Convulsions.	Use local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention. See Notes.			
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.			
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).			
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer immediately for medical attention.			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	Suspected of causing cancer May damage fertility or the unborn child
Store only in original container. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Store in an area without drain or sewer access.	May cause harm to breast-fed children Causes damage to organs Causes damage to organs through prolonged or repeated exposure Toxic to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification UN Hazard Class: 9; UN Pack Group: III







10/26/21, 1:40 PM ICSC 0052 - LEAD

LEAD ICSC: 0052

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

BLUE SILVERY-WHITE-TO-GREY POWDER.

Physical dangers

Chemical dangers

Upon heating, toxic fumes are formed. Reacts with strong oxidants and strong acids. This generates toxic, fire and explosion hazard.

Formula: Pb

Atomic mass: [207.2] Boiling point: 1740°C Melting point: 327.5°C Density: 11.34 g/cm³

Solubility in water, g/l: (practically insoluble)

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

# Effects of short-term exposure

Inhalation of high concentrations may cause effects on multiple organs. See Acute Hazards/Symptoms.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

#### Effects of long-term or repeated exposure

The substance may have effects on the blood, bone marrow, nervous system and kidneys. This may result in anaemia, encephalopathy (for example, convulsions), peripheral nerve disease, abdominal cramps, kidney impairment, cardiovascular disorders and hearing loss. See Notes. This substance is possibly carcinogenic to humans. Causes toxicity to human reproduction or development.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.05 mg/m<sup>3</sup>, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.

MAK: carcinogen category: 2; germ cell mutagen group: 3A.

EU-OEL: (binding): 0.15 mg/m<sup>3</sup> as TWA

# **ENVIRONMENT**

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

## **NOTES**

Specific treatment may be necessary in case of poisoning with this substance.

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

**EC Classification** 

#### **MAGNESIUM POWDER (pyrophoric)** ICSC: 0289 (November 2019)

CAS #: 7439-95-4 UN #: 1418

EC Number: 231-104-6

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. May ignite spontaneously on contact with air. Finely dispersed particles form explosive mixtures in air.		Use dry sand, special powder. NO water. NO other agents. See Notes.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the mouth.	Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Consult an expert! Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered dry containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT wash away into sewer.	According to UN GHS Criteria
STORAGE	DANGER In contact with water releases flammable gases
Fireproof. Dry. Well closed. Separated from other incompatible materials.	Catches fire spontaneously if exposed to air  Transportation
PACKAGING	UN Classification UN Hazard Class: 4.3; UN Subsidiary Risks: 4.2; UN Pack Group: I, II,
Airtight.	III







#### MAGNESIUM POWDER (pyrophoric)

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

GREY POWDER.

#### **Physical dangers**

Ignites in air when finely divided. Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

## **Chemical dangers**

The substance may ignite spontaneously on contact with air and moisture. This produces irritating or toxic fumes. Reacts with oxidants and many other substances. Reacts with moisture and acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Mg
Atomic mass: 24.3
Boiling point: 1100°C
Melting point: 649°C
Density: 1.7 g/cm³
Solubility in water: reaction
Auto-ignition temperature: 473 °C
Explosive limits, vol% in air: see Notes

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of dust.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract.

#### Inhalation risk

A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

ICSC: 0289

#### Effects of long-term or repeated exposure

Lungs may be affected by repeated or prolongated exposure to dust particles.

## OCCUPATIONAL EXPOSURE LIMITS

#### **ENVIRONMENT**

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

# **NOTES**

Burns with an intense flame.

In order to prevent eye injury do not look directly at magnesium fires.

Explosive limits, vol% in air: (LEL) 0.03 kg/m3.

See ICSC 0701.

Reacts violently with fire extinguishing agents such as water, carbon dioxide, halons, powder and foam.

# **ADDITIONAL INFORMATION**

**EC Classification** 

H250; H260

MANGANESE ICSC: 0174 (November 2003) CAS #: 7439-96-5 EC Number: 231-105-1

ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
particles form explosive mixtures in	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, special powder.

PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!					
	SYMPTOMS	PREVENTION	FIRST AID		
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.		
Skin		Protective gloves.	Rinse and then wash skin with water and soap.		
Eyes		Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.		
Ingestion	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .		

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	Transportation UN Classification
Separated from acids. Dry.	
PACKAGING	







MANGANESE ICSC: 0174

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

GREY-WHITE POWDER.

**Physical dangers** 

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

Chemical dangers

Reacts slowly with water. Reacts more rapidly with steam and acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

This generates fire and explosion hazard.

Formula: Mn Atomic mass: 54.9 Boiling point: 1962°C Melting point: 1244°C Density: 7.47 g/cm³ Solubility in water: none

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

#### Effects of short-term exposure

The aerosol is irritating to the respiratory tract.

#### Inhalation risk

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

# Effects of long-term or repeated exposure

The substance may have effects on the lungs and central nervous system. This may result in increased susceptibility to bronchitis, pneumonitis and neurologic and neuropsychiatric disorders (manganism). Animal tests show that this substance possibly causes toxicity to human reproduction or development.

#### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (respirable fraction): 0.02 mg/m³, as TWA. TLV: (inhalable fraction): 0.1 mg/m³, as TWA. TLV: A4 (not classifiable as a human carcinogen). EU-OEL: (inhalable fraction): 0.2 mg/m³ as TWA.

EU-OEL: (respirable fraction): 0.05 mg/m<sup>3</sup> as TWA.

MAK: (inhalable fraction): 0.2 mg/m<sup>3</sup>; (respirable fraction): 0.02 mg/m<sup>3</sup>; peak limitation category: II(8); pregnancy risk group: C

## **ENVIRONMENT**

This substance may be hazardous to the environment. Special attention should be given to aquatic organisms.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

The recommendations on this Card also apply to ferro manganese.

# **ADDITIONAL INFORMATION**

## **EC Classification**

MERCURY ICSC: 0056 (November 2019)

Quicksilver Liquid silver

CAS #: 7439-97-6 UN #: 2809

EC Number: 231-106-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FINE C	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Shortness of breath. Fever. Vomiting. Diarrhoea. Abdominal pain. Headache. Weakness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. See Notes. Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention .

#### SPILLAGE DISPOSAL **CLASSIFICATION & LABELLING** Evacuate danger area! Consult an expert! Personal protection: According to UN GHS Criteria chemical protection suit and filter respirator for mercury adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Then store and dispose of according to local regulations. **DANGER STORAGE** May be corrosive to metals Provision to contain effluent from fire extinguishing. Separated Fatal if inhaled from food and feedstuffs. Well closed. Store in an area without May damage fertility or the unborn child Causes damage to central nervous system and kidneys drain or sewer access. Causes damage to the central nervous system and the kidneys through prolonged or repeated exposure **PACKAGING** Very toxic to aquatic life with long lasting effects Special material. Transportation Do not transport with food and feedstuffs. **UN Classification** Marine pollutant. UN Hazard Class: 8; UN Subsidiary Risks: 6.1; UN Pack Group: III





MERCURY ICSC: 0056

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

ODOURLESS HEAVY MOBILE SILVERY LIQUID METAL.

Physical dangers

Chemical dangers

Upon heating, toxic fumes are formed. Reacts violently with ammonia, halogens, acetylene and amines. This generates fire and explosion hazard. Attacks aluminium and many other metals. This produces amalgams.

Formula: Hg

Atomic mass: 200.6 Boiling point: 357°C Melting point: -39°C Density: 13.5 g/cm³ Solubility in water: none

Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and through the skin also as a vapour.

#### Effects of short-term exposure

The substance is irritating to the skin. Inhalation of high concentrations of the vapour may cause pneumonitis. This may result in death. The substance may cause effects on the central nervous system and kidneys. This may result in tremors and tissue lesions. The effects may be delayed. Medical observation is indicated.

#### Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

#### Effects of long-term or repeated exposure

The substance may have effects on the central nervous system and kidneys. This may result in irritability, emotional instability, tremors, mental and memory disturbances and speech disorders. May cause inflammation and discoloration of gums. Cumulative effects are possible. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.025 mg/m<sup>3</sup>, as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.

EU-OEL: 0,02 mg/m<sup>3</sup> as TWA.

MAK: (inhalable fraction): 0.02 mg/m³; peak limitation category: II(8); skin absorption (H); sensitization of skin (SH); carcinogen

category: 3; pregnancy risk group: D

## **ENVIRONMENT**

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish and seafood.

## **NOTES**

Depending on the degree of exposure, periodic medical examination is suggested.

There is no odour warning even when toxic concentrations are present.

Do NOT take working clothes home.

Isolate contaminated clothing by sealing in a bag or other container.

Other UN number: 3506 Mercury contained in manufactured articles.

## **ADDITIONAL INFORMATION**

#### **EC Classification**

H330; H372; H400; H410; H360D

NICKEL

Metallic nickel

ICSC: 0062 (April 2017)

CAS #: 7440-02-0 EC Number: 231-111-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable as dust. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	electrical equipment and lighting	Use dry sand, dry powder. NO carbon dioxide. NO water.

	PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!		
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. See Notes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria  DANGER
STORAGE	May cause an allergic skin reaction May cause allergy or asthma symptoms or breathing difficulties if
Store only in original packaging. Cool. Well closed. Separated from strong oxidants and acids. Store in an area without drain or sewer access.	inhaled Suspected of causing cancer if inhaled Causes damage to the lungs through prolonged or repeated exposure if inhaled Harmful to aquatic life with long lasting effects
PACKAGING	Transportation UN Classification
1000	- X





10/26/21, 1:41 PM ICSC 0062 - NICKEL

NICKEL ICSC: 0062

## PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

SILVERY METALLIC LUSTROUS SOLID IN VARIOUS FORMS.

#### Physical dangers

If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc. Dust explosion possible if in powder or granular form, mixed with air.

# Chemical dangers

Reacts violently with acids. This produces flammable hydrogen. This generates fire and explosion hazard. Reacts violently with strong oxidants. This generates fire and explosion hazard. This produces toxic fumes of nickel monoxide. See ICSC 0926. On combustion, forms toxic gases and vapours including nickel (II) oxide (see ICSC 0926) and nickel carbonyl (see ICSC 0064).

Formula: Ni Atomic mass: 58.7 Boiling point: 2730°C Melting point: 1455°C Density: 8.9 g/cm³

Solubility in water, mg/l at 37°C: 1.1 (practically insoluble)

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of dust.

#### Effects of short-term exposure

May cause mechanical irritation. Inhalation of fume may cause pneumonitis.

#### Inhalation risk

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

## Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation may cause asthma. The substance may have effects on the respiratory tract. This may result in chronic inflammation of the respiratory tract and fibrosis. This substance is possibly carcinogenic to humans if inhaled.

## **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction): 1.5 mg/m<sup>3</sup>, as TWA; A5 (not suspected as a human carcinogen); BEI issued. MAK: (inhalable fraction): sensitization of respiratory tract and skin (SAH); carcinogen category: 1

#### **ENVIRONMENT**

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

#### **NOTES**

At high temperatures, toxic fumes of nickel(II)oxide may be formed (see ICSC 0926).

Depending on the degree of exposure, periodic medical examination is suggested.

The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Anyone who has shown symptoms of sensitization due to this substance should avoid all further contact with nickel, nickel compounds and other metal compounds of e.g. copper, chromium and cobalt.

Isolate contaminated clothing by sealing in a bag or other container.

Do NOT take working clothes home.

## ADDITIONAL INFORMATION

#### **EC Classification**

Symbol: Xn; R: 40-43; S: (2)-22-36

POTASSIUM ICSC: 0716 (April 2006)

Kalium

CAS #: 7440-09-7 UN #: 2257

EC Number: 231-119-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with acids, halogens or water.		Use special powder, dry sand. NO other agents. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use closed system or ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Severe deep burns. Loss of vision.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.	According to UN GHS Criteria
STORAGE	
Fireproof. Keep under mineral oil. Dry. Well closed.	DANGER
PACKAGING	In contact with water releases flammable gases which may ignite spontaneously
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	Causes severe skin burns and eye damage  Transportation UN Classification UN Hazard Class: 4.3; UN Pack Group: I





POTASSIUM ICSC: 0716

# **PHYSICAL & CHEMICAL INFORMATION**

Physical State; Appearance WHITE-TO-GREY LUMPS.

**Physical dangers** 

# Chemical dangers

Reacts violently with water. This generates fire and explosion hazard. Decomposes rapidly under the influence of air and moisture. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: K
Atomic mass: 39.1
Boiling point: 765.5°C
Melting point: 63.2°C
Density: 0.856 g/cm³
Solubility in water: reaction
Vapour pressure at 20°C: negligible

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

Serious by all routes of exposure.

Effects of short-term exposure

See ICSC 0357 (potassium hydroxide).

Inhalation risk

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

# **ENVIRONMENT**

## **NOTES**

Potassium is always kept under mineral oil.

Reacts violently with fire extinguishing agents such as water and carbon dioxide.

# **ADDITIONAL INFORMATION**

# EC Classification

Symbol: F, C; R: 14/15-34; S: (1/2)-5-8-45

SELENIUM ICSC: 0072 (November 2009)

CAS #: 7782-49-2 UN #: 3283 (n.o.s.) EC Number: 231-957-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	`		Use foam, powder, carbon dioxide. NO water.

	STRICT HYGIENE!		
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Nasal discharge. Loss of smell. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Garlic breath. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	WARNING May cause respiratory irritation
Separated from strong oxidants, strong acids and food and feedstuffs. Dry. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	May cause damage to the nervous system and gastrointestinal tract May cause damage to nervous system and gastrointestinal tract through prolonged or repeated exposure
PACKAGING	Very toxic to aquatic life  Transportation
Airtight. Do not transport with food and feedstuffs.	UN Classification





SELENIUM ICSC: 0072

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

GREY SOLID IN VARIOUS FORMS.

Physical dangers

No data.

Chemical dangers

Upon heating, toxic fumes are formed. Reacts with oxidants and strong acids. Reacts, if in amorphous form, with water at 50°C. This produces flammable/explosive gas (hydrogen - see ICSC 0001) and selenious acids.

Formula: Se Atomic mass: 79.0 Boiling point: 685°C Melting point: 217°C

Relative density (water = 1): 4.8 Solubility in water: none Vapour pressure, Pa at 20°C: 0.1

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by inquestion.

#### Effects of short-term exposure

The substance is irritating to the respiratory tract. The substance may cause effects on the gastrointestinal tract and nervous system.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly on spraying or when dispersed, especially if powdered.

#### Effects of long-term or repeated exposure

The substance may have effects on the respiratory tract, gastrointestinal tract and skin.

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.2 mg/m<sup>3</sup>, as TWA.

MAK: (inhalable fraction): 0.02 mg/m<sup>3</sup>; peak limitation category: II(8); skin absorption (H); carcinogen category: 3; pregnancy risk group: C

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

# **NOTES**

Do NOT take working clothes home.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T; R: 23/25-33-53; S: (1/2)-20/21-28-45-61

SILVER

Argentium C.I. 77820

CAS #: 7440-22-4 UN #: 3077 (n.o.s.) EC Number: 231-131-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Collect the spilled substance into containers. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	According to UN GHS Criteria	
STORAGE	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
Separated from : see Chemical Dangers. Store only in original packaging. Store in an area without drain or sewer access.	WARNING Very toxic to aquatic life with long lasting effects	
PACKAGING	Transportation UN Classification UN Hazard Class O. UN Book Croup. III	
The Garden State of S	UN Hazard Class: 9; UN Pack Group: III	





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ICSC: 0810 (November 2019)

10/26/21, 1:42 PM ICSC 0810 - SILVER

SILVER ICSC: 0810

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE METAL.

**Physical dangers** 

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

Chemical dangers

See Notes. Reacts with many other substances. This generates fire and explosion hazard. Consult your supplier.

Formula: Ag Atomic mass: 107.9 Boiling point: 2212°C

Melting point: 962°C Relative density (water = 1): 10.5

Solubility in water, g/100ml: <0.01 (practically insoluble)

## **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

# Effects of short-term exposure

May cause mechanical irritation to the eyes and respiratory tract.

#### Inhalation risk

No indication can be given whether a harmful concentration in the air will be reached.

#### Effects of long-term or repeated exposure

The substance may cause a grey-blue discolouration of the eyes, nose, throat and skin (argyria/argyrosis).

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 0.1 mg/m<sup>3</sup>, as TWA.

MAK: (inhalable fraction): 0.1 mg/m<sup>3</sup>; peak limitation category: II(8); pregnancy risk group: D.

EU-OEL: 0.1 mg/m<sup>3</sup> as TWA

#### **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

# **NOTES**

Finely divided silver can be combustible and reactive; in its bulk form silver is stable and non-combustible.

There are insufficient data to assess the hazards of this substance in its nanoform (< 100 nm). Therefore the utmost care must be taken when using the substance. Consult your supplier.

#### ADDITIONAL INFORMATION

**EC Classification** 

SODIUM ICSC: 0717 (April 2006)

Natrium

CAS #: 7440-23-5 UN #: 1428

EC Number: 231-132-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FINE C	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with acids, halogens or water.	halogens. NO open flames, NO	Use special powder, dry sand. NO other agents. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use closed system or ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Severe deep burns. Loss of vision.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.	According to UN GHS Criteria	
STORAGE		
Fireproof. Keep under mineral oil. Dry. Well closed.	DANGER	
PACKAGING	In contact with water releases flammable gases which may ignite spontaneously	
Airtight. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	Causes severe skin burns and eye damage  Transportation UN Classification UN Hazard Class: 4.3; UN Pack Group: I	





10/26/21, 1:42 PM ICSC 0717 - SODIUM

SODIUM ICSC: 0717

# PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

SILVERY SOLID IN VARIOUS FORMS.

**Physical dangers** 

Chemical dangers

Reacts violently with water. This generates fire and explosion hazard. Decomposes rapidly under the influence of air and moisture. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: Na
Atomic mass: 23.0
Boiling point: 880°C
Melting point: 97.4°C
Density: 0.97 g/cm³
Solubility in water: reaction
Vapour pressure at 20°C: negligible

Vapour pressure at 20°C: negligible Auto-ignition temperature: 120-125°C

# **EXPOSURE & HEALTH EFFECTS**

Routes of exposure

Serious by all routes of exposure.

Effects of short-term exposure

See ICSC 0360 (sodium hydroxide).

Inhalation risk

Effects of long-term or repeated exposure

## **OCCUPATIONAL EXPOSURE LIMITS**

# **ENVIRONMENT**

# **NOTES**

Sodium is always kept under mineral oil.

Reacts violently with fire extinguishing agents such as water and carbon dioxide.

# **ADDITIONAL INFORMATION**

# EC Classification

Symbol: F, C; R: 14/15-34; S: (1/2)-5-8-43-45

THALLIUM ICSC: 0077 (April 2013)

Ramor

Thallium (metal)

CAS #: 7440-28-0 UN #: 1707

EC Number: 231-138-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE &	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.		In case of fire in the surroundings, use appropriate extinguishing media.

See Notes.			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	No acute symptoms expected.	Use ventilation.	
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting. Headache. Weakness. Muscle pain. Blurred vision. Restlessness. Convulsions. Increased heart rate. Symptoms may be delayed. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Refer immediately for medical attention.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local	According to UN GHS Criteria
regulations.	
STORAGE	
Separated from strong acids, fluorine, other halogens and food	DANGER
and feedstuffs. Store only in original container. Well closed.	Fatal if swallowed May cause damage to gastrointestinal tract and the nervous system if swallowed
PACKAGING	Transportation
Do not transport with food and feedstuffs.	UN Classification UN Hazard Class: 6.1; UN Pack Group: II
CONTRACT DESCRIPTION	Sec. V







10/26/21, 1:42 PM ICSC 0077 - THALLIUM

THALLIUM ICSC: 0077

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

BLUISH-WHITE VERY SOFT METAL. TURNS GREY ON EXPOSURE TO AIR.

Physical dangers

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

Chemical dangers

The substance is a strong reducing agent. Reacts with strong acids. Reacts with fluorine and other halogens at room temperature. Formula: TI

Atomic mass: 204.4 Boiling point: 1457°C Melting point: 304°C

Relative density (water = 1): 11.9

Solubility in water: none

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by ingestion.

# Effects of short-term exposure

Ingestion could cause effects on the gastrointestinal tract and nervous system. Ingestion could cause hair loss. Ingestion of large amounts could cause death. The effects may be delayed. Medical observation is indicated. See Notes.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly.

Effects of long-term or repeated exposure

# **OCCUPATIONAL EXPOSURE LIMITS**

TLV: (inhalable fraction): 0.02 mg/m<sup>3</sup>, as TWA; (skin)

# **ENVIRONMENT**

Environmental effects from the substance have not been investigated adequately.

#### NOTES

The symptoms of neurological disorders do not become manifest until after a few days.

Depending on the degree of exposure, periodic medical examination is suggested.

Thallium metal is usually kept under mineral oil or an argon atmosphere.

Thallium salts may have different toxicological properties.

See ICSCs 0336 and 1221.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: T+; R: 26/28-33-53; S: (1/2)-13-28-45-61



Safety Data Sheet acc. to OSHA HCS

Page 1/4 Printing date 02/26/2018 Revision date 02/23/2018 Version 1

1 Identification

Product identifier

Product name: Vanadium turnings

Stock number: 10420 CAS Number: 7440-62-2 EC number:

Relevant identified uses of the substance or mixture and uses advised against. Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet Manufacturer/Supplier:

Alfa Aesar Thermo Fisher Scientific Chemicals, Inc.

30 Bond Street

30 Bond Street Ward Hill, MA 01835-8099 Tel: 800-343-0660 Fax: 800-322-4757 Email: tech@alfa.com

www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number: During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

#### 2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)
The substance is not classified as hazardous according to 29 CFR 1910 (OSHA GHS).
Hazards not otherwise classified No information known.

Label elements
GHS label elements Not applicable GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)



HEALTH D Health (acute effects) = 0
Flammability = 0
Physical Hazard = 0

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

#### 3 Composition/information on ingredients

Chemical characterization: Substances CAS# Description: 7440-62-2 Vanadium Concentration: ≤100% Identification number(s): EC number: 231-171-1

# 4 First-aid measures

Description of first aid measures

General information No special measures required.

After inhalation Seek medical treatment in case of complaints.

After skin contact Generally the product does not irritate the skin.

After eye contact Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

After swallowing if symptoms persist consult doctor.

Information for doctor

Most important symptoms and effects, both acute and delayed No further relevant information available.

Indication of any immediate medical attention and special treatment needed No further relevant information available.

## 5 Fire-fighting measures

Extinguishing media

Extinguishing media
Suitable extinguishing agents Special powder for metal fires. Do not use water.
For safety reasons unsuitable extinguishing agents Water
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Vanadium oxides
Advice for firefighters
Protective equipment: No special measures required.

#### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures Not required.
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up: Pick up mechanically.
Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.

(Contd. on page 2)

## Product name: Vanadium turnings

See Section 13 for disposal information. **Protective Action Criteria for Chemicals PAC-1:** 3 mg/m3 **PAC-2:** 5.8 mg/m3 **PAC-3:** 35 mg/m3

(Contd. of page 1)

# 7 Handling and storage

Handling Precautions for safe handling Keep container tightly sealed.

Note: In cone, dry place in tightly closed containers.

Information about protection against explosions and fires: No special measures required.

Conditions for safe storage, including any incompatibilities

Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility:
Do not store together with acids.
Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

#### 8 Exposure controls/personal protection

Additional information about design of technical systems: No further data; see section 7.

Components with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information: No data

Exposure controls Personal protective equipment General protective and hygienic measures

General protective and nygienic measures
The usual precautionary measures for handling chemicals should be followed.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Not required.
Recommended filter device for short term use:
Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if airpurifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.
Protection of hands: Not required.
Material of playes Nitrile rubber NPP

Material of gloves Nitrile rubber, NBR Penetration time of glove material (in minutes) 480

Glove thickness: 0.11 mm

Eye protection: Safety glasses with side shields / NIOSH (US) or EN 166(EU) Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties General Information

Appearance: Form:

Solid in various forms

Odor: Odor threshold:

Odorless Not determined

pH-value:

Not applicable

Change in condition

1910 °C (3470 °F) 3407 °C (6165 °F) Not determined

Change in condition
Melting point/Melting range:
Boiling point/Boiling range:
Sublimation temperature / start:
Flammability (solid, gaseous)
Ignition temperature:
Decomposition temperature:
Auto ignition

Not determined

Not determined

Auto igniting:

Not determined Not determined.

Danger of explosion: Explosion limits:

Not determined.

Lower:

Not determined

Upper:

Not determined

Not applicable

Vapor pressure: Density at 20 °C (68 °F):

6.11 g/cm³ (50.988 lbs/gal) 4000 kg/m³ Not determined.

Bulk density at 20 °C (68 °F): Relative density Vapor density Evaporation rate Solubility in / Miscibility with Water:

Not applicable. Not applicable.

Insoluble

Viscosity: dynamic: kinematic:

Partition coefficient (n-octanol/water): Not determined.

Not applicable. Not applicable.

Other information

No further relevant information available.

# 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents

Conditions to avoid No further relevant information available.

(Contd. on page 3)

(Contd. of page 2)

# Product name: Vanadium turnings

Incompatible materials:

Oxidizing agents

Hazardous decomposition products: Vanadium oxides

#### 11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation

Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.

Specific target organ system toxicity - single exposure: No effects known.

Aspiration hazard: No effects known.

Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.

Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

#### 12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional coolegical information.

Additional ecological information:
General notes: Avoid transfer into the environment.
Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.
Other adverse effects No further relevant information available.

#### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

# 14 Transport information

UN-Number DOT, ADN, IMDG, IATA	Not applicable
UN proper shipping name DOT, ADR, ADN, IMDG, IATA	Not applicable
Transport hazard class(es)	
DOT, ADR, ADN, IMDG, IATA Class	Not applicable

Packing group DOT, ADR, IMDG, IATA Not applicable

Not applicable. Environmental hazards: Special precautions for user Not applicable.

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

Transport/Additional information: DOT

Marine Pollutant (DOT):

No

UN "Model Regulation": Not applicable

# 15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements Not applicable Hazard pictograms Not applicable Signal word Not applicable Hazard statements Not applicable Hazard statements Not applicable National regulations

Mational regulations

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

All components of this product are listed on the Canadian Domestic Substances List (DSL).

# SARA Section 313 (specific toxic chemical listings)

7440-62-2 Vanadium

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

(Contd. on page 4)

### Product name: Vanadium turnings

(Contd. of page 3)
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the

market and use must be observed. Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed. Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

#### 16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user. Conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation/Revision: Print date, revision date and version number are in the header of each page.

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Information System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal dose, 50 percent
LD50: Lethal dose, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
SVHC: Substances of Very High Concern
VPVB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

USA

ZINC POWDER (pyrophoric)

Blue powder Merrillite

CAS #: 7440-66-6

UN #: 1436 (zinc powder or dust)

EC Number: 231-175-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. May ignite spontaneously on contact with air. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with water or incompatible substances. See Chemical Dangers.	system, ventilation, explosion-proof electrical equipment and lighting.	Use special powder, dry sand. NO water. NO foam, carbon dioxide. NO other agents. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact of the substance with water.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Metallic taste. Sore throat. Cough. Weakness. Fever. See Effects of short-term exposure.	Use local exhaust.	Fresh air, rest. Seek medical attention if you feel unwell. See Notes.
Skin	No acute symptoms expected.	Protective gloves.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Remove all ignition sources. Consult an expert! Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered dry containers. Then store and dispose of according to local regulations.	According to UN GHS Criteria
STORAGE	DANGER
Fireproof. Well closed. Separated from incompatible materials and : see Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.	Catches fire spontaneously if exposed to air In contact with water releases flammable gases which may ignite spontaneously Very toxic to aquatic life with long lasting effects
PACKAGING	Transportation
Airtight. Marine pollutant.	UN Classification UN Hazard Class: 4.3; UN Subsidiary Risks: 4.2
	100 11





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ICSC: 1205 (November 2019)

## ZINC POWDER (pyrophoric) ICSC: 1205

#### PHYSICAL & CHEMICAL INFORMATION

# Physical State; Appearance GREY-TO-BLUE POWDER.

## **Physical dangers**

Ignites in air when finely divided. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

#### Chemical dangers

On combustion forms zinc oxide fumes. See Notes. The substance is a strong reducing agent. It reacts violently with oxidants, acids and bases. Reacts with water. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Reacts violently with sulfur, halogenated hydrocarbons and many other substances. This generates fire and explosion hazard.

Formula: Zn
Atomic mass: 65.4
Boiling point: 907°C
Melting point: 419°C
Density: 7.1 g/cm³
Solubility in water: reaction
Auto-ignition temperature: 460°C

### **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation.

#### Effects of short-term exposure

May cause mechanical irritation to the eyes and respiratory tract. Inhalation of the respirable fraction may cause metal fume fever. This may result in influenza-like symptoms. The effects may be delayed up to 48 hours.

#### Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered or as fumes.

#### Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged inhalation may cause effects on the lungs. This may result in reduced lung function.

# **OCCUPATIONAL EXPOSURE LIMITS**

MAK: (as Zn, respirable fraction): 0.1 mg/m<sup>3</sup>; peak limitation category: I(4); (as Zn, inhalable fraction): 2 mg/m<sup>3</sup>; peak limitation category: I(2); pregnancy risk group: C; (DFG 2019)

# **ENVIRONMENT**

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

# **NOTES**

Zinc oxide fumes formed during combustion may cause metal fume fever (see ICSC 0208).

The symptoms of metal fume fever do not become manifest until hours.

Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC0001 and ICSC0222). Zinc powder stabilized: Combustible solid, UN number: 3077, Hazard class: 9, Packing group: III; GHS: Warning, H400, H410.

#### ADDITIONAL INFORMATION

#### EC Classification

H250; H260; H400 / H400; H410

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1,4-DIOXANE ICSC: 0041 (November 2008)

1,4-Diethylene dioxide Dioxane

para-Dioxane

CAS #: 123-91-1 UN #: 1165

EC Number: 204-661-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	explosion-proof electrical equipment	Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.

CLASSIFICATION & LABELLING
According to UN GHS Criteria
DANGER
Highly flammable liquid and vapour Causes eye irritation May cause respiratory irritation Suspected of causing cancer May be harmful if swallowed and enters airways
Transportation UN Classification
UN Hazard Class: 3; UN Pack Group: II





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1,4-DIOXANE ICSC: 0041

### PHYSICAL & CHEMICAL INFORMATION

#### Physical State; Appearance

COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

### Physical dangers

The vapour is heavier than air and may travel along the ground; distant ignition possible.

#### **Chemical dangers**

The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Formula: C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>
Molecular mass: 88.1
Boiling point: 101°C
Melting point: 12°C

Relative density (water = 1): 1.03 Solubility in water: miscible Vapour pressure, kPa at 20°C: 3.9 Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08

Flash point: 12°C c.c.

Auto-ignition temperature: 180°C Explosive limits, vol% in air: 2-22.0

Octanol/water partition coefficient as log Pow: -0.27

Viscosity: 1.17 mm<sup>2</sup>/s at 25°C

# **EXPOSURE & HEALTH EFFECTS**

#### Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and through the skin.

#### Effects of short-term exposure

The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

#### Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

### Effects of long-term or repeated exposure

The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

### **OCCUPATIONAL EXPOSURE LIMITS**

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: 37 mg/m<sup>3</sup>, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.

EU-OEL: 73 mg/m<sup>3</sup>, 20 ppm as TWA

# **ENVIRONMENT**

#### **NOTES**

Refer for medical attention if breathing difficulties and/or fever develop. Check for peroxides prior to distillation; eliminate if found.

# **ADDITIONAL INFORMATION**

#### **EC Classification**

Symbol: F, Xn; R: 11-19-36/37-40-66; S: (2)-9-16-36/37-46; Note: D

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# Safety Data Sheet 6164306

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/10/2015 Version: 1.0

### **SECTION 1: Identification**

#### Identification

: Substance Product form

Substance name 1H,1H,2H,2H-Perfluorooctanesulfonic acid

CAS No. 27619-97-2 Product code 6164-3-06 Formula : C8H5F13O3S

3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctanesulfonic acid Synonyms

Other means of identification : MFCD00042455

#### Relevant identified uses of the substance or mixture and uses advised against

: Laboratory chemicals Use of the substance/mixture

Manufacture of substances

Scientific research and development

#### Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.

P.O. Box 309

Alachua, FL 32615 - United States of America

T (386) 462-0788 - F (386) 462-7097

info@synquestlabs.com - www.synquestlabs.com

#### **Emergency telephone number**

Emergency number : (844) 523-4086 (3E Company - Account 10069)

# SECTION 2: Hazard(s) identification

#### Classification of the substance or mixture

#### Classification (GHS-US)

Acute Tox. 4 (Oral) H302 - Harmful if swallowed

Skin Corr. 1B H314 - Causes severe skin burns and eye damage

H318 - Causes serious eye damage Eye Dam. 1 STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

#### Label elements 2.2.

#### **GHS-US** labeling

Hazard pictograms (GHS-US)





GHS07

GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) H302 - Harmful if swallowed

H314 - Causes severe skin burns and eye damage

H335 - May cause respiratory irritation

: P260 - Do not breathe dust, mist, spray Precautionary statements (GHS-US) P264 - Wash skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product

P271 - Use only outdoors or in a well-ventilated area

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell

P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting

P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse

skin with water/shower

P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing

P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/ physician

P321 - Specific treatment (see supplemental first aid instructions on this label)

P330 - Rinse mouth

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P363 - Wash contaminated clothing before reuse

P403+P233 - Store in a well-ventilated place. Keep container tightly closed

P405 - Store locked up

P501 - Dispose of contents/container to an approved waste disposal plant

#### 2.3. Other hazards

No additional information available

#### 2.4. Unknown acute toxicity (GHS US)

Not applicable

#### **SECTION 3: Composition/information on ingredients**

#### 3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1H,1H,2H,2H-Perfluorooctanesulfonic acid (Main constituent)	(CAS No) 27619-97-2	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

#### 3.2. Mixture

Not applicable

#### **SECTION 4: First aid measures**

#### 4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial

respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if

present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

# 4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section

2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea

### 4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

### **SECTION 5: Firefighting measures**

#### 5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

#### 5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

#### 5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

#### **SECTION 6: Accidental release measures**

# 6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

## 6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

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#### 6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information

refer to section 8: "Exposure controls/personal protection".

#### 6.2. **Environmental precautions**

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

#### Methods and material for containment and cleaning up 6.3.

For containment : Stop leak if safe to do so.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust. : For disposal of solid materials or residues refer to section 13: "Disposal considerations". Other information

#### Reference to other sections

No additional information available

# **SECTION 7: Handling and storage**

#### Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good

ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective

equipment. Avoid contact with skin and eyes.

Hygiene measures Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or

smoke when using this product. Always wash hands after handling the product.

### Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.

Refer to Section 10 on Incompatible Materials. Incompatible materials

Storage area : Store in dry, cool, well-ventilated area.

# **SECTION 8: Exposure controls/personal protection**

#### **Control parameters**

No additional information available

#### **Exposure controls**

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers

should be available in the immediate vicinity of any potential exposure.

: Protective gloves. 29 CFR 1910.138: Hand Protection. Hand protection

Eye protection Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection Wear suitable protective clothing.

In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Respiratory protection

Protection.

Other information Safety shoes. 29 CFR 1910.136: Foot Protection.

### **SECTION 9: Physical and chemical properties**

#### 9.1. Information on basic physical and chemical properties

Physical state : Solid

Color : No data available Odor : No data available Odor threshold No data available pΗ : No data available

· > 300 °C Melting point

Freezing point No data available Boiling point : No data available No data available Flash point Relative evaporation rate (butyl acetate=1) : No data available Flammability (solid, gas) : No data available **Explosion limits** No data available Explosive properties : No data available

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Oxidizing properties : No data available Vapor pressure : No data available Relative density : No data available Relative vapor density at 20 °C : No data available Molecular mass 428.17 g/mol Solubility : No data available : No data available Log Pow Auto-ignition temperature : No data available Decomposition temperature : No data available : No data available Viscosity Viscosity, kinematic No data available Viscosity, dynamic : No data available

#### 9.2. Other information

No additional information available

# **SECTION 10: Stability and reactivity**

#### 10.1. Reactivity

No additional information available

#### 10.2. Chemical stability

The product is stable at normal handling and storage conditions.

#### 10.3. Possibility of hazardous reactions

No additional information available

#### 10.4. Conditions to avoid

Keep away from heat, sparks and flame.

# 10.5. Incompatible materials

Strong bases. Strong oxidizing agents.

# 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

### **SECTION 11: Toxicological information**

# 11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed.

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : May cause respiratory irritation.

Specific target organ toxicity (repeated

exposure)

: Not classified

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea.

# SECTION 12: Ecological information

# 12.1. Toxicity

No additional information available

#### 12.2. Persistence and degradability

No additional information available

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#### 12.3. Bioaccumulative potential

No additional information available

#### 12.4. Mobility in soil

No additional information available

#### 12.5. Other adverse effects

No additional information available

# **SECTION 13: Disposal considerations**

#### 13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

## **SECTION 14: Transport information**

#### **Department of Transportation (DOT)**

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, III

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 213 DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G

DOT Special Provisions (49 CFR 172.102)

: G - Identifies PSN requiring a technical name

: IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).

IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner.

T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154
DOT Quantity Limitations Passenger aircraft/rail : 25 kg
(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 : 100 kg

CFR 175.75)

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a

passenger vessel.

Other information : No supplementary information available.

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#### **TDG**

No additional information available

#### Transport by sea

UN-No. (IMDG) : 3261

Proper Shipping Name (IMDG) : CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.

Class (IMDG) : 8 - Corrosive substances

Packing group (IMDG) : III - substances presenting low danger

Air transport

UN-No. (IATA) : 3261

Proper Shipping Name (IATA) : Corrosive solid, acidic, organic, n.o.s.

Class (IATA) : 8 - Corrosives
Packing group (IATA) : III - Minor Danger

### **SECTION 15: Regulatory information**

#### 15.1. US Federal regulations

#### 1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

#### 15.2. International regulations

#### **CANADA**

#### 1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)

Listed on the Canadian NDSL (Non-Domestic Substances List)

#### **EU-Regulations**

No additional information available

# **National regulations**

#### 1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)

Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory

Listed on the Japanese ISHL (Industrial Safety and Health Law)

Listed on NZIoC (New Zealand Inventory of Chemicals)

#### 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

### **SECTION 16: Other information**

# Full text of H-phrases:

ext of n-prilases.	
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

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NFPA health hazard : 3 - Short exposure could cause serious temporary or

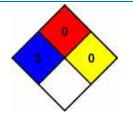
residual injury even though prompt medical attention was

given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



**HMIS III Rating** 

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is

given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT

react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

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 offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

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# Safety Data Sheet 61643X3

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/10/2015 Version: 1.0

### **SECTION 1: Identification**

#### 1.1. Identification

Product form : Substance

Substance name : 1H,1H,2H,2H-Perfluorodecanesulfonic acid

CAS No : 39108-34-4

Product code : 6164-3-X3

Formula : C10H5F17O3S

Synonyms : 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heptadecafluorodecane-1-sulfonic acid

Other means of identification : MFCD14584757

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Laboratory chemicals

Manufacture of substances

Scientific research and development

#### 1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.

P.O. Box 309

Alachua, FL 32615 - United States of America

T (386) 462-0788 - F (386) 462-7097

info@synquestlabs.com - www.synquestlabs.com

#### 1.4. Emergency telephone number

Emergency number : (844) 523-4086 (3E Company - Account 10069)

# SECTION 2: Hazard(s) identification

#### 2.1. Classification of the substance or mixture

#### **Classification (GHS-US)**

Acute Tox. 4 (Oral) H302 - Harmful if swallowed

Skin Corr. 1B H314 - Causes severe skin burns and eye damage

Eye Dam. 1 H318 - Causes serious eye damage STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

Precautionary statements (GHS-US)

### 2.2. Label elements

#### **GHS-US** labeling

Hazard pictograms (GHS-US)





GHS05 GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H302 - Harmful if swallowed

H314 - Causes severe skin burns and eye damage

H335 - May cause respiratory irritation

: P260 - Do not breathe dust, mist, spray P264 - Wash skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product

P271 - Use only outdoors or in a well-ventilated area

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell

P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting

P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse

skin with water/shower

P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing

P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/ physician

P321 - Specific treatment (see supplemental first aid instructions on this label)

P330 - Rinse mouth

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P363 - Wash contaminated clothing before reuse

P403+P233 - Store in a well-ventilated place. Keep container tightly closed

P405 - Store locked up

P501 - Dispose of contents/container to an approved waste disposal plant

### 2.3. Other hazards

No additional information available

#### 2.4. Unknown acute toxicity (GHS US)

Not applicable

# **SECTION 3: Composition/information on ingredients**

#### 3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1H,1H,2H,2H-Perfluorodecanesulfonic acid (Main constituent)	(CAS No) 39108-34-4	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318
(Main constituent)			

Full text of H-phrases: see section 16

#### 3.2. Mixture

Not applicable

#### **SECTION 4: First aid measures**

#### 4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial

respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate

medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if

present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

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4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section

2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea

# 4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

### **SECTION 5: Firefighting measures**

# 5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

#### 5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

#### 5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

#### **SECTION 6: Accidental release measures**

# 6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

## 6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

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#### 6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information

refer to section 8: "Exposure controls/personal protection".

#### 6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

#### 6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.

Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

#### 6.4. Reference to other sections

No additional information available

# **SECTION 7: Handling and storage**

#### 7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good

ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective

equipment. Avoid contact with skin and eyes.

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or

smoke when using this product. Always wash hands after handling the product.

### 7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage area : Store in dry, cool, well-ventilated area.

# **SECTION 8: Exposure controls/personal protection**

#### 8.1. Control parameters

No additional information available

#### 8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers

should be available in the immediate vicinity of any potential exposure.

Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.

Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory

Protection.

Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

### **SECTION 9: Physical and chemical properties**

# 9.1. Information on basic physical and chemical properties

Physical state : Solid

Color : No data available Odor : No data available Odor threshold No data available pΗ No data available : No data available Melting point Freezing point No data available Boiling point : No data available No data available Flash point Relative evaporation rate (butyl acetate=1) : No data available Flammability (solid, gas) : No data available **Explosion limits** No data available Explosive properties : No data available

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Oxidizing properties : No data available Vapor pressure : No data available Relative density : No data available Relative vapor density at 20 °C : No data available Molecular mass 528.18 g/mol Solubility : No data available : No data available Log Pow Auto-ignition temperature : No data available Decomposition temperature : No data available : No data available Viscosity No data available Viscosity, kinematic Viscosity, dynamic : No data available

#### 9.2. Other information

No additional information available

# **SECTION 10: Stability and reactivity**

#### 10.1. Reactivity

No additional information available

#### 10.2. Chemical stability

The product is stable at normal handling and storage conditions.

#### 10.3. Possibility of hazardous reactions

No additional information available

#### 10.4. Conditions to avoid

Keep away from heat, sparks and flame.

# 10.5. Incompatible materials

Strong bases. Strong oxidizing agents.

# 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

### **SECTION 11: Toxicological information**

# 11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed.

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : May cause respiratory irritation.

Specific target organ toxicity (repeated

exposure)

: Not classified

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea.

# **SECTION 12: Ecological information**

# 12.1. Toxicity

No additional information available

#### 12.2. Persistence and degradability

No additional information available

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#### 12.3. Bioaccumulative potential

No additional information available

#### 12.4. Mobility in soil

No additional information available

#### 12.5. Other adverse effects

No additional information available

# **SECTION 13: Disposal considerations**

#### 13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

#### **SECTION 14: Transport information**

#### **Department of Transportation (DOT)**

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, III

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 213 DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Au

: IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 12HZ2, 21HZ1, 21HZ2, 21HZ1, 21HZ2, 21HZ2,

13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2). IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and

water-resistant liner. T1 - 1.5 178.274(d)(2) Normal...... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154
DOT Quantity Limitations Passenger aircraft/rail : 25 kg
(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 : 100 kg

CFR 175.75)

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a

passenger vessel.

Other information : No supplementary information available.

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#### TDG

No additional information available

#### Transport by sea

UN-No. (IMDG) : 3261

Proper Shipping Name (IMDG) : CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.

Class (IMDG) : 8 - Corrosive substances

Packing group (IMDG) : III - substances presenting low danger

Air transport

UN-No. (IATA) : 3261

Proper Shipping Name (IATA) : Corrosive solid, acidic, organic, n.o.s.

Class (IATA) : 8 - Corrosives
Packing group (IATA) : III - Minor Danger

### **SECTION 15: Regulatory information**

### 15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

1H.1H.2H.2H-Perfluorodecanesulfonic acid	CAS No 39108-34-4	100%
I III, III, ZII, ZII-PEIIIUOIOGECANESUIIONIC ACIG	CAS No 39108-34-4	100%

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

#### 15.2. International regulations

#### **CANADA**

No additional information available

## **EU-Regulations**

No additional information available

#### **National regulations**

# 1H,1H,2H,2H-Perfluorodecanesulfonic acid (39108-34-4)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)

Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory

Listed on the Japanese ISHL (Industrial Safety and Health Law)

Listed on NZIoC (New Zealand Inventory of Chemicals)

#### 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

## **SECTION 16: Other information**

#### Full text of H-phrases:

on in principes.	
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

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NFPA health hazard : 3 - Short exposure could cause serious temporary or

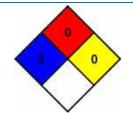
residual injury even though prompt medical attention was

given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



**HMIS III Rating** 

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is

given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT

react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

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 offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

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# Safety Data Sheet 8169308

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 04/04/2016 Version: 1.0

# **SECTION 1: Identification**

#### 1.1. Identification

Product form : Substance

Substance name : Perfluorooctanesulfonamide

 CAS No
 : 754-91-6

 Product code
 : 8169-3-08

 Formula
 : C8H2F17NO2S

Synonyms : 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-Heptadecafluorooctane-1-sulfonamide

Other means of identification : MFCD03094345

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Laboratory chemicals

Manufacture of substances Scientific research and development

#### 1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.

P.O. Box 309

Alachua, FL 32615 - United States of America

T (386) 462-0788 - F (386) 462-7097

info@synquestlabs.com - www.synquestlabs.com

#### 1.4. Emergency telephone number

Emergency number : (844) 523-4086 (3E Company - Account 10069)

### **SECTION 2: Hazard(s) identification**

### 2.1. Classification of the substance or mixture

#### Classification (GHS-US)

Skin Irrit. 2 H315 - Causes skin irritation
Eye Irrit. 2A H319 - Causes serious eye irritation
STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

## 2.2. Label elements

# **GHS-US** labeling

Hazard pictograms (GHS-US)



GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) : H315 - Causes skin irritation

H319 - Causes serious eye irritation H335 - May cause respiratory irritation

Precautionary statements (GHS-US) : P261 - Avoid breathing dust, mist, spray P264 - Wash skin thoroughly after handling

P271 - Use only outdoors or in a well-ventilated area

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P302+P352 - If on skin: Wash with plenty of soap and water

P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing

P312 - Call a POISON CENTER or doctor/physician if you feel unwell P321 - Specific treatment (see supplemental first aid instructions on this label)

P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed

P405 - Store locked up

P501 - Dispose of contents/container to an approved waste disposal plant

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#### 2.3. Other hazards

No additional information available

#### **Unknown acute toxicity (GHS US)** 2.4.

Not applicable

#### **SECTION 3: Composition/information on ingredients**

#### **Substance**

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
Perfluorooctanesulfonamide (Main constituent)	(CAS No) 754-91-6	<= 100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

#### **Mixture**

Not applicable

#### **SECTION 4: First aid measures**

#### **Description of first aid measures**

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial

First-aid measures after inhalation respiration. Get medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if

present and easy to do. Continue rinsing. Get medical advice/attention.

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse First-aid measures after ingestion

mouth out with water. Get medical advice/attention.

#### Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section Symptoms/injuries

2.2) and/or in section 11.

### Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

## **SECTION 5: Firefighting measures**

### **Extinguishing media**

Suitable extinguishing media Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media

appropriate for surrounding fire.

### Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Nitrogen oxides. Sulfur

# **Advice for firefighters**

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

# **SECTION 6: Accidental release measures**

#### Personal precautions, protective equipment and emergency procedures 6.1.

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

# For non-emergency personnel

**Emergency procedures** : Only qualified personnel equipped with suitable protective equipment may intervene.

#### 612 For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

# **Environmental precautions**

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

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#### Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust. : For disposal of solid materials or residues refer to section 13 : "Disposal considerations". Other information

#### Reference to other sections

No additional information available

# **SECTION 7: Handling and storage**

# Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good

ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective

equipment. Avoid contact with skin and eyes.

: Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or Hygiene measures

smoke when using this product. Always wash hands after handling the product.

#### Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations. Storage conditions : Keep container closed when not in use. Incompatible materials Refer to Section 10 on Incompatible Materials. : Store in dry, cool, well-ventilated area. Storage area

#### **SECTION 8: Exposure controls/personal protection**

#### **Control parameters**

No additional information available

#### **Exposure controls**

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers

should be available in the immediate vicinity of any potential exposure.

Hand protection Protective gloves. 29 CFR 1910.138: Hand Protection.

Eye protection Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection Wear suitable protective clothing.

Respiratory protection In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory

Protection.

Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

# **SECTION 9: Physical and chemical properties**

# Information on basic physical and chemical properties

Physical state : Solid

Color : No data available Odor : No data available : No data available Odor threshold No data available 154.6 °C

Melting point

No data available Freezing point : No data available Boiling point Flash point No data available Relative evaporation rate (butyl acetate=1) No data available Flammability (solid, gas) No data available **Explosion limits** : No data available Explosive properties : No data available : No data available Oxidizing properties Vapor pressure : No data available No data available Relative density Relative vapor density at 20 °C : No data available Molecular mass : 499.15 g/mol

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Solubility : No data available Log Pow : No data available Auto-ignition temperature : No data available Decomposition temperature : No data available Viscosity : No data available : No data available Viscosity, kinematic Viscosity, dynamic : No data available

#### 9.2. Other information

No additional information available

# **SECTION 10: Stability and reactivity**

#### 10.1. Reactivity

No additional information available

### **Chemical stability**

The product is stable at normal handling and storage conditions.

### Possibility of hazardous reactions

No additional information available

#### **Conditions to avoid**

Keep away from heat, sparks and flame.

#### Incompatible materials

Strong oxidizing agents.

#### **Hazardous decomposition products**

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

# **SECTION 11: Toxicological information**

# Information on toxicological effects

Acute toxicity : Not classified

Perfluorooctanesulfonamide (754-91-6)	
LD50 oral rat	> 172 mg/kg
Skin corrosion/irritation	: Causes skin irritation.
Serious eye damage/irritation	: Causes serious eye irritation.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified

# **SECTION 12: Ecological information**

#### 12.1. **Toxicity**

No additional information available

# Persistence and degradability

No additional information available

### **Bioaccumulative potential**

No additional information available

# **Mobility in soil**

No additional information available

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#### Other adverse effects

No additional information available

# **SECTION 13: Disposal considerations**

### Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber. : Dispose of contents/container in accordance with licensed collector's sorting instructions. Waste disposal recommendations

Additional information : Recycle the material as far as possible.

# **SECTION 14: Transport information**

### **Department of Transportation (DOT)**

In accordance with DOT Not regulated for transport

No additional information available

#### Transport by sea

No additional information available

#### Air transport

No additional information available

# **SECTION 15: Regulatory information**

#### 15.1. US Federal regulations

Perfluorooctanesulfonamide (754-91-6)		
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.	

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

CAS No 754-91-6 Perfluorooctanesulfonamide

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

### 15.2. International regulations

#### **CANADA**

No additional information available

# **EU-Regulations**

No additional information available

# **National regulations**

# Perfluorooctanesulfonamide (754-91-6)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)

Listed on the Japanese ISHL (Industrial Safety and Health Law)

Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

#### 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

## **SECTION 16: Other information**

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#### Full text of H-phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A	
Skin Irrit. 2	Skin corrosion/irritation Category 2	
STOT SE 3	Specific target organ toxicity (single exposure) Category 3	
H315	Causes skin irritation	
H319	Causes serious eye irritation	
H335	May cause respiratory irritation	

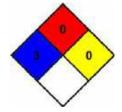
NFPA health hazard : 3 - Short exposure could cause serious temporary or

residual injury even though prompt medical attention was

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

: 0 Minimal Hazard - Materials that will not burn Flammability

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT

react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

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 offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

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# SAFETY DATA SHEET

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

According to Regulation (EC) No 1907/2006, Annex II, as amended. Commission Regulation (EU) No 2015/830 of 28 May 2015.

# SECTION 1: Identification of the substance/mixture and of the company/undertaking

# 1.1. Product identifier

Product name N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

 Product number
 FE91897

 CAS number
 2991-50-6

 EC number
 221-061-1

# 1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Laboratory reagent. Manufacture of substances. Research and development.

# 1.3. Details of the supplier of the safety data sheet

Supplier Carbosynth Ltd

8&9 Old Station Business Park

Compton Berkshire RG20 6NE

UK

+44 1635 578444 +44 1635 579444 info@carbosynth.com

# 1.4. Emergency telephone number

Emergency telephone +44 7887 998634

# SECTION 2: Hazards identification

# 2.1. Classification of the substance or mixture

Classification (EC 1272/2008)

Physical hazards Not Classified

Health hazards Skin Irrit. 2 - H315 Eye Irrit. 2 - H319 STOT SE 3 - H335

Environmental hazards Not Classified

2.2. Label elements

**EC number** 221-061-1

Hazard pictograms



Signal word Warning

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

**Hazard statements** H315 Causes skin irritation.

H319 Causes serious eye irritation. H335 May cause respiratory irritation.

**Precautionary statements** P264 Wash contaminated skin thoroughly after handling.

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

P302+P352 IF ON SKIN: Wash with plenty of water.

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove

contact lenses, if present and easy to do. Continue rinsing.

### 2.3. Other hazards

No data available.

# SECTION 3: Composition/information on ingredients

# 3.1. Substances

Product name N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

**CAS number** 2991-50-6 **EC number** 221-061-1

Chemical formula C<sub>12</sub>H<sub>8</sub>F<sub>17</sub>NO<sub>4</sub>S

### **SECTION 4: First aid measures**

### 4.1. Description of first aid measures

**General information** Get medical advice/attention if you feel unwell.

**Inhalation** Remove person to fresh air and keep comfortable for breathing. If breathing stops, provide

artificial respiration. When breathing is difficult, properly trained personnel may assist affected person by administering oxygen. Get medical attention if symptoms are severe or persist.

**Ingestion** Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse

mouth thoroughly with water. Give plenty of water to drink. Get medical attention if symptoms

are severe or persist.

Skin contact Remove contaminated clothing. Rinse with water. Continue to rinse for at least 15 minutes.

Wash contaminated clothing before reuse. Get medical attention if symptoms are severe or

persist.

Eye contact Rinse immediately with plenty of water. Continue to rinse for at least 15 minutes. Get medical

attention if symptoms are severe or persist.

# 4.2. Most important symptoms and effects, both acute and delayed

**General information** See Section 11 for additional information on health hazards.

# 4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor Treat symptomatically.

### SECTION 5: Firefighting measures

# 5.1. Extinguishing media

Suitable extinguishing media Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog. Use fire-

extinguishing media suitable for the surrounding fire.

# 5.2. Special hazards arising from the substance or mixture

Specific hazards None known.

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Hazardous combustion

products

Thermal decomposition or combustion products may include the following substances: Harmful gases or vapours. Oxides of carbon. Oxides of nitrogen. Oxides of sulphur. Hydrogen fluoride (HF).

### 5.3. Advice for firefighters

Special protective equipment for firefighters

Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Firefighter's clothing conforming to European standard EN469 (including helmets, protective boots and gloves) will provide a basic level of protection for chemical incidents. Use protective equipment appropriate for surrounding materials.

### SECTION 6: Accidental release measures

# 6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions

Wear protective clothing as described in Section 8 of this safety data sheet. No action shall be taken without appropriate training or involving any personal risk. Do not touch or walk into spilled material. Avoid inhalation of dust and vapours. Provide adequate ventilation. Keep unnecessary and unprotected personnel away from the spillage.

#### 6.2. Environmental precautions

**Environmental precautions** 

Avoid discharge into drains or watercourses or onto the ground.

#### 6.3. Methods and material for containment and cleaning up

Methods for cleaning up

Wear protective clothing as described in Section 8 of this safety data sheet. Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into suitable waste disposal containers and seal securely. Clear up spills immediately and dispose of waste safely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. For waste disposal, see Section 13.

# 6.4. Reference to other sections

Reference to other sections

For personal protection, see Section 8. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards. For waste disposal, see Section 13.

### SECTION 7: Handling and storage

# 7.1. Precautions for safe handling

Usage precautions

Wear protective clothing as described in Section 8 of this safety data sheet. Wash hands thoroughly after handling. Provide adequate ventilation. Avoid generation and spreading of dust. Avoid contact with skin and eyes. Avoid inhalation of dust and vapours.

# 7.2. Conditions for safe storage, including any incompatibilities

Storage precautions

Keep container tightly closed. Store in a cool and well-ventilated place. Store contents under inert gas. Store at temperatures between -15°C and -25°C.

#### 7.3. Specific end use(s)

Specific end use(s)

The identified uses for this product are detailed in Section 1.2.

# SECTION 8: Exposure controls/Personal protection

# 8.1. Control parameters

# Occupational exposure limits

No exposure limits known for ingredient(s).

### 8.2. Exposure controls

Appropriate engineering controls

Provide adequate ventilation. Observe any occupational exposure limits for the product or ingredients.

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

**Eye/face protection** Unless the assessment indicates a higher degree of protection is required, the following

protection should be worn: Tight-fitting safety glasses. Personal protective equipment for eye

and face protection should comply with European Standard EN166.

Hand protection Wear protective gloves. To protect hands from chemicals, gloves should comply with

European Standard EN374.

Other skin and body

protection

Wear appropriate clothing to prevent repeated or prolonged skin contact.

Respiratory protection Respiratory protection complying with an approved standard should be worn if a risk

assessment indicates inhalation of contaminants is possible. Ensure all respiratory protective equipment is suitable for its intended use and is 'CE'-marked. Particulate filters should comply with European Standard EN143. Full face mask respirators with replaceable filter cartridges should comply with European Standard EN136. Half mask and quarter mask respirators with

replaceable filter cartridges should comply with European Standard EN140.

**Environmental exposure** 

controls

Keep container tightly sealed when not in use.

### SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Appearance Solid.

**Colour** White. to Off-white.

Odour No data available.

Odour threshold No data available.

**pH** No data available.

Melting point >69°C

**Initial boiling point and range** No data available.

Flash point No data available.

**Evaporation rate** No data available.

Flammability (solid, gas) No data available.

Upper/lower flammability or

explosive limits

No data available.

Vapour pressure No data available.

Vapour density No data available.

Relative density No data available.

**Solubility(ies)** Almost insoluble in the following materials: DMSO Methanol.

Partition coefficient No data available.

Auto-ignition temperature No data available.

**Decomposition Temperature** No data available.

Viscosity No data available.

**Explosive properties** No data available.

Oxidising properties No data available.

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

9.2. Other information

Molecular weight 585.24

# SECTION 10: Stability and reactivity

10.1. Reactivity

**Reactivity** No data available.

10.2. Chemical stability

**Stability** Stable under the prescribed storage conditions.

10.3. Possibility of hazardous reactions

Possibility of hazardous

No data available.

reactions

10.4. Conditions to avoid

Conditions to avoid No data available.

10.5. Incompatible materials

Materials to avoid Strong oxidising agents.

10.6. Hazardous decomposition products

Hazardous decomposition

Oxides of carbon. Oxides of nitrogen. Oxides of sulphur. Hydrogen fluoride (HF).

products

# **SECTION 11: Toxicological information**

# 11.1. Information on toxicological effects

Acute toxicity - oral

Notes (oral LD<sub>50</sub>) Based on available data the classification criteria are not met.

Acute toxicity - dermal

Notes (dermal LD<sub>50</sub>) Based on available data the classification criteria are not met.

Acute toxicity - inhalation

Notes (inhalation LC50) Based on available data the classification criteria are not met.

Skin corrosion/irritation

Animal data Irritating.

Serious eye damage/irritation

**Serious eye damage/irritation** Causes serious eye irritation.

Respiratory sensitisation

**Respiratory sensitisation** Based on available data the classification criteria are not met.

Skin sensitisation

**Skin sensitisation**Based on available data the classification criteria are not met.

Germ cell mutagenicity

**Genotoxicity - in vitro**Based on available data the classification criteria are not met.

Carcinogenicity

**Carcinogenicity** Based on available data the classification criteria are not met.

IARC carcinogenicity None of the ingredients are listed or exempt.

Reproductive toxicity

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Reproductive toxicity - fertility Based on available data the classification criteria are not met.

Reproductive toxicity -

Based on available data the classification criteria are not met.

development

Specific target organ toxicity - single exposure

**STOT - single exposure** STOT SE 3 - H335 May cause respiratory irritation.

Target organs Respiratory system, lungs

Specific target organ toxicity - repeated exposure

**STOT - repeated exposure** Not classified as a specific target organ toxicant after repeated exposure.

Aspiration hazard

Aspiration hazard Not relevant. Solid.

General information Dust may irritate the eyes and the respiratory system. The severity of the symptoms described

will vary dependent on the concentration and the length of exposure.

**Inhalation** A single exposure may cause the following adverse effects: Irritation of nose, throat and

airway. Difficulty in breathing. Coughing.

**Ingestion** May cause irritation.

**Skin contact** Redness. Irritating to skin.

**Eye contact** Irritating to eyes.

Route of exposure Ingestion Inhalation Skin and/or eye contact

Target organs Respiratory system, lungs

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

# SECTION 12: Ecological information

Ecotoxicity Not regarded as dangerous for the environment. However, large or frequent spills may have

hazardous effects on the environment.

12.1. Toxicity

**Toxicity** Based on available data the classification criteria are not met.

# 12.2. Persistence and degradability

Persistence and degradability The degradability of the product is not known.

### 12.3. Bioaccumulative potential

Bioaccumulative potential No data available on bioaccumulation.

Partition coefficient No data available.

12.4. Mobility in soil

**Mobility** No data available.

# 12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB

assessment

No data available.

# 12.6. Other adverse effects

Other adverse effects None known.

# **SECTION 13: Disposal considerations**

# 13.1. Waste treatment methods

General information Dispose of waste to licensed waste disposal site in accordance with the requirements of the

local Waste Disposal Authority. This material and its container must be disposed of in a safe way. When handling waste, the safety precautions applying to handling of the product should

be considered.

# **SECTION 14: Transport information**

General The product is not covered by international regulations on the transport of dangerous goods

(IMDG, IATA, ADR/RID).

# 14.1. UN number

Not applicable.

# 14.2. UN proper shipping name

Not applicable.

# 14.3. Transport hazard class(es)

No transport warning sign required.

# 14.4. Packing group

Not applicable.

# 14.5. Environmental hazards

# Environmentally hazardous substance/marine pollutant

No.

# 14.6. Special precautions for user

# N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Not applicable.

### 14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Not applicable.

Annex II of MARPOL 73/78

and the IBC Code

### SECTION 15: Regulatory information

#### 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations Health and Safety at Work etc. Act 1974 (as amended).

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment

Regulations 2009 (SI 2009 No. 1348) (as amended) ["CDG 2009"].

EH40/2005 Workplace exposure limits.

**EU legislation** Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18

December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of

Chemicals (REACH) (as amended).

Commission Regulation (EU) No 2015/830 of 28 May 2015.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as

amended).

## 15.2. Chemical safety assessment

No chemical safety assessment has been carried out.

# SECTION 16: Other information

Abbreviations and acronyms used in the safety data sheet

ADR: European Agreement concerning the International Carriage of Dangerous Goods by

Road.

ADN: European Agreement concerning the International Carriage of Dangerous Goods by

Inland Waterways.

RID: European Agreement concerning the International Carriage of Dangerous Goods by

Rail

IATA: International Air Transport Association.

ICAO: Technical Instructions for the Safe Transport of Dangerous Goods by Air.

IMDG: International Maritime Dangerous Goods.

CAS: Chemical Abstracts Service. ATE: Acute Toxicity Estimate.

LC₅o: Lethal Concentration to 50 % of a test population.

LD<sub>50</sub>: Lethal Dose to 50% of a test population (Median Lethal Dose).

EC₅: 50% of maximal Effective Concentration.

PBT: Persistent, Bioaccumulative and Toxic substance.

vPvB: Very Persistent and Very Bioaccumulative.

**Training advice** Only trained personnel should use this material.

25/05/2020

Revision 1

Revision date

Hazard statements in full H315 Causes skin irritation.

H319 Causes serious eye irritation. H335 May cause respiratory irritation.

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.



# Safety Data Sheet - Version 5.0

**Preparation Date** 8/1/2019

Latest Revision Date (If Revised)

SDS Expiry Date 7/30/2022

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

1.1 Product Identifier

Chemical Name N-Methylperfluoro-1-octanesulfonamidoacetic Acid

Catalogue # M320055

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

**Product Uses**To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals

2 Brisbane Road Toronto, ON M3J 2J8

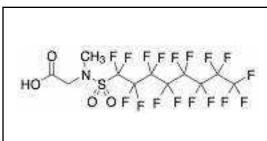
**CANADA** 

**Telephone** +14166659696 **FAX** +14166654439

Email orders@trc-canada.com

1.4 Emergency Telephone Number

**Emergency#** +1(416) 665-9696 between 0800-1700 (GMT-5)



# 2. HAZARDS IDENTIFICATION

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Hazardous to the Aquatic Environment, Long-Term Hazard (Category 4)

# GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word

**GHS Hazard Statements** 

H413 May cause long lasting harmful effects to aquatic life.

**GHS Precautionary Statements** 

P273 Avoid release to the environment.

# 2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

# 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula:  $C_{11}H_6F_{17}NO_4S$  Molecular Weight: 571.21

**CAS Registry #**: 2355-31-9 **EC#**:

**Synonyms** 

N-[(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-Heptadecafluorooctyl)sulfonyl]-N-methylglycine;

2-(N-Methyl-perfluorooctane sulfonamido) Acetate;

2-(N-Methylperfluorooctanesulfoamido)acetic Acid;

2-(N-Methylperfluorooctanesulfonamido)acetic Acid;

Me-PFOSA-AcOH;

N-Me-PFOSAA; N-[(heptadecafluorooctyl)sulfonyl]-sarcosine; N-[(heptadecafluorooctyl)sulfonyl]-N-methyl-glycine

Toronto Research Chemicals - M320055

Page 1

This Safety Data Sheet contains 16 sections. All 16 sections must be present for this document to be valid.

### 3.2 Mixtures

Not a mixture.

## 4. FIRST AID MEASURES

#### 4.1 Description of First Aid Measures

#### **General Advice**

If medical attention is required, show this safety data sheet to the doctor.

#### If Inhaled

If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

#### In Case of Skin Contact

Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

# In Case of Eye Contact

Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

#### If Swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

### 4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

### 4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

# 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing Media

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

#### 5.2 Special Hazards Arising from the Substance or Mixture

Carbon oxides, Nitrogen oxides, Sulfur oxides, Hydrogen fluoride

# **5.3 Advice for Firefighters**

Wear self contained breathing apparatus for fire fighting if necessary.

#### **5.4 Further Information**

No data available.

# 6. ACCIDENTAL RELEASE MEASURES

#### **Personal precautions**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

#### **Environmental precautions**

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

# Method and materials for containment and cleaning up

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

# 7. HANDLING AND STORAGE

#### 7.1 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.

# 7.2 Conditions for safe storage

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

Keep in a dry place.

Storage conditions: -20°C Freezer, Under inert atmosphere

# 7.3 Specific End Uses

For scientific research and development only. Not for use in humans or animals.

Toronto Research Chemicals - M320055

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

## **8.1 Control Parameters**

Contains no components with established occupational exposure limits.

#### **8.2 Exposure Controls**

## **Appropriate Engineering Controls**

A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

## **Personal Protective Equipment**

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

#### **Eye/Face Protection**

Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

#### **Skin Protection**

Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as "chemical resistant" by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.

Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.

Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated "chemical resistant" as per EN 734 with the resistance codes corresponding to the anticipated use of the material.

Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.

Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

## **Body Protection**

Fire resistant (Nomex) lab coat or coveralls.

## **Respiratory Protection**

Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

## 9.1 Information on Basic Physical and Chemical Properties

A) Appearance

White to Off-White Solid

C) Odour Threshold

No data available

E) Melting Point/Freezing Point

142 - 144°C

G) Flash point

No data available

I) Flammability (Solid/Gas)

No data available

K) Vapour Pressure No data available

M) Relative Density No data available

O) Partition Coefficient: n-octanol/water

B) Odour

No data available

D) pH

No data available

F) Initial Boiling Point/Boiling Range

No data available

H) Evaporation Rate

No data available

J) Upper/Lower Flammability/Explosive Limits

No data available

L) Vapour Density

No data available

N) Solubility

DMSO (Slightly), Methanol (Slightly)

P) Auto-Ignition Temperature

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No data available

Q) Decomposition Temperature

No data available

S) Explosive Properties

No data available

No data available T) Oxidizing Properties

No data available

R) Viscosity

No data available

9.2 Other Information

no data available

## 10. STABILITY AND REACTIVITY

#### 10.1 Reactivity

No data available.

#### **10.2 Chemical Stability**

Stable under recommended storage conditions.

## 10.3 Possibility of Hazardous Reactions

No data available.

**10.4 Conditions to Avoid** 

No data available.

10.5 Incompatible Materials

Strong oxidizing agents.

#### 10.6 Hazardous Decomposition Products

In the event of fire: See section 5. Other decomposition products: No data available.

## 11. TOXICOLOGICAL INFORMATION

## 11.1 Information on Toxicological Effects

#### A) Acute Toxicity

Oral LD50: No data available.

Dermal LD50: No data available.

## **B) Skin Corrosion/Irritation**

No data available

## C) Serious Eye Damage/Irritation

No data available

## D) Respiratory or Skin Sensitization

No data available

#### E) Germ Cell Mutagenicity

No data available

## F) Carcinogenicity

No data available

## G) Reproductive Toxicity/Teratogenicity

No data available

## H) Single Target Organ Toxicity - Single Exposure

No data available

## I) Single Target Organ Toxicity - Repeated Exposure

No data available

## **J) Aspiration Hazard**

No data available

## K) Potential Health Effects and Routes of Exposure

#### Inhalation

May be harmful if inhaled. May cause respiratory tract irritation.

## Ingestion

May be harmful if swallowed.

#### Skin

May be harmful if absorbed through skin. May cause skin irritation.

May cause eye irritation.

## L) Signs and Symptoms of Exposure

Page 4

Inhalation LC50: No data available.

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

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

## **M) Additional Information**

RTECS: Not available.

## 12. ECOLOGICAL INFORMATION

#### 12.1 Toxicity

No data available.

#### 12.2 Persistance and Degradability

No data available.

#### 12.3 Bioaccumulative Potential

No data available.

## 12.4 Mobility in Soil

No data available.

## 12.5 Results of PBT and vPvB Assessment

No data available.

## 12.6 Other Adverse Effects

No data available.

## 13. DISPOSAL CONSIDERATIONS

## 13.1 Waste Treatment Methods

## A) Product

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

#### **B) Contaminated Packaging**

Dispose of as above.

#### C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

## 14. TRANSPORT INFORMATION

## 14.1 UN Number

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

## 14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

## 14.3 Transport Hazard Class(es)

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

**14.5 Environmental Hazards** 

DOT (US): None IATA: None IMDG: None ADR/RID: None

#### 14.6 Special Precautions for User

None

## 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

#### 15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

#### A) Canada

**DSL/NDSL Status:** This product is not listed on the Canadian DSL/NDSL.

## **B) United States**

TSCA Status: This product is not listed on the US EPA TSCA.

## C) European Union

**ECHA Status:** This product is not registered with the EU ECHA.

#### 15.2 Chemical Safety Assessment

No data available

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## **16. OTHER INFORMATION**

## **16.1 Revision History**

Original Publication Date: 8/1/2019

## 16.2 List of Abbreviations

LD50 Median lethal dose of a substance required to kill 50% of a test population.

LC50 Medial lethal concentration of a substance required to kill 50% of a test population.

LDLo Lowest known lethal dose TDLo Lowest known toxic dose

IARC International Agency for Research on Cancer

NTP National Toxicology Program

RTECS Registry of Toxic Effects of Chemical Substances

## 16.3 Further Information

Copyright 2015. Toronto Research Chemicals Inc. Copies may be made for internal use only. The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.



# TCI AMERICA SAFETY DATA SHEET

Revision number: 3
Revision date: 08/15/2016

## 1. IDENTIFICATION

Product name: Nonafluoro-1-butanesulfonic Acid

Product code: N0709

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 4]

Eye Damage/Irritation [Category 1] Corrosive to Metals [Category 1] Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage

Causes severe skin burns and eye damage

Harmful if swallowed May be corrosive to metals

Pictogram(s) or Symbol(s):





## Precautionary Statement(s):

[Prevention]

Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full

length face shield). Keep only in original container.

[Response]

If swallowed: Immediately call a poison center or doctor. Rinse mouth. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb

spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: Nonafluoro-1-butanesulfonic Acid

 $\begin{array}{lll} \textbf{Percent:} & >98.0\%(T) \\ \textbf{CAS Number:} & 375-73-5 \\ \textbf{Molecular Weight:} & 300.09 \\ \textbf{Chemical Formula:} & C_4HF_9O_3S \\ \end{array}$ 

Synonyms: Perfluoro-1-butanesulfonic Acid

## 4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed.

Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact:

For severe burns, immediate medical attention is required. Immediately call a poison center or doctor.

Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes.

Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact

with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat

symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control

Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm

and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is harmful. WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved

and take precautions to protect themselves.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub> or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Sulfur oxides Halogenated compounds

Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

#### Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

#### Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

## 6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise

caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if

needed.

## Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

**Environmental precautions:** 

Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

## 7. HANDLING AND STORAGE

**Precautions for safe handling:** Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest.

Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep

away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool,

well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under

inert gas (e.g. Argon). Hygroscopic material, store in a tightly sealed container.

Storage incompatibilities: Acids, Store away from oxidizing agents

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

#### Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

#### Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves.

**Eye protection:** Wear eye protection (splash goggles) and face protection (full length face shield).

**Skin and body protection:** Wear protective clothing (lab coat and chemical resistant boots).

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Color: Colorless - Very pale yellow

Odor: No data available
Odor threshold: No data available

Melting point/freezing point:No data availablepH:No data availableBoiling point/range:212°C (414°F)Vapor pressure:No data availableDecomposition temperature:No data availableVapor density:No data availableRelative density:No data availableDynamic Viscosity:No data available

Relative density: No data available
Kinematic Viscosity: No data available

Partition coefficient: No data available Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: No data available Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

Water: Soluble Soluble: Acetonitrile

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Very slightly soluble: Toluene, Heptane

#### 10. STABILITY AND REACTIVITY

**Reactivity:** Corrodes in contact with metals.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

**Conditions to avoid:** Avoid excessive heat and light.

Incompatible materials:

Hazardous Decomposition Products:

Oxidizing agents

No data available

## 11. TOXICOLOGICAL INFORMATION

RTECS Number: EK5930000

Acute Toxicity: orl-rat LD50:430 mg/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.

Target organ(s): No data available

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available Crustacea: No data available Algae: No data available

Persistence and degradability:

Bioaccumulative potential (BCF):

Mobillity in soil:

Partition coefficient:

No data available
No data available
No data available

n-octanol/water (log Pow)

Soil adsorption (Koc):

Henry's Law:

No data available
No data available

constant (PaM³/mol)

## 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

## 14. TRANSPORT INFORMATION

DOT (US) UN number

UN number: Proper Shipping Name: Class or Division: Packing Group:

Alkyl sulfonic acids, liquid 8 Corrosive material II

IATA

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2586 Alkylsulfonic acids, liquid 8 Corrosive material II

IMDG

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN2586 Alkylsulphonic acids, liquid 8 Corrosive material II

**EmS number:** F-A, S-B

## 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

#### **US Federal Regulations**

**CERCLA Hazardous substance and Reportable Quantity:** 

SARA 313: Not Listed SARA 302: Not Listed

## **State Regulations**

State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

## Other Information

NFPA Rating: HMIS Classification:

Health:3Health:3Flammability:0Flammability:0Instability:0Physical:0

#### **International Inventories**

WHMIS hazard class: E: Corrosive material.

D2A: Materials causing other toxic effects. (Very Toxic)

 Canada: NDSL
 On NDSL

 EC-No:
 206-793-1

## 16. OTHER INFORMATION

Revision date: 08/15/2016 Revision number: 3

## 16. OTHER INFORMATION

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



# TCI AMERICA SAFETY DATA SHEET

Revision number: 3
Revision date: 08/18/2015

1. IDENTIFICATION

Product name: Heptafluorobutyric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]

Product code: A571

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies: Chemtrec 24-Hour +1-800-424-9300 (U.S.A.) +1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]

Corrosive to Metals [Category 1] Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage

Causes severe skin burns and eye damage

May be corrosive to metals

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves,

protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full

length face shield). Keep only in original container.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all

contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present

and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture

[Ion-Pair Reagent for LC-MS]

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Components: Heptafluorobutyric Acid (ca. 0.5mol/L in Water) [lon-Pair Reagent for LC-MS]

Percent: ...

CAS Number:375-22-4Molecular Weight:214.04Chemical Formula: $C_4HF_7O_2$ 

Synonyms: IPC-PFFA-4 (ca. 0.5mol/L in Water), Perfluorobutyric Acid (ca. 0.5mol/L in Water)

## 4. FIRST-AID MEASURES

Eye contact:

**Inhalation:** Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed.

Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is

difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: personnel are aware of the material(s) involved and take precautions to protect themselves.

For severe burns, immediate medical attention is required. Immediately call a poison center or doctor.

Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact

with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat

symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do

not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat

symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves.

#### 5. FIRE-FIGHTING MEASURES

fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products:

These products include: Carbon oxides Halogenated compounds

Other specific hazards:

WARNING: Highly toxic HF gas is produced during combustion.

#### Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

## Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile)

## 6. ACCIDENTAL RELEASE MEASURES

**Emergency procedures:** 

In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed

#### Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

Environmental precautions:

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

## 7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Avoid contact with

skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources

of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool,

well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must

be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

#### Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

#### Personal protective equipment

**Respiratory protection:** Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves.

**Eye protection:** Wear eye protection (splash goggles) and face protection (full length face shield).

**Skin and body protection:**Wear protective clothing (lab coat and chemical resistant boots).

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):

Form:
Color:
Color:
Odor:
No data available
Odor threshold:
No data available

Melting point/freezing point:No data availablepH:No data availableBoiling point/range:No data availableVapor pressure:No data availableDecomposition temperature:No data availableVapor density:No data availableRelative density:No data availableDynamic Viscosity:No data available

Kinematic Viscosity: No data available

Partition coefficient: No data available Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: No data available Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

## 10. STABILITY AND REACTIVITY

**Reactivity:** Corrodes in contact with metals.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

10. STABILITY AND REACTIVITY **Possibility of Hazardous Reactions:** 

No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials: Oxidizing agents **Hazardous Decomposition Products:** No data available

## 11. TOXICOLOGICAL INFORMATION

RTECS Number: ET4025000

**Acute Toxicity:** ipr-mus LD50:68 uL/kg

ivn-rbt LD:>10 uL/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

No data available NTP: No data available OSHA: No data available IARC:

Reproductive toxicity: No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.

No data available Target organ(s):

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available No data available Crustacea: No data available Algae:

Persistence and degradability: No data available Bioaccumulative potential (BCF): No data available Mobillity in soil: No data available No data available Partition coefficient: n-octanol/water (log Pow)

No data available Soil adsorption (Koc): Henry's Law: No data available

constant (PaM3/mol)

## 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

DOT (US)

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3265 Corrosive liquid, acidic, organic, n.o.s. 8 Corrosive material II

<u>IATA</u>

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3265 Corrosive liquid, acidic, organic, n.o.s. 8 Corrosive material II

**IMDG** 

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3265 Corrosive liquid, acidic, organic, n.o.s. 8 Corrosive material

EmS number: F-A, S-B

## 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

## **US Federal Regulations**

## **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed SARA 302: Not Listed

## **State Regulations**

## State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

## Other Information

NFPA Rating: HMIS Classification:

Health:3Health:3Flammability:0Flammability:0Instability:0Physical:0

## International Inventories

WHMIS hazard class: E: Corrosive material.

**EC-No**: 206-786-3

## 16. OTHER INFORMATION

Revision date: 08/18/2015 Revision number: 3

## 16. OTHER INFORMATION

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



# TCI AMERICA SAFETY DATA SHEET

Revision number: 3
Revision date: 10/17/2016

1. IDENTIFICATION

Product name: Nonadecafluorodecanoic Acid

Product code: N0607

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department: TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Acute Toxicity - Oral [Category 3]

Eye Damage/Irritation [Category 1] Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage

Causes severe skin burns and eye damage

Toxic if swallowed

Pictogram(s) or Symbol(s):





Precautionary Statement(s):

[Storage]

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Do

not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full

length face shield).

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If swallowed: Rinse mouth. Do NOT

induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Nonadecafluorodecanoic Acid **TCI AMERICA** Page 2 of 6

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Nonadecafluorodecanoic Acid Components:

Percent: >98.0%(T) **CAS Number:** 335-76-2 Molecular Weight: 514.09 **Chemical Formula:** C<sub>10</sub>HF<sub>19</sub>O<sub>2</sub>

Synonyms: Perfluorodecanoic Acid

## 4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed.

Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is

difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Skin contact:

Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact

Eye contact: with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move

> victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

Toxic if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control Ingestion:

Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Pain, Redness, Acute: Delayed: No data available

Immediate medical attention: WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is toxic. WARNING: It might be hazardous to the person providing aid to give mouthto-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved

and take precautions to protect themselves.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub> or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

Specific hazards arising from the chemical

These products include: Carbon oxides Halogenated compounds Hazardous combustion products: Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

## Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

#### Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

#### 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

> damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

Nonadecafluorodecanoic Acid **TCI AMERICA** Page 3 of 6

## 6. ACCIDENTAL RELEASE MEASURES

**Emergency procedures:** 

Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

## Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. **Environmental precautions:** 

Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

## 7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Do not ingest. Avoid contact

with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container

dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face

protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from

incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent

leakage. Avoid prolonged storage periods.

Combustible substances, Store away from oxidizing agents Storage incompatibilities:

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure limits:** No data available

## Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

#### Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves. Eye protection: Safety glasses.

Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid

Form: Crystal - Powder Color: White - Almost white No data available Odor: Odor threshold: No data available

Melting point/freezing point: 88°C (190°F) No data available pH: 145°C (293°F)/13kPa <1.3kPa/0°C Boiling point/range: Vapor pressure: **Decomposition temperature:** No data available Vapor density: No data available No data available No data available Relative density: **Dynamic Viscosity:** 

**Kinematic Viscosity:** No data available

Partition coefficient: No data available No data available **Evaporation rate:** 

n-octanol/water (log Pow) (Butyl Acetate = 1)

Autoignition temperature: No data available Flash point: No data available No data available

Flammability or explosive limits: Flammability (solid, gas):

No data available Lower:

Upper: No data available

Solubility(ies):

## 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported. Nonadecafluorodecanoic Acid TCI AMERICA Page 4 of 6

## 10. STABILITY AND REACTIVITY

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials: Alkali, Bases, Oxidizing agents, Reducing agents

Hazardous Decomposition Products: No data available

## 11. TOXICOLOGICAL INFORMATION

RTECS Number: HD9900000

**Acute Toxicity:** 

ipr-mus LD50:150 mg/kg ipr-rat LD50:40 mg/kg

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Overexposure may result in serious illness or death. Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s): No data available

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability:
Bioaccumulative potential (BCF):
Mobillity in soil:
Partition coefficient:
n-octanol/water (log Pow)

No data available
No data available

Soil adsorption (Koc):

Henry's Law:

No data available
No data available

constant (PaM³/mol)

## 13. DISPOSAL CONSIDERATIONS

Disposal of product:

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Nonadecafluorodecanoic Acid TCI AMERICA Page 5 of 6

## 13. DISPOSAL CONSIDERATIONS

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

## 14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: Class or Division: Subrisk(s): Packing Group:

UN2923 Corrosive solids, toxic, n.o.s. 8 Corrosive material 6.1 Toxic material.

IATA

UN number: Proper Shipping Name: Class or Division: Subrisk(s): Packing Group:

UN2923 Corrosive solid, toxic, n.o.s. 8 Corrosive material 6.1 Toxic material. II

**IMDG** 

UN number: Proper Shipping Name: Class or Division: Subrisk(s): Packing Group:

UN2923 Corrosive solid, toxic, n.o.s. 8 Corrosive material 6.1 Toxic material. II

EmS number: F-A, S-B

## 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

## **US Federal Regulations**

#### **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed SARA 302: Not Listed

#### **State Regulations**

#### State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

#### Other Information

NFPA Rating: HMIS Classification:

 Health:
 2
 Health:
 2

 Flammability:
 0
 Flammability:
 0

 Instability:
 0
 Physical:
 0

#### International Inventories

WHMIS hazard class: E: Corrosive material.

D1B: Materials causing immediate and serious toxic effects. (Toxic)

**EC-No**: 206-400-3

## 16. OTHER INFORMATION

Revision date: 10/17/2016
Revision number: 3

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

Nonadecafluorodecanoic Acid TCI AMERICA Page 6 of 6



## TCI AMERICA **SAFETY DATA SHEET**

**Revision number: 3** Revision date: 10/06/2014

## IDENTIFICATION

Product name: Tricosafluorododecanoic Acid

Product code: T2492

For laboratory research purposes. Product use: Restrictions on use: Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

sales-US@TCIchemicals.com www.TCIchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.) +1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]

Corrosive to Metals [Category 1] Aquatic Hazard (Acute) [Category 3] Aquatic Hazard (Long-Term) [Category 3] Skin Corrosion/Irritation [Category 1B]

Danger! Signal word:

Hazard Statement(s): Causes serious eye damage

Causes severe skin burns and eye damage

May be corrosive to metals Harmful to aquatic life

Harmful to aquatic life with long lasting effects

## Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves,

protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full

length face shield). Keep only in original container.

If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all [Response]

contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present

and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner. [Disposal]

Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

Tricosafluorododecanoic Acid **TCI AMERICA** Page 2 of 6

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Tricosafluorododecanoic Acid Components:

Percent: >92.0%(GC) **CAS Number:** 307-55-1 Molecular Weight: 614.10 **Chemical Formula:** C<sub>12</sub>HF<sub>23</sub>O<sub>2</sub>

Perfluorododecanoic Acid , Tricosafluorolauric Acid , Perfluorolauric Acid Synonyms:

## 4. FIRST-AID MEASURES

Eye contact:

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed.

Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Skin contact:

Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact

with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat

symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do

not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat

symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Symptoms/effects:

Pain Redness Acute: Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub> or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

## Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

## Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

## 6. ACCIDENTAL RELEASE MEASURES

Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch Personal precautions:

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

Tricosafluorododecanoic Acid TCI AMERICA Page 3 of 6

## 6. ACCIDENTAL RELEASE MEASURES

**Emergency procedures:** 

Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

## Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

#### **Environmental precautions:**

Conditions for safe storage:

Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

## 7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Avoid contact with skin and

eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition. Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool,

well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must

be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure limits:**No data available

#### Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

#### Personal protective equipment

**Respiratory protection:** Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Wear protective gloves.

Eye protection: Safety glasses.

Skin and body protection: Lab coat.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid

Form: Crystal - Powder
Color: White - Almost white
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:110°C (230°F)pH:No data availableBoiling point/range:245°C (473°F)Vapor pressure:No data availableDecomposition temperature:No data availableVapor density:No data availableRelative density:No data availableDynamic Viscosity:No data available

Kinematic Viscosity: No data available

Partition coefficient: 10.16 Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: No data available Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

Water: Insoluble Soluble: Methanol

## 10. STABILITY AND REACTIVITY

Tricosafluorododecanoic Acid TCI AMERICA Page 4 of 6

## 10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light. Incompatible materials: Alkali, Bases, Oxidizing agents

Hazardous Decomposition Products: No data available

## 11. TOXICOLOGICAL INFORMATION

RTECS Number: JR3740000

Acute Toxicity: No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

orl-rat TDLo:22 mg/kg(110D male)

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s): No data available

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: 96h LC50:>0.500 mg/L (Oryzias latipes)
Crustacea: 48h EC50:0.129 mM (Daphnia magna)

Algae: No data available

Persistence and degradability: -16 - -11 % (by BOD), 1 - 2 % (by HPLC)
Bioaccumulative potential (BCF): 16000 (conc. 1 ug/L), 10000 (conc. 0.1 ug/L)

Mobility in soil:

Partition coefficient:

No data available
10.16

Partition coefficient: 10 n-octanol/water (log Pow)

Soil adsorption (Koc): No data available

Henry's Law: 7 x 10<sup>6</sup>

constant (PaM³/mol)

Tricosafluorododecanoic Acid TCI AMERICA Page 5 of 6

## 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

## 14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3261 Corrosive solid, acidic, organic, n.o.s. 8 Corrosive material I

IATA

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3261 Corrosive solid, acidic, organic, n.o.s. 8 Corrosive material

**IMDG** 

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3261 Corrosive solid, acidic, organic, n.o.s. 8 Corrosive material

EmS number: F-A, S-B

## 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

#### **US Federal Regulations**

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed SARA 302: Not Listed

## **State Regulations**

State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

## Other Information

NFPA Rating: HMIS Classification:

#### **International Inventories**

WHMIS hazard class: E: Corrosive material.

**EC-No**: 206-203-2

## 16. OTHER INFORMATION

Revision date: 10/06/2014 Revision number: 3 Tricosafluorododecanoic Acid TCI AMERICA Page 6 of 6

## 16. OTHER INFORMATION

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



## Safety Data Sheet - Version 5.0

Preparation Date 8/24/2016

Latest Revision Date (If Revised) 6/12/2020

SDS Expiry Date 6/11/2023

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

1.1 Product Identifier

Chemical Name Perfluorodecane Sulfonic Acid

Catalogue # P286540

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

**Product Uses**To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals

2 Brisbane Road Toronto, ON M3J 2J8

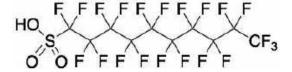
CANADA

**Telephone** +14166659696 **FAX** +14166654439

Email orders@trc-canada.com

1.4 Emergency Telephone Number

**Emergency#** +1(416) 665-9696 between 0800-1700 (GMT-5)



## 2. HAZARDS IDENTIFICATION

## 2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Skin Irritation (Category 2)

Eye Damage/Irritation (Category 2A)

Specific Target Organ Toxicity, Single Exposure; Respiratory Tract Irritation (Category 3)

## GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word Warning

 $\Diamond$ 

## **GHS Hazard Statements**

H315 Causes skin irritation.

H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

## **GHS Precautionary Statements**

P261 Avoid breathing dust/fume/gas/mist/vapours/spray

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P305/P351/P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and

easy to do. Continue rinsing.

## 2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula:  $C_{10}HF_{21}O_3S$  Molecular Weight: 600.14

CAS Registry #: 335-77-3 EC#: 206-401-9

#### **Synonyms**

1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heneicosafluoro-1-decanesulfonic Acid 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Henicosafluorodecane-1-sulfonate

#### 3.2 Mixtures

Not a mixture.

## 4. FIRST AID MEASURES

## 4.1 Description of First Aid Measures

#### **General Advice**

If medical attention is required, show this safety data sheet to the doctor.

#### If Inhaled

If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

#### In Case of Skin Contact

Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

#### In Case of Eye Contact

Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

#### If Swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

## 4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

#### 4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

## 5. FIREFIGHTING MEASURES

#### 5.1 Extinguishing Media

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

## 5.2 Special Hazards Arising from the Substance or Mixture

Carbon oxides, Sulfur oxides, Hydrogen fluoride

#### 5.3 Advice for Firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

#### 5.4 Further Information

No data available.

## 6. ACCIDENTAL RELEASE MEASURES

#### Personal precautions

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

#### **Environmental precautions**

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

#### Method and materials for containment and cleaning up

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

## 7. HANDLING AND STORAGE

#### 7.1 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.

#### 7.2 Conditions for safe storage

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

Keep in a dry place.

Storage conditions: Hygroscopic, -20°C Freezer, Under inert atmosphere

## 7.3 Specific End Uses

For scientific research and development only. Not for use in humans or animals.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### **8.1 Control Parameters**

Contains no components with established occupational exposure limits.

#### **8.2 Exposure Controls**

## **Appropriate Engineering Controls**

A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

#### **Personal Protective Equipment**

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

## **Eye/Face Protection**

Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

## **Skin Protection**

Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as "chemical resistant" by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.

Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.

Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated "chemical resistant" as per EN 734 with the resistance codes corresponding to the anticipated use of the material.

Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.

Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

#### **Body Protection**

Fire resistant (Nomex) lab coat or coveralls.

#### **Respiratory Protection**

Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 Information on Basic Physical and Chemical Properties

A) Appearance

Dark Brown to Very Dark Brown Solid

C) Odour Threshold

No data available

E) Melting Point/Freezing Point

No data available

G) Flash point

No data available

I) Flammability (Solid/Gas)

No data available

K) Vapour Pressure

No data available

INO data available

M) Relative Density
No data available

O) Partition Coefficient: n-octanol/water

No data available

B) Odour

No data available

D) pH

No data available

F) Initial Boiling Point/Boiling Range

No data available

H) Evaporation Rate

No data available

J) Upper/Lower Flammability/Explosive Limits

No data available

L) Vapour Density

No data available

N) Solubility

Acetone (Slightly), DMSO (Slightly), Methanol (Slightly)

P) Auto-Ignition Temperature

No data available

**Q) Decomposition Temperature** 

No data available

S) Explosive Properties

No data available

No data available

R) Viscosity

T) Oxidizing Properties

No data available

9.2 Other Information

no data available

## 10. STABILITY AND REACTIVITY

## 10.1 Reactivity

No data available.

## 10.2 Chemical Stability

Stable under recommended storage conditions.

#### 10.3 Possibility of Hazardous Reactions

No data available.

#### **10.4 Conditions to Avoid**

No data available.

#### 10.5 Incompatible Materials

Strong oxidizing agents.

#### **10.6 Hazardous Decomposition Products**

In the event of fire: See section 5. Other decomposition products: No data available.

## 11. TOXICOLOGICAL INFORMATION

## 11.1 Information on Toxicological Effects

## A) Acute Toxicity

Oral LD50: No data available.

Inhalation LC50: No data available.

Dermal LD50: No data available.

## **B) Skin Corrosion/Irritation**

Moderate skin irritant.

## C) Serious Eye Damage/Irritation

Moderate eye irritant.

## D) Respiratory or Skin Sensitization

No data available

## E) Germ Cell Mutagenicity

No data available

#### F) Carcinogenicity

No data available

## G) Reproductive Toxicity/Teratogenicity

No data available

## H) Single Target Organ Toxicity - Single Exposure

Moderate respiratory tract irritation.

## I) Single Target Organ Toxicity - Repeated Exposure

No data available

#### J) Aspiration Hazard

No data available

## K) Potential Health Effects and Routes of Exposure

#### Inhalation

May be harmful if inhaled. Causes respiratory tract irritation.

## Ingestion

May be harmful if swallowed.

May be harmful if absorbed through skin. Causes skin irritation.

## **Eves**

Causes eye irritation.

## L) Signs and Symptoms of Exposure

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

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

## **M) Additional Information**

RTECS: Not available.

## 12. ECOLOGICAL INFORMATION

#### 12.1 Toxicity

No data available.

## 12.2 Persistance and Degradability

No data available.

#### 12.3 Bioaccumulative Potential

No data available.

#### 12.4 Mobility in Soil

No data available.

#### 12.5 Results of PBT and vPvB Assessment

No data available.

## 12.6 Other Adverse Effects

No data available.

## 13. DISPOSAL CONSIDERATIONS

#### **13.1 Waste Treatment Methods**

## A) Product

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

#### **B) Contaminated Packaging**

Dispose of as above.

#### C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

## 14. TRANSPORT INFORMATION

14.1 UN Number

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

## 14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

#### 14.3 Transport Hazard Class(es)

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.5 Environmental Hazards

DOT (US): None IATA: None IMDG: None ADR/RID: None

## 14.6 Special Precautions for User

None

## 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

## 15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

#### A) Canada

**DSL/NDSL Status:** This product is not listed on the Canadian DSL/NDSL.

**B) United States** 

TSCA Status: This product is not listed on the US EPA TSCA.

C) European Union

**ECHA Status:** This product is not registered with the EU ECHA.

#### 15.2 Chemical Safety Assessment

No data available

## 16. OTHER INFORMATION

#### **16.1 Revision History**

Original Publication Date: 8/24/2016

## 16.2 List of Abbreviations

LD50 Median lethal dose of a substance required to kill 50% of a test population.

LC50 Medial lethal concentration of a substance required to kill 50% of a test population.

LDLo Lowest known lethal dose

TDLo Lowest known toxic dose

IARC International Agency for Research on Cancer

NTP National Toxicology Program

RTECS Registry of Toxic Effects of Chemical Substances

16.3 Further Information

Copyright 2015. Toronto Research Chemicals Inc. Copies may be made for internal use only. The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.



## TCI AMERICA SAFETY DATA SHEET

Revision number: 1 **Revision date: 07/06/2018** 

1. IDENTIFICATION

Product name: Tridecafluoroheptanoic Acid

Product code: T1545

For laboratory research purposes. Product use: Restrictions on use: Not for drug or household use.

Company: TCI America 9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone: +1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail:

sales-US@TCIchemicals.com

www.TCIchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies:

Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:

WHMIS 2015:

Eye Damage/Irritation [Category 1] Corrosive to Metals [Category 1] Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): May be corrosive to metals

Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention]

[Response]

Keep only in original container. Do not breathe dusts or mists. Wash hands and face thoroughly after

handling. Wear protective gloves, protective clothing, face protection.

If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a poison center or doctor. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor. Absorb spillage to prevent

material damage.

[Storage] Store in corrosive resistant bottle or metal container with a resistant inner liner. Store locked up. [Disposal] Dispose of contents and container in accordance with local, regional, national regulations (e.g. US: 40

CFR Part 261, EU:91/156/EEC, JP: Waste Disposal and Cleaning Act, etc.).

Hazards not otherwise classified:

[HNOC]

None.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/mixture: Substance

Components: Tridecafluoroheptanoic Acid

 Percent:
 >98.0%(T)

 CAS RN:
 375-85-9

 Molecular Weight:
 364.06

 Chemical Formula:
 C7HF13O2

Synonyms: Perfluoroenanthic Acid, Perfluoroheptanoic Acid, Tridecafluoroenanthic Acid

## 4. FIRST-AID MEASURES

Description of first aid measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a

POISON CENTER or doctor/physician.

Skin contact: Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water.

Immediately call a POISON CENTER or doctor/physician.

Eye contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.

Continue rinsing.Immediately call a POISON CENTER or doctor/physician.

Ingestion: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

## Indication of any immediate medical attention:

Not available.

Notes to physician: No data available

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, foam, water spray, carbon dioxide.

Specific hazards arising from the

chemical:

Hazardous combustion products:

Other specific hazards:

These products include: Carbon oxides Halogenated compounds WARNING: Highly toxic HF gas is produced during combustion.

Advice for firefighters: Wear self-contained breathing apparatus if possible.

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Environmental precautions:

Methods and materials for containment

and cleaning up:

Use personal protective equipment. Keep people away from and upwind of spill/leak. Entry to non-involved personnel should be controlled around the leakage area by roping off, etc.

Prevent product from entering drains.

Sweep dust to collect it into an airtight container, taking care not to disperse it. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

Take care as it may decompose upon combustion or in high temperatures to generate poisonous fume.

#### 7. HANDLING AND STORAGE

Precautions for safe handling: Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent

dispersion of dust. Wash hands and face thoroughly after handling.

Use a closed system if possible. Use a local exhaust if dust or aerosol will be generated.

Avoid contact with skin, eyes and clothing.

Use corrosive resistant equipment.

Conditions for safe storage, including any incompatibilities

Storage conditions: Keep container tightly closed. Store in a cool and dark place.

Store locked up.

Store away from incompatible materials such as oxidizing agents.

Packaging material: Comply with laws. Keep only in original container.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls: Follow safe industrial engineering/laboratory practices when handling any chemical. Install a closed

system or local exhaust. Also install safety shower and eye bath.

Personal protective equipment

Respiratory protection: Dust respirator, self-contained breathing apparatus(SCBA), supplied air respirator, etc. Use respirators

approved under appropriate government standards and follow local and national regulations.

Hand protection: Impervious gloves.

**Eye protection:** Safety goggles. A face-shield, if the situation requires.

Skin and body protection: Impervious protective clothing. Protective boots, if the situation requires.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid

Form: Crystal - Lump

Colour: White - Very pale yellow Odour: No data available Odor threshold: No data available Odour threshold: No data available No data available

Melting point/freezing point: 32°C (Freezing point) (90°F) No data available pH: 177°C (351°F) No data available. Boiling point/range: Vapour pressure: **Decomposition temperature:** No data available Vapour density: No data available No data available **Dynamic Viscosity:** Relative density: No data available

Kinematic viscosity: No data available

Log Pow:No data availableEvaporation rate(ButylNo data available

Acetate=1):

Flash point: No data available Autoignition temperature: No data available

Flammability(solid, gas): No data available Flammability or explosive limits:

Lower: No data available Upper: No data available

Solubility(ies):

[Water] No data available [Other solvents] No data available

## 10. STABILITY AND REACTIVITY

Reactivity: No data available

Chemical stability: Stable under proper conditions.

**Possibility of hazardous reactions:** No special reactivity has been reported.

Incompatible materials: Oxidizing agents

Hazardous decomposition products: Carbon dioxide, Carbon monoxide, Hydrogen fluoride

## 11. TOXICOLOGICAL INFORMATION

**Acute Toxicity:** 

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

No data available

Target organ(s): No data available

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity:** 

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence / degradability: Bioaccumulative potential(BCF): No data available No data available

Mobility in soil

INO data avallable

violatity iii Soii

Log Pow: No data available
Soil adsorption (Koc): No data available
Henry's Law (PaM ³/mol): No data available

## 13. DISPOSAL CONSIDERATIONS

Disposal of product:

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not

be allowed to enter the environment, drains, water ways, or the soil.

be allowed to enter the environment, drains, water ways, or the sol

Disposal of container:

Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

## 14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3261 Corrosive solid, acidic, organic, n.o.s 8 Corrosive material I

<u>IATA</u>

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3261 Corrosive solid, acidic, organic, n.o.s 8 Corrosive material

**IMDG** 

er:

UN UN3261 Proper Shipping Name: Class or Division: Packing Group:

numb Corrosive solid, acidic, organic, n.o.s 8 Corrosive material III

EmS number: F-A, S-B

## 15. REGULATORY INFORMATION

## Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

## **US Federal Regulations**

## **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed SARA 302: Not Listed

## State Regulations

State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

## **Other Information**

NFPA Rating:HMIS Classification:Health:3Health:3Flammability:1Flammability:1Instability:0Physical:0

**International Inventories** 

 Canada: NDSL
 On NDSL

 EC-No:
 206-798-9

## 16. OTHER INFORMATION

Revision date: 07/06/2018 Revision number: 1

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



## 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-

## Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet 616432S

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 09/04/2016 Version: 1.0

## **SECTION 1: Identification**

#### Identification

Product form Substance

Substance name 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

375-92-8 CAS No : 6164-3-2S Product code : C7HF15O3S Formula

: Perfluoroheptanesulfonic acid Synonyms

Other means of identification : MFCD28015666

## Relevant identified uses of the substance or mixture and uses advised against

: Laboratory chemicals Use of the substance/mixture

Manufacture of substances

Scientific research and development

## Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.

P.O. Box 309

Alachua, FL 32615 - United States of America

T (386) 462-0788 - F (386) 462-7097

info@synquestlabs.com - www.synquestlabs.com

## **Emergency telephone number**

Emergency number : (844) 523-4086 (3E Company - Account 10069)

## **SECTION 2: Hazard(s) identification**

## Classification of the substance or mixture

## Classification (GHS-US)

Acute Tox. 4 (Oral) H302 - Harmful if swallowed

Skin Corr. 1B H314 - Causes severe skin burns and eye damage

H318 - Causes serious eye damage Eve Dam. 1 H335 - May cause respiratory irritation STOT SE 3

Full text of H-phrases: see section 16

Precautionary statements (GHS-US)

## **Label elements**

## GHS-US labeling

Hazard pictograms (GHS-US)





GHS07

GHS05

Signal word (GHS-US) : Danger

: H302 - Harmful if swallowed Hazard statements (GHS-US)

H314 - Causes severe skin burns and eye damage

H335 - May cause respiratory irritation : P260 - Do not breathe dust, mist, spray

P264 - Wash skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product

P271 - Use only outdoors or in a well-ventilated area

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell

P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting

P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse

skin with water/shower

P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing

P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/ physician

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P321 - Specific treatment (see supplemental first aid instructions on this label)

P330 - Rinse mouth

P363 - Wash contaminated clothing before reuse

P403+P233 - Store in a well-ventilated place. Keep container tightly closed

P405 - Store locked up

P501 - Dispose of contents/container to an approved waste disposal plant

#### Other hazards

No additional information available

## **Unknown acute toxicity (GHS US)**

Not applicable

## **SECTION 3: Composition/information on ingredients**

## **Substance**

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (Main constituent)	(CAS No) 375-92-8	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

#### **Mixture**

Not applicable

## **SECTION 4: First aid measures**

## **Description of first aid measures**

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label

where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate

medical advice/attention.

First-aid measures after eye contact Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if

present and easy to do. Continue rinsing. Get immediate medical advice/attention.

: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse First-aid measures after ingestion mouth out with water. Get immediate medical advice/attention.

## Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section

2.2) and/or in section 11.

Symptoms/injuries after inhalation Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea.

## Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

## **SECTION 5: Firefighting measures**

## **Extinguishing media**

: Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media Suitable extinguishing media

appropriate for surrounding fire.

## Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

## **Advice for firefighters**

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting Wear gas tight chemically protective clothing in combination with self contained breathing

apparatus. For further information refer to section 8: "Exposure controls/personal protection".

## **SECTION 6: Accidental release measures**

## Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

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#### 6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

## 6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information

refer to section 8: "Exposure controls/personal protection".

## 6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

## 6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust. Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

#### 6.4. Reference to other sections

No additional information available

## **SECTION 7: Handling and storage**

## 7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good

ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective

equipment. Avoid contact with skin and eyes.

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or

smoke when using this product. Always wash hands after handling the product.

## 7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep container closed when not in use.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage area : Store in dry, cool, well-ventilated area.

## **SECTION 8: Exposure controls/personal protection**

## 8.1. Control parameters

No additional information available

## 8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers

should be available in the immediate vicinity of any potential exposure.

Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.

Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory

Protection.

Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

## **SECTION 9: Physical and chemical properties**

## 9.1. Information on basic physical and chemical properties

Physical state : Solid

Color : No data available : No data available Odor Odor threshold : No data available рΗ : No data available Melting point No data available Freezing point No data available Boiling point : No data available Flash point No data available Relative evaporation rate (butyl acetate=1) : No data available Flammability (solid, gas) : No data available

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## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

**Explosion limits** : No data available : No data available Explosive properties : No data available Oxidizing properties Vapor pressure : No data available Relative density No data available Relative vapor density at 20 °C : No data available Molecular mass : 450.12 g/mol Solubility : No data available Log Pow : No data available Auto-ignition temperature : No data available Decomposition temperature : No data available Viscosity : No data available Viscosity, kinematic : No data available Viscosity, dynamic : No data available

## 9.2. Other information

No additional information available

## **SECTION 10: Stability and reactivity**

#### 10.1. Reactivity

No additional information available

#### 10.2. Chemical stability

The product is stable at normal handling and storage conditions.

## 10.3. Possibility of hazardous reactions

No additional information available

## 10.4. Conditions to avoid

Keep away from heat, sparks and flame.

## 10.5. Incompatible materials

Strong bases. Strong oxidizing agents. Strong reducing agents.

## 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

## **SECTION 11: Toxicological information**

## 11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed.

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : May cause respiratory irritation.

Specific target organ toxicity (repeated : Not classified

exposure)

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea.

## **SECTION 12: Ecological information**

## 12.1. Toxicity

No additional information available

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#### 12.2. Persistence and degradability

No additional information available

#### 12.3. Bioaccumulative potential

No additional information available

#### 12.4. Mobility in soil

No additional information available

#### 12.5. Other adverse effects

No additional information available

## **SECTION 13: Disposal considerations**

#### 13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

## **SECTION 14: Transport information**

## **Department of Transportation (DOT)**

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, II

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212 DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21H

21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H2

13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).

IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.

IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.

T3 - 2.65 178.274(d)(2) Normal...... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154
DOT Quantity Limitations Passenger aircraft/rail : 15 kg
(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 : 50 kg

CFR 175.75)

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DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a

passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this

section is exceeded.

Other information : No supplementary information available.

**TDG** 

No additional information available

Transport by sea

UN-No. (IMDG) : 3261

Proper Shipping Name (IMDG) : CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.

Class (IMDG) : 8 - Corrosive substances

Packing group (IMDG) : II - substances presenting medium danger

Air transport

UN-No. (IATA) : 3261

Proper Shipping Name (IATA) : Corrosive solid, acidic, organic, n.o.s.

Class (IATA) : 8 - Corrosives
Packing group (IATA) : II - Medium Danger

## **SECTION 15: Regulatory information**

## 15.1. US Federal regulations

## 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

EPA TSCA Regulatory Flag

S - S - indicates a substance that is identified in a proposed or final

Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

## 15.2. International regulations

## CANADA

## 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)

Listed on the Canadian NDSL (Non-Domestic Substances List)

## **EU-Regulations**

No additional information available

## National regulations

## 1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)

Listed on the Japanese ISHL (Industrial Safety and Health Law)

## 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

## **SECTION 16: Other information**

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## Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4	
Eye Dam. 1	Serious eye damage/eye irritation Category 1	
Skin Corr. 1B	Skin corrosion/irritation Category 1B	
STOT SE 3	Specific target organ toxicity (single exposure) Category 3	
H302	Harmful if swallowed	
H314	Causes severe skin burns and eye damage	
H318	Causes serious eye damage	
H335	May cause respiratory irritation	

NFPA health hazard : 3 - Short exposure could cause serious temporary or

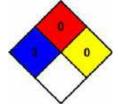
residual injury even though prompt medical attention was

given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is

given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT

react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

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 offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

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# TCI AMERICA SAFETY DATA SHEET

Revision number: 1 Revision date: 07/06/2018

1. IDENTIFICATION

Product name: Undecafluorohexanoic Acid High Grade [Ion-Pair Reagent for LC-MS]

Product code: A572

Product use:For laboratory research purposes.Restrictions on use:Not for drug or household use.

Company: TCI America 9211 N. Harborgate Street Portland, OR 97203 U.S.A. Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail:

sales-US@TCIchemicals.com www.TCIchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies: Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.) +1-703-527-3887 (International) Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:

WHMIS 2015:

Eye Damage/Irritation [Category 1] Corrosive to Metals [Category 1] Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): May be corrosive to metals

Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention]

[Response]

Keep only in original container. Do not breathe dusts or mists. Wash hands and face thoroughly after handling. Wear protective gloves, protective clothing, face protection.

If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.

Immediately call a poison center or doctor. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor. Absorb spillage to prevent potential demands.

material damage.

[Storage] Store in corrosive resistant bottle or metal container with a resistant inner liner. Store locked up.

[Disposal] Dispose of contents and container in accordance with local, regional, national regulations (e.g. US: 40

CFR Part 261, EU:91/156/EEC, JP: Waste Disposal and Cleaning Act, etc.).

Hazards not otherwise classified:

[HNOC]

None.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/mixture: Substance

Components: Undecafluorohexanoic Acid High Grade [Ion-Pair Reagent for LC-MS]

 Percent:
 >98.0%(T)

 CAS RN:
 307-24-4

 Molecular Weight:
 314.05

 Chemical Formula:
 C6HF<sub>11</sub>O<sub>2</sub>

Synonyms: IPC-PFFA-6 HG , Perfluorohexanoic Acid High Grade

## 4. FIRST-AID MEASURES

Description of first aid measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a

POISON CENTER or doctor/physician.

Skin contact: Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water.

Immediately call a POISON CENTER or doctor/physician.

Eye contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.

Continue rinsing.Immediately call a POISON CENTER or doctor/physician.

Ingestion: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

## Indication of any immediate medical attention:

Not available.

Notes to physician: No data available

## 5. FIRE-FIGHTING MEASURES

**Suitable extinguishing media:** Dry chemical, foam, water spray, carbon dioxide.

Specific hazards arising from the

chemical:

Hazardous combustion products:
Other specific hazards:
These products include: Carbon oxides Halogenated compounds WARNING: Highly toxic HF gas is produced during combustion.

Advice for firefighters: Wear self-contained breathing apparatus if possible.

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:

Use personal protective equipment. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Entry to non-involved personnel should be controlled around the leakage area by roping off,

Take care as it may decompose upon combustion or in high temperatures to generate poisonous fume.

etc.

Environmental precautions:

Methods and materials for containment

and cleaning up:

Prevent product from entering drains.

Absorb spilled material in a suitable absorbent (e.g. rag, dry sand, earth, saw-dust). In case of large amount of spillage, contain a spill by bunding. Adhered or collected material should be promptly

disposed of, in accordance with appropriate laws and regulations.

## 7. HANDLING AND STORAGE

Precautions for safe handling: Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent

generation of vapour or mist. Wash hands and face thoroughly after handling.

Use a closed system if possible. Use a ventilation, local exhaust if vapour or aerosol will be generated.

Avoid contact with skin, eyes and clothing.

Use corrosive resistant equipment.

Conditions for safe storage, including any incompatibilities

Storage conditions: Keep container tightly closed. Store in a cool and dark place.

Store under inert gas. Protect from moisture. Store locked up. Store away from incompatible materials such as oxidizing agents.

Light-sensitive Hygroscopic

Packaging material: Comply with laws. Keep only in original container.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Follow safe industrial engineering/laboratory practices when handling any chemical. Install a closed Appropriate engineering controls:

system or local exhaust. Also install safety shower and eye bath.

Personal protective equipment

Respiratory protection: Half or full facepiece respirator, self-contained breathing apparatus(SCBA), supplied air respirator, etc.

Use respirators approved under appropriate government standards and follow local and national

regulations.

Hand protection: Impervious gloves.

Eye protection: Safety goggles. A face-shield, if the situation requires.

Skin and body protection: Impervious protective clothing. Protective boots, if the situation requires.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Colour: Colorless - Almost colorless

Odour: No data available Odor threshold: No data available No data available Odour threshold:

Melting point/freezing point: 14°C (57°F) pH: No data available 157°C (315°F) Boiling point/range: Vapour pressure: No data available. **Decomposition temperature:** No data available No data available Vapour density: **Dynamic Viscosity:** Relative density: 1.76 No data available

No data available Kinematic viscosity: Log Pow: No data available

Evaporation rate(Butyl No data available

Acetate=1):

Flash point: No data available Autoignition temperature: No data available

Flammability(solid, gas): No data available Flammability or explosive limits:

Lower: No data available Upper: No data available

Solubility(ies):

No data available [Water] [Other solvents] No data available

## 10. STABILITY AND REACTIVITY

Reactivity: No data available

Chemical stability: Stable under proper conditions.

Possibility of hazardous reactions: No special reactivity has been reported.

Incompatible materials: Oxidizing agents

Hazardous decomposition products: Carbon dioxide, Carbon monoxide, Hydrogen fluoride

## 11. TOXICOLOGICAL INFORMATION

**Acute Toxicity:** 

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

No data available

Target organ(s): No data available

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity:** 

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence / degradability:

Bioaccumulative potential(BCF):

Mobility in soil

No data available No data available

Log Pow: No data available
Soil adsorption (Koc): No data available
Henry's Law (PaM ³/mol): No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and

Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for

Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not

be allowed to enter the environment, drains, water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

## 14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3265 Corrosive liquid, acidic, organic, n.o.s 8 Corrosive material

<u>IATA</u>

UN number: Proper Shipping Name: Class or Division: Packing Group:

UN3265 Corrosive liquid, acidic, organic, n.o.s 8 Corrosive material II

<u>IMDG</u>

UN UN3265 Proper Shipping Name: Class or Division: Packing Group:

numb Corrosive liquid, acidic, organic, n.o.s 8 Corrosive material II

er:

EmS number: F-A, S-B

## 15. REGULATORY INFORMATION

## Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

## US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts
New Jersey
Pennsylvania
California Proposition 65:
Not Listed
Not Listed
Not Listed

Other Information

NFPA Rating: HMIS Classification:

International Inventories

 Canada: NDSL
 On NDSL

 EC-No:
 206-196-6

## 16. OTHER INFORMATION

Revision date: 07/06/2018 Revision number: 1

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



## Safety Data Sheet 616432T

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 09/21/2016 Version: 1.0

## **SECTION 1: Identification**

## 1.1. Identification

Product form : Substance

Substance name : Perfluorohexanesulfonic acid

 CAS No
 : 355-46-4

 Product code
 : 6164-3-2T

 Formula
 : C6HF13O3S

Synonyms : 1,1,2,2,3,3,4,4,5,5,6,6,6-Tridecafluorohexane-1-sulfonic acid

Other means of identification : MFCD00042453

## 1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Laboratory chemicals

Manufacture of substances
Scientific research and development

## 1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.

P.O. Box 309

Alachua, FL 32615 - United States of America

T (386) 462-0788 - F (386) 462-7097

info@synquestlabs.com - www.synquestlabs.com

## 1.4. Emergency telephone number

Emergency number : (844) 523-4086 (3E Company - Account 10069)

## SECTION 2: Hazard(s) identification

## 2.1. Classification of the substance or mixture

## Classification (GHS-US)

Acute Tox. 4 (Oral) H302 - Harmful if swallowed

Skin Corr. 1B H314 - Causes severe skin burns and eye damage

Eye Dam. 1 H318 - Causes serious eye damage STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

## 2.2. Label elements

## **GHS-US** labeling

Hazard pictograms (GHS-US)





GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H302 - Harmful if swallowed

H314 - Causes severe skin burns and eye damage

H335 - May cause respiratory irritation

Precautionary statements (GHS-US) : P260 - Do not breathe dust, mist, spray P264 - Wash skin thoroughly after handling

P270 - Do not eat, drink or smoke when using this product P271 - Use only outdoors or in a well-ventilated area

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell

P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting

P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse

skin with water/shower

P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/ physician

P321 - Specific treatment (see supplemental first aid instructions on this label)

P330 - Rinse mouth

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P363 - Wash contaminated clothing before reuse

P403+P233 - Store in a well-ventilated place. Keep container tightly closed

P405 - Store locked up

P501 - Dispose of contents/container to an approved waste disposal plant

## 2.3. Other hazards

No additional information available

## 2.4. Unknown acute toxicity (GHS US)

Not applicable

## SECTION 3: Composition/information on ingredients

#### 3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
Perfluorohexanesulfonic acid (Main constituent)	(CAS No) 355-46-4	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

First-aid measures after inhalation

## 3.2. Mixture

Not applicable

## **SECTION 4: First aid measures**

## 4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label

where possible). Move the affected personnel away from the contaminated area.

 Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate

medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if

present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

## 4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section

2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea.

## 4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

## **SECTION 5: Firefighting measures**

## 5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media

appropriate for surrounding fire.

## 5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

## 5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

## **SECTION 6: Accidental release measures**

## 6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

## 6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

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## 6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information

refer to section 8: "Exposure controls/personal protection".

## 6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

## 6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust. Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

#### 6.4. Reference to other sections

No additional information available

## **SECTION 7: Handling and storage**

## 7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good

ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective

equipment. Avoid contact with skin and eyes.

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or

smoke when using this product. Always wash hands after handling the product.

## 7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage area : Store in dry, cool, well-ventilated area.

## **SECTION 8: Exposure controls/personal protection**

## 8.1. Control parameters

No additional information available

## 8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers

should be available in the immediate vicinity of any potential exposure.

Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.

Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory

Protection.

Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

## **SECTION 9: Physical and chemical properties**

## 9.1. Information on basic physical and chemical properties

Physical state : Solid

Color No data available Odor No data available Odor threshold : No data available рН No data available No data available Melting point Freezing point No data available Boiling point No data available Flash point : No data available Relative evaporation rate (butyl acetate=1) : No data available Flammability (solid, gas) : No data available **Explosion limits** No data available Explosive properties No data available

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: No data available Oxidizing properties : No data available Vapor pressure : No data available Relative density Relative vapor density at 20 °C No data available Molecular mass 400.11 g/mol Solubility : No data available Log Pow : No data available Auto-ignition temperature : No data available : No data available Decomposition temperature Viscosity No data available Viscosity, kinematic : No data available : No data available Viscosity, dynamic

#### 9.2. Other information

No additional information available

## **SECTION 10: Stability and reactivity**

## 10.1. Reactivity

No additional information available

#### 10.2. Chemical stability

The product is stable at normal handling and storage conditions.

## 10.3. Possibility of hazardous reactions

No additional information available

## 10.4. Conditions to avoid

Keep away from heat, sparks and flame.

## 10.5. Incompatible materials

Strong bases. Strong oxidizing agents. Strong reducing agents.

## 10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

## **SECTION 11: Toxicological information**

## 11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed.

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : May cause respiratory irritation.

Specific target organ toxicity (repeated : Not classified

exposure)

: Not classified

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough,

shortness of breath, headache, nausea.

## **SECTION 12: Ecological information**

## 12.1. Toxicity

Aspiration hazard

No additional information available

## 12.2. Persistence and degradability

No additional information available

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#### **Bioaccumulative potential**

No additional information available

#### Mobility in soil

No additional information available

#### Other adverse effects

No additional information available

## **SECTION 13: Disposal considerations**

## Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber. Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

## **SECTION 14: Transport information**

## **Department of Transportation (DOT)**

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, II

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive



Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212 DOT Packaging Bulk (49 CFR 173.xxx) : 240

**DOT Symbols** : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102)

: IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1,

13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).

IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.

IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with

a sift-proof and water-resistant liner.

T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx)

DOT Quantity Limitations Passenger aircraft/rail : 15 kg

(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 : 50 kg

CFR 175.75)

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DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a

passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this

section is exceeded.

Other information : No supplementary information available.

**TDG** 

No additional information available

Transport by sea

UN-No. (IMDG) : 3261

Proper Shipping Name (IMDG) : CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.

Class (IMDG) : 8 - Corrosive substances

Packing group (IMDG) : II - substances presenting medium danger

Air transport

UN-No. (IATA) : 3261

Proper Shipping Name (IATA) : Corrosive solid, acidic, organic, n.o.s.

Class (IATA) : 8 - Corrosives
Packing group (IATA) : II - Medium Danger

## **SECTION 15: Regulatory information**

## 15.1. US Federal regulations

## Perfluorohexanesulfonic acid (355-46-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

EPA TSCA Regulatory Flag S - S - indicates a substance that is identified in a proposed or final

Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

## 15.2. International regulations

## CANADA

## Perfluorohexanesulfonic acid (355-46-4)

Listed on the Canadian NDSL (Non-Domestic Substances List)

## **EU-Regulations**

No additional information available

## National regulations

## Perfluorohexanesulfonic acid (355-46-4)

Listed on the Japanese ISHL (Industrial Safety and Health Law)

## 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

## **SECTION 16: Other information**

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## Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4	
Eye Dam. 1	Serious eye damage/eye irritation Category 1	
Skin Corr. 1B Skin corrosion/irritation Category 1B		
STOT SE 3	Specific target organ toxicity (single exposure) Category 3	
H302	Harmful if swallowed	
H314 Causes severe skin burns and eye damage		
H318 Causes serious eye damage		
H335 May cause respiratory irritation		

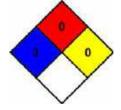
NFPA health hazard : 3 - Short exposure could cause serious temporary or

residual injury even though prompt medical attention was

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions,

and are not reactive with water.



HMIS III Rating

: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is Health

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT

react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

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 offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

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# TCI AMERICA SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Heptadecafluorononanoic Acid

Product code: H0843

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TClchemicals.com www.TClchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies: Chemtrec 24-Hour +1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International) Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]

Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage

Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves,

protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full

length face shield).

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all

contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present

and easy to do. Continue rinsing.

[Storage] Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: Heptadecafluorononanoic Acid

**Percent:** >95.0%(GC)(T)

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number: 375-95-1
Molecular Weight: 464.08
Chemical Formula: C<sub>9</sub>HF<sub>17</sub>O<sub>2</sub>

Synonyms: Heptadecafluoropelargonic Acid , Perfluorononanoic Acid , Perfluoropelargonic Acid

## 4. FIRST-AID MEASURES

Eye contact:

Ingestion:

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed.

Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is

difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

**Skin contact:** For severe burns, immediate medical attention is required. Immediately call a poison center or doctor.

Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact

with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat

symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so

that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub> or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

## Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

## Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

Emergency procedures:

Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or

confined areas; dike if needed.

## 6. ACCIDENTAL RELEASE MEASURES

#### Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. **Environmental precautions:** 

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

## 7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Avoid contact with skin and

eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When

using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from

incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent

leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

## Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

#### Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection:Nitrile gloves.Eye protection:Safety glasses.

**Skin and body protection:** Wear protective clothing (lab coat and chemical resistant boots).

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid

Form: Crystal - Powder
Color: White - Pale yellow
Odor: No data available
Odor threshold: No data available

Melting point/freezing point: 65°C (149°F) pH: No data available Boiling point/range: No data available No data available Vapor pressure: **Decomposition temperature:** No data available Vapor density: No data available No data available No data available Relative density: **Dynamic Viscosity:** 

Kinematic Viscosity: No data available

Partition coefficient: No data available Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: No data available Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available
Upper: No data available

Solubility(ies):

## 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials: Alkali, Bases, Reducing agents, Strong oxidizing agents

Hazardous Decomposition Products: No data available

## 11. TOXICOLOGICAL INFORMATION

**Acute Toxicity:** 

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.

Target organ(s): No data available

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability:

Bioaccumulative potential (BCF):

Mobillity in soil:

Partition coefficient:

No data available
No data available
No data available

n-octanol/water (log Pow)

Soil adsorption (Koc):
Henry's Law:
No data available
No data available

constant (PaM³/mol)

## 13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

## 14. TRANSPORT INFORMATION

**DOT (US)** Non-hazardous for transportation.

## 14. TRANSPORT INFORMATION

IATA Non-hazardous for transportation.

**IMDG** Non-hazardous for transportation.

## 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

## **US Federal Regulations**

**CERCLA Hazardous substance and Reportable Quantity:** 

SARA 313: Not Listed SARA 302: Not Listed

**State Regulations** 

State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

Other Information

NFPA Rating: HMIS Classification:

**International Inventories** 

WHMIS hazard class: E: Corrosive material.

**EC-No**: 206-801-3

## 16. OTHER INFORMATION

Revision date: 10/06/2014 Revision number: 2

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

## PERFLUOROOCTANOIC ACID

Pentadecafluorooctanoic acid Pentadecafluoro-n-octanoic acid Perfluorocaprylic acid

PFOA

CAS #: 335-67-1 UN #: 3261

EC Number: 206-397-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with bases, oxidants or reducing agents.	NO contact with incompatible substances. See Chemical Dangers.	Use water spray, carbon dioxide, dry powder, foam.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!				
	SYMPTOMS	PREVENTION	FIRST AID	
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.	
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap.	
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.	
Ingestion	Abdominal pain. Nausea. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING	
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	According to UN GHS Criteria	
STORAGE	DANGER Harmful if swallowed	
Store only in original container. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers.	Toxic if inhaled Causes serious eye irritation May cause damage to immune system and liver through prolonged or repeated exposure	
PACKAGING	May damage fertility or the unborn child May cause harm to breast-fed children	
Do not transport with food and feedstuffs. Unbreakable packaging. Put breakable packaging into closed unbreakable container.	Suspected of causing cancer  Transportation UN Classification UN Hazard Class: 8; UN Pack Group: III	





Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission. © ILO and WHO 2021



ICSC: 1613 (April 2017)

PERFLUOROOCTANOIC ACID ICSC: 1613

## PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance

WHITE POWDER WITH PUNGENT ODOUR.

**Physical dangers** 

No data.

Chemical dangers

Decomposes on heating above 300°C . This produces toxic and corrosive gases including hydrogen fluoride (See ICSC 0283). The solution is a weak acid. Reacts with bases, oxidants and reducing agents. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Attacks many metals.

Formula: C<sub>8</sub>HF<sub>15</sub>O<sub>2</sub>
Molecular mass: 414.1
Boiling point: 189°C
Melting point: 52-54°C
Density: 1.79 g/cm³
Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.3

## **EXPOSURE & HEALTH EFFECTS**

## Routes of exposure

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

## Effects of short-term exposure

The substance is irritating to the eyes, skin and respiratory tract.

## Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed.

## Effects of long-term or repeated exposure

The substance may have effects on the liver and immune system. This substance is possibly carcinogenic to humans. May cause toxicity to human reproduction or development.

## **OCCUPATIONAL EXPOSURE LIMITS**

MAK: (inhalable fraction): 0.005 mg/m³; peak limitation category: II(8); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

## **ENVIRONMENT**

## **NOTES**

## **ADDITIONAL INFORMATION**

## **EC Classification**

Symbol: T, Xn; R: 40-61-48/23-48/21/22-41-64; S: 53-45

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# **Material Safety Data Sheet**

## HAZARD WARNINGS





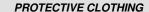


RISK PHRASES

Corrosive to eyes and skin on contact. Toxic compound, do not ingest or inhale. Avoid all contact with this material.

Environmental hazard.

This material is toxic to aquatic organisms and may cause long term adverse effects to the aquatic environment. POSSIBLE MUTAGEN. MINIMIZE EXPOSURE.









Section I. Chemical Product and Company Identification				
Chemical Name Heptadecafluorooctanesulfonic Acid				
Catalog Number	H0781	Supplier	TCI America 9211 N. Harborgate St.	
Synonym	Perfluorooctanesulfonic Acid		Portland OR 1-800-423-8616	
Chemical Formula	$C_8HF_{17}O_3S$			
CAS Number	1763-23-1	In case of Emergency Call	Chemtrec® (800) 424-9300 (U.S.) (703) 527-3887 (International)	
			(100) 021 0001 (international)	

Section II. Composition and Information on Ingredients					
Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data	
Heptadecafluorooctanesulfonic Acid	1763-23-1		This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.	. , , , ,	

#### Section III. Hazards Identification

Acute Health Effects

Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested.

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

Chronic Health Effects

**CARCINOGENIC EFFECTS**: Not available. **MUTAGENIC EFFECTS**: Not available. TERATOGENIC EFFECTS: Not available. **DEVELOPMENTAL TOXICITY: Reproductive effects.** Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy

TOXIC EFFECTS:

Effects on Newborn - Viability index

Effects on Newborn - Other neonatal measures or effects

Effects on Newborn - Growth statistics

Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy

TOXIC EFFECTS:

Effects on Newborn - Stillbirth

Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy

TOXIC EFFECTS:

Specific Developmental Abnormalities - Respiratory system

Effects on Newborn - Live birth index

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. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

#### Section IV. First Aid Measures

Eye Contact Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing Skin Contact

and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

If the victim is not breathing, perform mouth-to-mouth resuscitation. Loosen tight clothing such as a collar, tie, belt or Inhalation waistband. If breathing is difficult, oxygen can be administered. Seek medical attention if respiration problems do not

improve

DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, Ingestion perform mouth-to-mouth resuscitation. 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.

H0/81	Нертадесат	luorooctanesultoi	nic Acid Page 2		
Section V.	Section V. Fire and Explosion Data				
Flammability	May be combustible at high temperature.	Auto-Ignition	Not available.		
Flash Points	Not available.	Flammable Limits	Not available.		
Combustion Products	These products are toxic carbon oxides (CO, CO <sub>2</sub> ), halogenated compounds, sulfur oxides (SO <sub>x</sub> ). WARNING: Highly toxic HF gas is produced during combustion.				
Fire Hazards	Not available.				
Explosion Hazards	Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.				
Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemical powder.  LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.  Consult with local fire authorities before attempting large scale fire-fighting operations.				
Section VI.	Accidental Release Measures				
Spill Cleanup Instructions	Corrosive material. Toxic material. Environmentally hazardous material. Possibly mutagenic material.  Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Consult federal, state, and/or local authorities for assistance on disposal.				
Section VII.	Handling and Storage				
Handling and Storage Information	and Storage CORROSIVE. TOXIC. ENVIRONMENTAL HAZARD. POSSIBLE MUTAGEN. Keep locked up. Keep container dry. Keep				
Section VIII.	Exposure Controls/Personal	Protection			
Engineering Controls			rols to keep airborne levels below recommended ation to keep exposure to airborne contaminants		
Personal Protection	Face shield. Lab coat. Dust respirator. Boots. Gloves. A MSHA/NIOSH approved respirator must be used to avoid inhalation of the product.  Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.				
Exposure Limits	This compound is classified as a possible mu	tagen. There is no acceptable	exposure limit for a mutagen.		
Section IX.	Physical and Chemical Prope	rties			
Physical state @ 20°C	Solid. (White crystal ~ powder.)	Solubility	Soluble in water.		
Specific Gravity	Not available.				
Molecular Weight	500.13	Partition Coefficient	Not available.		
<b>Boiling Point</b>	260°C (500°F)	Vapor Pressure	0.3 Pa (@ 25℃)		
Melting Point	90℃ (194℉)	Vapor Density	Not available.		
Refractive Index	Not available.	Volatility	Not available.		
Critical Temperature	Not available.	Odor	Not available.		
Viscosity	Not available.	Taste	Not available.		
Section X. Stability and Reactivity Data					
Stability	This material is stable if stored under proper conditions. (See Section VII for instructions)				
Conditions of Instability	Avoid excessive heat and light.				
Incompatibilities	Reactive with oxidizing agents, alkalis (bases	s).			

H0781 Heptadecafluorooctanesulfonic Acid Page 3 Section XI. Toxicological Information RG9701600 RTECS Number Eye Contact. Ingestion. Inhalation. Skin contact. Routes of Exposure Rat LD<sub>50</sub> (oral) 154 mg/kg Toxicity Data CARCINOGENIC EFFECTS : Not available. Chronic Toxic Effects MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. **DEVELOPMENTAL TOXICITY**: Reproductive effects. Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Viability index Effects on Newborn - Other neonatal measures or effects Effects on Newborn - Growth statistics Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy TOXIC FFFFCTS: Effects on Newborn - Stillbirth Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Specific Developmental Abnormalities - Respiratory system Effects on Newborn - Live birth index 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. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in

Acute Toxic Effects

Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested.

Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death.

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

## Section XII. Ecological Information

Ecotoxicity

Not available.

Environmental Fate

Perfluorooctane sulfonic acid's production and use as a precursor for fluorinated surfactants has resulted in its release to the environment through various waste streams. If released to air, an estimated vapor pressure of 2.0X10-3 mm Hg at 25 deg C indicates perfluorooctane sulfonic acid will exist solely as a vapor in the ambient atmosphere. Vapor-phase perfluorooctane sulfonic acid will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 110 days. If released to soil, perfluorooctane sulfonic acid is expected to have no mobility based upon an estimated Koc of 100,000. Perfluorooctane sulfonic acid is essentially nonvolatile. Perfluoro compound recalcitrance can be attributed to the stability conferred by fluorine substitutes and the absence of structures susceptible to electrophilic or nucleophilic attack. Perfluorooctane sulfonic acid reached 0% of its theoretical BOD in four weeks using an activated sludge inoculum in the manometric respirometry test. If released into water, perfluorooctane sulfonic acid is expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process as the compound is essentially nonvolatile; an estimated volatilization half-life for a model pond is 3 years if adsorption is considered. An estimated BCF of 56 suggests the potential for bioconcentration in aquatic organisms is moderate. Monitoring studies however would suggest that this compound is highly bioaccumulative. As a class, fluorinated organic compounds are resistant to hydrolysis. Occupational exposure to perfluorooctane sulfonic acid may occur through inhalation and dermal contact with this compound at workplaces where perfluorooctane sulfonic acid is produced or used. Monitoring data indicate that the general population may be exposed to perfluorooctane sulfonic acid via ingestion of contaminated fish and drinking water, and dermal contact with this compound and other products containing perfluorooctane sulfonic acid.

## Section XIII. Disposal Considerations

Waste Disposal

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

## Section XIV. Transport Information

DOT Classification DOT CLASS 8: Corrosive material DOT CLASS 6.1: Toxic material

PIN Number UN2923

Proper Shipping Name Corrosive solid, toxic, n.o.s.

Packing Group (PG)

**DOT Pictograms** 

ing Group (FG)

CORROSIVE



Emergency phone number (800) 424-9300

H0781 Heptadecafluorooctanesulfonic Acid Page 4 Section XV. Other Regulatory Information and Pictograms This compound is ON the EPA Toxic Substances Control Act (TSCA) inventory list. TSCA Chemical Inventory (EPA) WHMIS Classification CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS E: Corrosive solid. (Canada) On NDSL. EINECS Number (EEC) 217-179-8 **EEC Risk Statements** R23/24/25- Toxic by inhalation, in contact with skin and if swallowed. R34- Causes burns. R46- May cause heritable genetic damage. R47- May cause birth defects. R51- Toxic to aquatic organisms.

R53- May cause long-term adverse effects in the aquatic environment.

## Section XVI. Other Information

ENCS No. 2-1595

Version 1.0 Validated on 1/6/2010. Printed 1/6/2010.

Japanese Regulatory Data

## **Notice to Reader**

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

Printed 1/6/2010.



# TCI AMERICA SAFETY DATA SHEET

Revision number: 1
Revision date: 11/12/2013

1. IDENTIFICATION

Product name: Nonafluorovaleric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]

Product code: A571

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail:

sales@tciamerica.com www.TCIchemicals.com Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies: Chemtrec 24-Hour +1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International) Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

## 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]

Corrosive to Metals [Category 1] Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage

Causes severe skin burns and eye damage

May be corrosive to metals

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves,

protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full

length face shield). Keep only in original container.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all

contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present

and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and

determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture

[Ion-Pair Reagent for LC-MS]

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Components: Nonafluorovaleric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]

Percent: .

Synonyms: IPC-PFFA-5 , Nonafluoropentanoic Acid , Perfluoropentanoic Acid , Perfluorovaleric Acid

## 4. FIRST-AID MEASURES

Eye contact:

**Inhalation:** Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed.

Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor.

Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact

with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat

symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical

personnel are aware of the material(s) involved and take precautions to protect themselves.

**Ingestion:**Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do

not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat

symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because

the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves.

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub> or water spray. Consult with local fire authorities before attempting large scale fire

fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products:

These products include: Carbon oxides Halogenated compounds

Other specific hazards:

WARNING: Highly toxic HF gas is produced during combustion.

## Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

## Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

## 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

## 6. ACCIDENTAL RELEASE MEASURES

**Emergency procedures:** 

In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed

## Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

Environmental precautions:

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

## 7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Avoid contact with

skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources

of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool,

well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must

be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

## Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

## Personal protective equipment

**Respiratory protection:** Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves.

**Eye protection:** Wear eye protection (splash goggles) and face protection (full length face shield).

**Skin and body protection:** Wear protective clothing (lab coat and chemical resistant boots).

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid Form: Clear

Coloriess - Almost coloriess

Odor: No data available
Odor threshold: No data available

Melting point/freezing point:No data availablepH:No data availableBoiling point/range:No data availableVapor pressure:No data availableDecomposition temperature:No data availableVapor density:No data availableRelative density:No data availableDynamic Viscosity:No data available

Kinematic viscosity: No data available

Partition coefficient: No data available Evaporation rate: No data available

n-octanol/water (log P<sub>ow</sub>) (Butyl Acetate = 1)

Flash point: No data available Autoignition temperature: No data available

Flammability (solid, gas): No data available Flammability or explosive limits:

Lower: No data available

Upper: No data available

Solubility(ies):

## 10. STABILITY AND REACTIVITY

**Reactivity:** Corrodes in contact with metals.

Chemical Stability: Stable under recommended storage conditions. (See Section 7)

10. STABILITY AND REACTIVITY

Possibility of Hazardous Reactions:

No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials:

Hazardous Decomposition Products:

Oxidizing agents

No data available

#### 11. TOXICOLOGICAL INFORMATION

RTECS Number: No data available

Acute Toxicity: No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

IARC: No data available NTP: No data available OSHA: No data available

Reproductive toxicity:

No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.

Symptoms related to exposure:

Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.

**Potential Health Effects:** 

No specific information available; skin and eye contact may result in irritation. May be harmful if inhaled or ingested.

Target organ(s): No data available

#### 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability:
Bioaccumulative potential (BCF):
Mobillity in soil:
Partition coefficient:
No data available
No data available
No data available

n-octanol/water (log Pow)
Soil adsorption (Koc):
Henry's Law:
No data available
No data available

constant (PaM³/mol)

# 13. DISPOSAL CONSIDERATIONS

**Disposal of product:**Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a

chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

**Disposal of container:** Dispose of as unused product. Do not re-use empty containers.

#### 13. DISPOSAL CONSIDERATIONS

Other considerations:

Observe all federal, state and local regulations when disposing of the substance.

#### 14. TRANSPORT INFORMATION

DOT (US)

UN number: Proper Shipping Name: UN3265 Corrosive liquid, acidic, organic, n.o.s.

Class or Division:

**Packing Group:** 

8 Corrosive material

Ш

IATA

UN3265

**UN number:** Proper Shipping Name:

Class or Division:

**Packing Group:** 

8 Corrosive material

Ш

**IMDG** 

UN3265

EmS number:

UN number: Proper S

Proper Shipping Name:

Class or Division: 8 Corrosive material Packing Group:

Corrosive liquid, acidic, organic, n.o.s.

Corrosive liquid, acidic, organic, n.o.s.

F-A, S-B

#### 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

#### **US Federal Regulations**

#### **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed SARA 302: Not Listed

#### State Regulations

#### State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

#### Other Information

NFPA Rating: HMIS Classification:

#### International Inventories

WHMIS hazard class: E: Corrosive material.

EC-No: 220-300-7 Notice Through Official Gazettes Reference Number: (Japan)

**ENCS**: (2)-1182

#### 16. OTHER INFORMATION

# Revision date: 11/12/2013

**Revision number: 1** 

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



Safety Data Sheet per OSHA HazCom 2012

Page 1/5 Printing date 11/23/2015 Reviewed on 06/10/2014

#### 1 Identification

Product identifier

Product name: Perfluorotetradecanoic acid

Stock number: L13796

**CAS Number:** 376-06-7

**EC** number: 206-803-4

Relevant identified uses of the substance or mixture and uses advised against.

Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet

Details of the supplier of the safety da Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc. 30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757

Email: tech@alfa.com www.alfa.com

Information Department: Health, Safety and Environmental Department

Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

#### 2 Hazard(s) identification

#### Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)



**GHS05** Corrosion

Skin Corr. 1B H314 Causes severe skin burns and eye damage. Eye Dam. 1 H318 Causes serious eye damage. **Hazards not otherwise classified** No information known.

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms



#### Signal word Danger

Hazard statements

Hazard statements
H314 Causes severe skin burns and eye damage.
Precautionary statements
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
D28 - Toxic material causing other toxic effects

D2B - Toxic material causing other toxic effects E - Corrosive material



Classification system HMIS ratings (scale 0-4) (Hazardous Materials Identification System)



EALTH S Health (acute effects) = 3
IRE 1 Flammability = 1
EACTIVITY 1 Physical Hazard = 1

Other hazards Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable.

#### 3 Composition/information on ingredients

Chemical characterization: Substances

CAS# Description: 376-06-7 Perfluorotetradecanoic acid Identification number(s): EC number: 206-803-4

#### 4 First-aid measures

Description of first aid measures

General information Immediately remove any clothing soiled by the product.

After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

(Contd. on page 2)

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor. After swallowing Seek medical treatment. Information for doctor

(Contd. of page 1)

Most important symptoms and effects, both acute and delayed Causes severe skin burns. Causes serious eye damage.

Indication of any immediate medical attention and special treatment needed No further relevant information available

#### 5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:

Carbon monoxide and carbon dioxide

Hydrogen fluoride (HF)

Advice for firefighters

Protective equipment:

Wear self-contained respirator.

Wear fully protective impervious suit.

#### 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.

Methods and material for containment and cleaning up:
Use neutralizing agent.
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.

Prevention of secondary hazards: No special measures required.

Reference to other sections

See Section 7 for information on safe handling

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

#### 7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities

Requirements to be met by storerooms and receptacles: No special requirements.

Requirements to be met by storerooms and receptacies: N Information about storage in one common storage facility: Store away from strong bases. Store away from oxidizing agents. Further information about storage conditions: Keen container tingthy sealed.

Keep container tightly sealed. Store in cool, dry conditions in well sealed containers.

Specific end use(s) No further relevant information available.

#### 8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace. **Additional information**: No data

Exposure controls

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.

Maintain an ergonomically appropriate working environment.

Breathing equipment: Use suitable respirator when high concentrations are present.

Recommended filter device for short term use:

Use a respirator with type P100 (USA) or P3 (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if airpurifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.

Protection of hands:

Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Penetration time of glove material (in minutes) Not determined

Eye protection:
Tightly sealed goggles
Full face protection

Body protection: Protective work clothing.

### 9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance: Form:

Powder

(Contd. on page 3)

(Contd. of page 2) Color: White Odor: Odor threshold: Not determined Not determined pH-value: Not applicable Change in condition Melting point/Melting range: Boiling point/Boiling range: Sublimation temperature / start: 130-132 °C (266-270 °F) 192 °C (378 °F) (60mm) Not determined Not applicable Not determined Flash point: Flammability (solid, gaseous) Ignition temperature: Decomposition temperature: Not determined Not determined Auto igniting: Not determined.

Danger of explosion: Explosion limits: Product does not present an explosion hazard.

Explosion limits:
Lower:
Upper:
Vapor pressure:
Density:
Relative density
Vapor density
Evaporation rate
Solubility in / Miscibility with
Water: Not determined Not determined Not applicable. Not determined Not determined. Not applicable. Not applicable.

Water: Insoluble
Partition coefficient (n-octanol/water): Not determined. Viscosity: dynamic: kinematic: Not applicable.

Not applicable.
No further relevant information available.

Other information

#### 10 Stability and reactivity

Reactivity No information known.

Chemical stability Stable under recommended storage conditions.

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.

Possibility of hazardous reactions Reacts with strong oxidizing agents

Conditions to avoid No further relevant information available.

Incompatible materials:

Oxidizing agents

Hazardous decomposition products: Carbon monoxide and carbon dioxide Hydrogen fluoride

#### 11 Toxicological information

Information on toxicological effects

Acute toxicity: Swallowing will lead to a strong corrosive effect on mouth and throat and to the danger of perforation of esophagus and stomach. LD/LC50 values that are relevant for classification: No data

LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Causes severe skin burns.
Eye irritation or corrosion: Causes serious eye damage.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Garcinogenicity: No effects known.
Carcinogenicity: No effects known.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

#### 12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Avoid transfer into the environment

Avoid transfer into the environment.

Results of PBT and vPvB assessment

PBT: Not applicable. vPvB: Not applicable

Other adverse effects No further relevant information available.

#### 13 Disposal considerations

Waste treatment methods

Recommendation Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

#### 14 Transport information

**UN-Number** DOT, IMDG, IATA

UN3261

UN proper shipping name

Corrosive solid, acidic, organic, n.o.s. (Perfluorotetradecanoic acid)

(Contd. on page 4)

Product name: Permuorotetradecanoic acid	
	(Contd. of page 3)
IMDG, IATA	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Perfluorotetradecanoic acid)
Transport hazard class(es)	
DOT	
Class	8 Corrosive substances.
Label Class	8 (C4) Corrosive substances
Label IMDG, IATA	8
INIDG, IATA	
Class Label	8 Corrosive substances. 8
Packing group DOT, IMDG, IATA	III
Environmental hazards:	Not applicable.
Special precautions for user EMS Number:	Warning: Corrosive substances
EMS Number: Segregation groups	F-A,S-B Acids
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Co	<b>de</b> Not applicable.
Transport/Additional information:	

Nο

UN3261, Corrosive solid, acidic, organic, n.o.s. (Perfluorotetradecanoic acid), 8, III

# UN "Model Regulation": 15 Regulatory information

Marine Pollutant (DOT):

Safety, health and environmental regulations/legislation specific for the substance or mixture GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS) Hazard pictograms



DOT

Signal word Danger Hazard statements

H314 Causes severe skin burns and eye damage.

Precautionary statements

Precautionary statements
Do not breathe dust/fume/gas/mist/vapours/spray.
Do not breathe dust/fume/gas/mist/vapours/spray.
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P405 Store locked up.

Dispose of contents/container in accordance with local/regional/national/international regulations.

Mational regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).

All components of this product are listed on the Canadian Non-Domestic Substance's List (NDSL).

SARA Section 313 (specific toxic chemical listings) Substance is not listed.

California Proposition 65

Prop 65 - Chemicals known to cause cancer Substance is not listed.

Prop 65 - Developmental toxicity Substance is not listed.

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male Substance is not listed.

Information about limitation of use: For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations

Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.

This substance is included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH).

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed. market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / Abbreviations and acronyms:

RID: Réglement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
ICAO: International Civil Aviation Organization
ICAO: International Civil Aviation Organization
ICAO: International Instructions by the "International Civil Aviation Organization" (ICAO)
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Hazardous Materials Information System (Canada)
LC50: Lethal dose, 50 percent
UPOB: very Persistent and very Bioaccumulative

(Contd. on page 5)



ACGIH: American Conference of Governmental Industrial Hygienists (USA) OSHA: Occupational Safety and Health Administration (USA) NTP: National Toxicology Program (USA) IARC: International Agency for Research on Cancer EPA: Environmental Protection Agency (USA)

(Contd. of page 4)



# SAFETY DATA SHEET

Version 6.2 Revision Date 07/16/2021 Print Date 10/24/2021

# SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1 **Product identifiers**

Product name : Perfluorotridecanoic acid

Product Number : 654973 Brand Aldrich CAS-No. : 72629-94-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

> : Sigma-Aldrich Inc. Company

3050 SPRUCE ST ST. LOUIS MO 63103 **UNITED STATES** 

Telephone +1 314 771-5765 Fax +1 800 325-5052

1.4 **Emergency telephone** 

> Emergency Phone # 800-424-9300 CHEMTREC (USA) +1-703-

527-3887 CHEMTREC (International) 24

Hours/day; 7 Days/week

#### **SECTION 2: Hazards identification**

#### 2.1 Classification of the substance or mixture

#### GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302

Acute toxicity, Inhalation (Category 4), H332

Carcinogenicity (Category 2), H351

Reproductive toxicity (Category 1B), H360

Effects on or via lactation, H362

Specific target organ toxicity - repeated exposure (Category 1), Liver, H372

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

#### GHS Label elements, including precautionary statements

Pictogram

Signal word Danger



Hazard statement(s) H302 + H332 H351 H360 H362 H372	Harmful if swallowed or if inhaled. Suspected of causing cancer. May damage fertility or the unborn child. May cause harm to breast-fed children. Causes damage to organs (Liver) through prolonged or repeated exposure.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal

# 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

plant.

# **SECTION 3: Composition/information on ingredients**

# 3.1 Substances

Component	Classification	Concentration
Perfluorotridecanoic acid		
	Acute Tox. 4; Carc. 2; Repr. 1B; Lact.; STOT RE 1; H302, H332, H351, H360, H362, H372	<= 100 %

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



#### **SECTION 4: First aid measures**

# 4.1 Description of first-aid measures

#### **General advice**

Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

# 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

# 4.3 Indication of any immediate medical attention and special treatment needed No data available

#### **SECTION 5: Firefighting measures**

#### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (CO2) Dry powder

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

# 5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

#### 5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

#### 5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.



#### **SECTION 6: Accidental release measures**

# 6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

#### 6.2 Environmental precautions

Do not let product enter drains.

# 6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

#### 6.4 Reference to other sections

For disposal see section 13.

# **SECTION 7: Handling and storage**

#### 7.1 Precautions for safe handling

#### Advice on safe handling

Work under hood. Do not inhale substance/mixture.

# **Hygiene measures**

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

#### 7.2 Conditions for safe storage, including any incompatibilities

#### **Storage conditions**

Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

# 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

#### **SECTION 8: Exposure controls/personal protection**

#### 8.1 Control parameters

#### **Ingredients with workplace control parameters**

Contains no substances with occupational exposure limit values.

# 8.2 Exposure controls

#### **Appropriate engineering controls**

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Aldrich - 654973

Millipore SigMa

# **Personal protective equipment**

#### Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

#### Skin protection

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm Break through time: 480 min

Material tested: KCL 741 Dermatril® L

#### **Body Protection**

protective clothing

#### **Respiratory protection**

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

#### **Control of environmental exposure**

Do not let product enter drains.

#### **SECTION 9: Physical and chemical properties**

#### 9.1 Information on basic physical and chemical properties

a) Appearance Form: solid

b) Odorc) Odor Thresholdd) pHNo data availableNo data available

e) Melting point/range: 112 - 123 °C (234 - 253 °F) - lit.

point/freezing point

f) Initial boiling point No data available

and boiling range

g) Flash point ()Not applicableh) Evaporation rate No data availablei) Flammability (solid, No data available



gas) No data available j) Upper/lower flammability or explosive limits No data available k) Vapor pressure Vapor density No data available m) Density No data available Relative density No data available n) Water solubility No data available No data available o) Partition coefficient: n-octanol/water

p) Autoignition temperature

No data available

q) Decomposition temperature

No data available

r) Viscosity No data availables) Explosive properties No data availablet) Oxidizing properties No data available

# 9.2 Other safety information

No data available

# **SECTION 10: Stability and reactivity**

#### 10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

# 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

# 10.3 Possibility of hazardous reactions

No data available

# 10.4 Conditions to avoid

no information available

# 10.5 Incompatible materials

Strong oxidizing agents

# 10.6 Hazardous decomposition products

In the event of fire: see section 5



#### **SECTION 11: Toxicological information**

# 11.1 Information on toxicological effects

#### Acute toxicity

Acute toxicity estimate Oral - 500.1 mg/kg

(Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l

(Expert judgment)

Dermal: No data available

No data available

#### Skin corrosion/irritation

No data available

# Serious eye damage/eye irritation

Causes serious eye damage.

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

No data available

No data available

No data available

# Carcinogenicity

Suspected of causing cancer.

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is

identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient 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

on OSHA's list of regulated carcinogens.

#### Reproductive toxicity

May damage the unborn child.

Studies indicating a hazard to babies during the lactation period

# Specific target organ toxicity - single exposure

No data available

# Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - Liver

#### **Aspiration hazard**

No data available

# 11.2 Additional Information

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

After absorption:

gastric pain

Nausea

Vomiting

Drowsiness

#### somnolence

Handle in accordance with good industrial hygiene and safety practice.

#### **SECTION 12: Ecological information**

#### 12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates

Remarks: No data available (Perfluorotridecanoic acid)

Toxicity to algae Remarks: No data available (Perfluorotridecanoic acid)

# 12.2 Persistence and degradability

No data available

#### 12.3 Bioaccumulative potential

No data available

#### 12.4 Mobility in soil

No data available

#### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

#### 12.6 Other adverse effects

Discharge into the environment must be avoided.

#### **SECTION 13: Disposal considerations**

#### 13.1 Waste treatment methods

#### **Product**

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

# **SECTION 14: Transport information**

#### DOT (US)

Not dangerous goods

#### **IMDG**

Not dangerous goods

#### **IATA**

Not dangerous goods



#### **Further information**

Not classified as dangerous in the meaning of transport regulations.

#### **SECTION 15: Regulatory information**

#### **SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

#### **SARA 313 Components**

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

No SARA Hazards

# **Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components** 

Perfluorotridecanoic acid CAS-No. Revision Date

72629-94-8

**New Jersey Right To Know Components** 

Perfluorotridecanoic acid CAS-No. Revision Date

72629-94-8

#### **SECTION 16: Other information**

#### **Further information**

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

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Version: 6.2 Revision Date: 07/16/2021 Print Date: 10/24/2021



# TCI AMERICA SAFETY DATA SHEET

Revision number: 2 Revision date: 10/06/2014

#### 1. IDENTIFICATION

Product name: Heneicosafluoroundecanoic Acid

Product code: H1234

**Product use:** For laboratory research purposes. **Restrictions on use:** Not for drug or household use.

Company: TCI America

9211 N. Harborgate Street Portland, OR 97203 U.S.A.

Telephone:

+1-800-423-8616 / +1-503-283-1681

Fax:

+1-888-520-1075 / +1-503-283-1987

e-mail

sales-US@TCIchemicals.com www.TCIchemicals.com

Emergency telephone number:

Chemical Emergencies:

TCI America (8:00am - 5:00pm) PST

+1-503-286-7624

Transportation Emergencies: Chemtrec 24-Hour

+1-800-424-9300 (U.S.A.)

+1-703-527-3887 (International)

Responsible department:

TCI America

Environmental Health Safety and Security

+1-503-286-7624

#### 2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Skin Corrosion/Irritation [Category 2]

Eye Damage/Irritation [Category 2A]

Signal word: Warning!

Hazard Statement(s): Causes serious eye irritation

Causes skin irritation

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Wash hands and face thoroughly after handling. Wear protective gloves. Wear eye and face protection. [Response] If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off

contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical

advice or attention.

[Storage] None [Disposal] None

# 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance

Components: Heneicosafluoroundecanoic Acid

 Percent:
 >97.0%(GC)(T)

 CAS Number:
 2058-94-8

 Molecular Weight:
 564.09

 Chemical Formula:
 C<sub>11</sub>HF<sub>21</sub>O<sub>2</sub>

Synonyms: Perfluoroundecanoic Acid

Heneicosafluoroundecanoic Acid TCI AMERICA Page 2 of 5

#### 4. FIRST-AID MEASURES

Inhalation: Call a poison center or doctor if you feel unwell. Move victim to fresh air. Give artificial respiration if victim

is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat

symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and

take precautions to protect themselves.

Skin contact: If skin irritation occurs get medical advice/attention. Remove and wash contaminated clothing before reuse. In case of contact with substance, immediately flush skin with running water for at least 20 minutes.

Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with

material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s)

involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. If swallowed, seek medical advice immediately and show

the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the

material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.

Delayed: No data available

Immediate medical attention: If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the

injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect

themselves.

#### 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO<sub>2</sub>, sand, earth, water spray or regular foam Consult with local fire authorities before

attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

#### Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

#### Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

#### 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch

damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation.

Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust

respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves

(nitrile).

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the

area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective cotting. Warn personnel to move away. Prevent entry into sewers, basements or

confined areas; dike if needed.

#### Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. **Environmental precautions:** 

Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

Page 3 of 5 Heneicosafluoroundecanoic Acid **TCI AMERICA** 

#### 7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Avoid contact with skin and eyes. Good general ventilation should be

sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep

away from sources of ignition.

Keep only in the original container in a cool well-ventilated place. Keep away from incompatibles. Conditions for safe storage:

Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid

prolonged storage periods.

Storage incompatibilities: Store away from oxidizing agents

#### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure limits:** No data available

#### Appropriate engineering controls:

Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

#### Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.

Hand protection: Nitrile gloves. Safety glasses. Eye protection: Skin and body protection: Lab coat.

# 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):

Crystal - Powder Form: Color: White - Almost white Odor: No data available Odor threshold: No data available

Melting point/freezing point: 101°C (214°F) pH: No data available 160°C (320°F)/8kPa No data available Boiling point/range: Vapor pressure: **Decomposition temperature:** No data available No data available Vapor density: No data available No data available Relative density: **Dynamic Viscosity:** 

**Kinematic Viscosity:** No data available

Partition coefficient: No data available No data available Evaporation rate: (Butyl Acetate = 1)

n-octanol/water (log Pow)

113°C (235°F) Autoignition temperature: No data available Flash point:

No data available Flammability (solid, gas): Flammability or explosive limits:

> Lower: No data available Upper: No data available

Solubility(ies):

# 10. STABILITY AND REACTIVITY

Reactivity: Not Available.

**Chemical Stability:** Stable under recommended storage conditions. (See Section 7)

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

Conditions to avoid: Avoid excessive heat and light.

Incompatible materials: Oxidizing agents **Hazardous Decomposition Products:** No data available

#### 11. TOXICOLOGICAL INFORMATION

**Acute Toxicity:** 

No data available

Skin corrosion/irritation:

No data available

Serious eye damage/irritation:

No data available

Respiratory or skin sensitization:

No data available

Germ cell mutagenicity:

No data available

Carcinogenicity:

No data available

No data available NTP: No data available OSHA: No data available IARC:

Reproductive toxicity:

No data available

Inhalation, Eye contact, Ingestion, Skin contact. Routes of Exposure:

Symptoms related to exposure:

Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.

**Potential Health Effects:** 

Skin and eye contact may result in irritation.

Target organ(s): No data available

#### 12. ECOLOGICAL INFORMATION

**Ecotoxicity** 

Fish: No data available No data available Crustacea: Algae: No data available

Persistence and degradability:

No data available Bioaccumulative potential (BCF): 1400 - 3500 (conc. 1 ug/L), 1300 - 5300 (conc. 0.1 ug/L)

Mobillity in soil: No data available No data available Partition coefficient:

n-octanol/water (log Pow) Soil adsorption (Koc):

No data available No data available Henry's Law:

constant (PaM3/mol)

13. DISPOSAL CONSIDERATIONS

Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local **Disposal of product:** 

rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains,

water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Observe all federal, state and local regulations when disposing of the substance. Other considerations:

# 14. TRANSPORT INFORMATION

DOT (US) Non-hazardous for transportation.

Non-hazardous for transportation. IATA

IMDG Non-hazardous for transportation. Heneicosafluoroundecanoic Acid TCI AMERICA Page 5 of 5

#### 15. REGULATORY INFORMATION

#### Toxic Substance Control Act (TSCA 8b.):

This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:

- (i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
- (ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

### **US Federal Regulations**

#### **CERCLA Hazardous substance and Reportable Quantity:**

SARA 313: Not Listed SARA 302: Not Listed

# **State Regulations**

State Right-to-Know

MassachusettsNot ListedNew JerseyNot ListedPennsylvaniaNot ListedCalifornia Proposition 65:Not Listed

#### Other Information

NFPA Rating: HMIS Classification:

 Health:
 1
 Health:
 1

 Flammability:
 0
 Flammability:
 0

 Instability:
 0
 Physical:
 0

#### **International Inventories**

WHMIS hazard class: D2B: Materials causing other toxic effects. (Toxic)

**EC-No:** 218-165-4

#### 16. OTHER INFORMATION

Revision date: 10/06/2014 Revision number: 2

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



# APPENDIX F HOSPITAL INFORMATION, MAP AND FIELD ACCIDENT REPORT



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# FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident. PROJECT NAME PROJECT. NO.\_\_ Date of Accident Time Report By \_\_\_\_\_ Type of Accident (Check One): () Vehicular () Personal () Property Name of Injured\_\_\_\_\_\_ DOB or Age\_\_\_\_\_ How Long Employed\_\_\_\_\_ Names of Witnesses Description of Accident\_ Action Taken Did the Injured Lose Any Time? \_\_\_\_\_ How Much (Days/Hrs.)?\_\_\_\_ Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? (If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

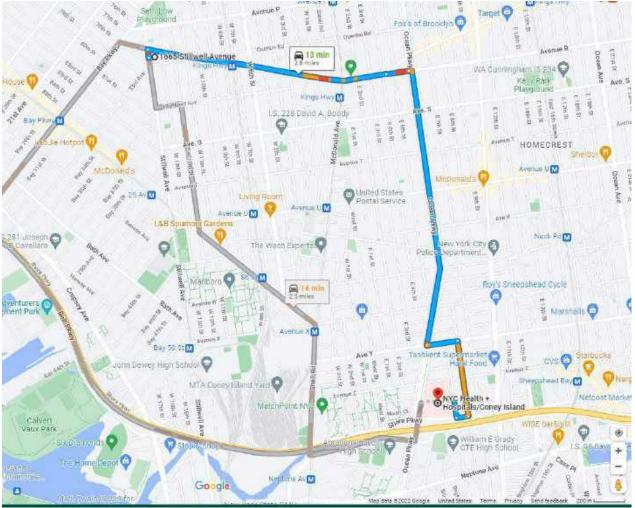


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# **HOSPITAL INFORMATION AND MAP**

The hospital nearest the site is: **Coney Island Hospital Emergency Department** 2601 Ocean Parkway, Brooklyn, NY 11235 718-616-4327

# Figure 1 – Directions



#### START

- 1. Head west toward Stillwell Ave
- 2. Take Kings Hwy and Ocean Pkwy to Hubbard St
- 3. Take right onto Hubbard St
- 4. Hubbard St turns right and becomes Ocean Shore Pkwy
- 5. Turn right onto E 6<sup>th</sup> St
- 6. NYC Health + Hospitals/Coney Island is on the left **2601 Ocean Parkway, Brooklyn, NY 11235**

**END** 

# Appendix G Project Team Resumes





# Karen G. Tyll, P.E.

#### **President**

#### **Fields of Competence**

Ms. Tyll applies her knowledge of civil and environmental engineering to remediation design, stormwater management, forensic investigations, environmental compliance, and environmental permitting/complaince. Ms. Tyll's background is an interesting mix of remedial design, site grading, drainage and utility design, environmental investigations, forensic engineering, and permitting/ regulatory compliance.

#### **Experience Summary**

Twenty five years of experience: President with Tyll Engineering and Consulting PC, Senior Engineer with J.R. Holzmacher, PE LLC, Senior Engineer with Roux Associates, Inc./Remedial Engineering, P.C.; Senior and Project Engineer at P.W. Grosser Consulting; Project Engineer at Vollmuth & Brush; Project Engineer at Anderson & Associates.

#### Credentials

B.S.C.E., Civil Engineering with Environmental Option, Virginia Tech

Professional Engineer: New York (079520), North Carolina (044315), Florida (81892)

OSHA Health & Safety 40 Hour Training and 8 hour annual refresher.

NYC OER Turbo Training Gold/Bronze Certification NYC OER Brownfield Incentive Grant Qualified Vendor

#### **Professional Affiliations**

American Society of Civil Engineers
National Society of Professional Engineers
Society of Women Engineers, Section Treasurer 1999-2002
Society of Women Engineers, Section President, 2002-2005
Engineers Joint Committee of Long Island, Rube Goldberg
Contest Chair

# **Key Projects**

# Remediation:

- Providing professional engineering services to assist other environmental consulting firms' clients and directly to land owners to fulfill needs for PE involvement with NYSDEC, NYCOER, and NYCDEP driven projects.
- Completed inspection of Vapor Barrier system (VBS) design and inspection of the installation and Sub-slab Depressurization System (SSDS) design

- and inspection. Train and troubleshoot the installation of VBS with Contractors.
- Completed outdoor, ambient, and sub-slab air sampling for office building with passive SSDS in Melville, NY. Completed design to turn passive system to active system, completed necessary reports, and supported consent order issues.
- Project Manager to complete investigation and remediation at historic aircraft part facility in New Jersey. Oversaw staff that completed multiple, large sampling events, test pits, and reporting to the NJDEP.
- Project Manager on multiple remediation sites requiring investigations, tank removals, remedial action activities, compliance reporting, and monitoring.

#### Stormwater Experience:

- Senior Engineer to design stormwater collection structures during design upgrades to 10 acres of an existing storm drain system at a former fuel terminal in Buffalo, New York. Responsible for laying out system, selecting sizes based upon angles and minimum distances between pipes.
- Senior Engineer to design an alternative Part 360 cap for an industrial landfill near Albany, New York. The cap incorporated lined swales and ponds, trees planted for phytoremediation purposes. An education center was also designed for the Site and was responsible for designing a cistern system that would capture both rainwater and treated effluent from a groundwater treatment system.
- Project Engineer to complete a computer hydraulic model and evaluation of a stormwater collection system at a national laboratory facility in Upton, NY. The storm drain study included multiple modeling and design scenarios to evaluate flood reduction. Potential solutions included the installation of additional dry wells and the removal of paved parking areas to increase infiltration.
- Senior Engineer to design a second overflow weir which would help to regulate the height of water in a stormwater wetland, to provide an additional outfall to prevent flooding, and to revegetate a wetlands area in the receiving creek. This project involved the evaluation of the 12 square mile watershed area that contributed to the stormwater wetland, the design of the weir structure, apron, and spillway to route the water between two bridge abutments, and the

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- analysis to determine the height of water over each of the weirs during various storm events.
- Senior Engineer to complete multiple smaller investigations regarding stormwater management at residential, commercial, and industrial facilities.
- Senior Engineer to complete multiple Stormwater Pollution Prevention Plans (SWPPP) and their required inspections. Completed multiple State Pollution Discharge Elimination System (SPDES) permit packages for new systems and modifications.

#### Forensic Engineering/Expert Witness:

- Engineer to complete over two hundred poststorm forensic investigations from 2011 to the present to assist insurance companies in assigning coverage to Insureds. Responsible for determining cause and origin of damage and wind vs. water determinations in flooding situations.
- Engineer to complete multiple residential and commercial forensic investigations not related to storms. Claim matters included stormwater drainage from off-site sources causing flooding, wood floor damage, pipe breaks, and pool failure (both gunite and vinyl lined).
- Have been involved with multiple cases as expert witness where the subject of the claims are SuperStorm Sandy, environmental contamination, or personal injury related.

#### Permitting/Compliance:

- Project Manager for providing engineering and environmental services to four machining facilities that specialize in the manufacturing of parts for aircraft. Responsible for completing Suffolk County Department of Health Services toxic and hazardous waste storage permits, assisting with RCRA Hazardous Material storage issues and reporting, preparing and participating in SCDHS variance hearing, strategizing with client to come up with best solutions for the facility permits, completing Emergency Action Plan and SPCC Plans, providing training for employees as required by the SPCC Plan, revising the SPCC plans when required due to facility changes or ownership changes, assisting in with follow up tasks from in house third party audits. and assisting facility environmental personnel with day-to-day issues.
- Interim Environmental Health and Safety (EHS)
   Officer for large laboratory/R&D facility

- undergoing large construction project. Acted as EHS Officer by being onsite two days a week and being available by phone and email, when not on-site. Was responsible for maintaining compliance with local, state and federal compliance and reporting requirements, reviewing chemicals, attending construction meetings, completing Stormwater Pollution (SWPPP) Prevention Plan inspections. completing a State Pollution Discharge Elimination System (SPDES) modification, participating in an ISO 14001 audit, interfaced with laboratory and facility personnel to complete internal projects, completed bi-weekly construction safety inspections, and provided facility with strategy regarding compliance needs for both long term and short term. Completed SPCC Plan revisions and training for facility.
- Senior Engineer to complete the facility's air facility registration form and accompanying data for their Hauppauge, NY location. Responsibilities included completing a site visit, preparing a spreadsheet to compute the facility emissions, preparing a site plan of the facility including the emissions points, interfacing with the client, facility contact, and regulator.
- Senior Engineer to complete state facility permit modification for bulk fuel supplier in Westchester, NY. Responsibilities included devising methodology for determining VOC emissions previously used in permit due to former gasoline operations, preparing complex spreadsheet for multiple alternatives, reviewing the current permit to verify that all current conditions are beneficial to the Client, provided professional engineering requirements for the submittal, coordinating with NYSDEC case manager and prepare responses to comments from NYSDEC.
- Environmental Compliance Audit team member for numerous healthcare facilities in New York. Coordinated with the facilities' environmental staff to develop audit scope of work and reporting format. Assessed facilities' compliance with federal, state and local regulations including CAA, CWA, EPCRA, RCRA, SARA Title III, and TSCA. A specialized software tool, Dakota Auditor, was utilized to help complete the audits and to stay abreast of the changing regulations.
- Project Manager for the completion of the Emergency Planning and Community Right-to-Know Act's (EPCRA) Toxic Release Inventory (TRI) reporting for nine, airport-based, aviation-

#### TYLL ENGINEERING & CONSULTING PC

fueling facilities as required by the USEPA for the reporting years 1998 - 2001. The project included the identification and quantification of chemical and petroleum usage at each facility, a review of the facility's MSDS sheets, and the determination of the threshold levels of each of the EPCRA Section 313-listed chemicals found in the fuel. Tank and fugitive emissions were calculated using the tank and fueling system information supplied by the client. Stormwater discharge quantities were calculated and reported using analytical data. The resulting information was compiled, and the necessary forms were completed.

- Project Manager to complete SPCC Plan for individual Manhasset hospital in major healthcare system on Long Island. Completed original SPCC plan in 2006 and then was asked to complete revision in 2018.
- Project Engineer to complete a Facility Response Plan (FRP) to be submitted and approved by the USEPA for an aviation fueling facility in San Juan, Puerto Rico. The FRP preparation included a site visit to collect site data, review of the applicable regulations, and preparation of site, evacuation, and drainage drawings.
- Senior Engineer to complete the joint permit application and associated documents for a maintenance dredging project in a small incorporated village on the north fork of Long Island. Tasks included digitally determining dredging volumes, preparing sediment sampling plan, preparing site drawings, preparation of application and associated documents, and coordination with agencies, Owners, and contractors.

# **Project Management**

- Project Manager for a comprehensive audit program for an airport services company with locations in the United States and Canada. The audits covered environmental, health and safety aspects of the operations (fueling, maintenance, food services). Responsibilities included interfacing with the client and attorneys, devising an audit report template, coordinating team deployments, review audit findings and audit reports, and supported follow up work to resolve findings.
- Senior Engineer to oversee installation of a subslab depressurization system on a former manufacturing facility in Hicksville, New York. Responsible for overseeing the survey completed

- before the initial indoor, outdoor and sub-slab testing.
- Project Manager for the design and construction management of a new filtration system for the jet fuel to be stored at the bulk fuel storage facility at a NYC airport. The project included preparation of detailed design drawings and specifications, which included piping schematics, system layout plans, concrete design, and system details in accordance with NYC building code and the Port Authority of New York and New Jersey's requirements.

#### Design Experience:

- Senior Engineer responsible for the design of retention pond to be constructed inside former industrial lagoons to store stormwater from the former industrial facility near Albany, New York. The project included the optimization of the design (varying shape, slopes, and depths) to provide the necessary volume of storage for a 25 year 24 hour storm, overseeing the preparation of the specifications, coordinating with the landscape architects, and completing volume calculations to determine the different quantities of soil needed for the bid documents.
- Senior Engineer for the design of stormwater and sanitary sewers at and around a former fuel terminal in Brooklyn, New York. Responsible for laying out the existing utilities confirming their locations using over a hundred paper maps and laying out the proposed piping as per New York City Department of Environmental Protection
- Project Engineer responsible for completing the site and utility design for the first phase of athletic fields, the associated parking lots, and access road for a private school being built on the East End of Long Island. The project included the coordination with the architects, contractors, the owner's representatives, and local governmental agencies. Responsibilities also included the design and planning of the associated traffic controls, water supply, drainage, and sanitary systems.

# Dhanraj D. Singh

251 Vincent Drive | East Meadow, NY 11554 | 347-728-0768 | dhanrajdsingh@gmail.com

#### Objective

To find a challenging career in an established organization so that I may grow professionally, while earning a good reputation amongst my peers.

#### PROFESSIONAL EXPERIENCE

DC Environmental Services, Inc. (Brooklyn, NY)

2004 - 2015

- Managed the operations and productivity of the division of environmental remediation
- Performed and prepare Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight/implementation of Site-Specific Health and Safety Plans with job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings

# BSD Environmental Group (Brooklyn, NY)

2015 - 2018

D.b.a. RSK Environmental Group (Brooklyn, NY)

2018 - present

- Managed the operations and productivity
- Perform Environmental Phase I and II (ESA) reports
- Planning, coordinating and implementation of environmental Phases I, II and III
- Preparation and review of Closure Reports for BCP/VCP/Rezoned development projects
- Preparation of Site-Specific Health and Safety Plans
- Preparation of Remedial/Corrective Action Plans
- Oversight and implementation of Site-Specific Health and Safety Plans; job oversight, toolbox meetings
- Environmental Site Assessments and Remediation Costing
- Direct communicational with clients, Case Managers of NYSDEC, NYCDEP & NYCOER
- Performed Geoprobe investigations and Ground Penetrating Radar survey
- Collection of soil, groundwater and soil gas samples; performed field-screening
- Collection of Asbestos sampling; prepare inspection reports based on findings
- Perform Lead-based paint survey.

#### **EDUCATION**

NYC College of Technology (Brooklyn, NY)

2008

St. Georges College & School of Business and Computer Science (Trinidad, W.I.)

1990 - 1999

2005 - 2022

#### Certification and Training

- 62 Hour SST Supervisor approved by New York City Department of Buildings

- 30 Hour OSHA Construction Safety and Health 29 CFR 1926
- 40 Hour plus annual refresher OSHA HAZWOPER 29 CFR 1910.120
- 8 Hour plus annual refresher OSHA HAZWOPER Site Supervisor 29 CFR 1910.120(e)(4)
- NYSDOL Asbestos Inspector
- OSHA Confined Space Awareness 29 CFR 1910.146
- 4-Hour Supported Scaffolding Safety 29 CFR 1926.451
- Mold Inspection and Assessment
- Lead-based Paint Inspector EPA TSCA Section 402/40 CFR Part 745.226
- EPA Lead Safe Certified Renovator
- NYSDEC Class A/B Operator 6 NYCRR 613.25 & 6 NYCRR 598.12
- Mt. Vernon Fire Department Supervise and/or install oil burner equipment
- Yonkers Fire Department Tank Pump Installer Permit
- NCDOH Certificate of Fitness Article 12, Section 1.9(j) Tank Installer/Remover

#### DRUMITA GABRIEL DMELLO

dgdmello389@gmail.com | +1(646)249-6129 | www.linkedin.com/in/drumita-dmello/

A proficient Environmental Consultant reflecting skillful individuality in solo and team projects, and dedication to a career with an ability to adapt to new situations and grasp new software/techniques. 3+ years of experience in the capacity of an Environmental Consultant within a dynamic workspace. Directly led several NYS & NYC projects assigned in Voluntary Cleanup Program (VCP) and Brownfield Cleanup Program (BCP) from the initial stage of Phase-I Site Assessment to the final stage (Phase-III) of Remedial Cleanup and reporting.

#### **EDUCATION**

University of New Haven, West Haven, CT

May 2020

Master of Science, Environmental Science

GPA: 3.73/4

**Concentration: Geographical Information Systems (GIS)** 

St. Xavier's College, Ahmedabad, Gujarat **Bachelor of Science, Chemistry** 

April 2017 GPA: 7/10

#### WORK EXPERIENCE

# RSK Environmental Group LLC: Environmental Consultant

October 2020 – Present

- Experience in preparation of Environmental Assessment Reports (Phase 1, 2, 3) in compliance with NYS & NYC Environmental Rules & Regulations (NYSDEC Part 375 and DER-10).
- Management of cost estimation, and budgeting during the initiation of a project along with efficient client organization and sub-contractor communication and oversight during field activities.
- Implementing project work plans and on-site health and safety monitoring during site activities.
- Reading engineering plans and creating remedial investigation and remedial action diagrams utilizing AutoCAD 2022.
- Organizing staff briefing, and safety procedure run-through prior to field activities.
- Oversight and handling of soil samples, collection of samples utilizing spoons/macro-core liners in labprovided glassware; groundwater collection utilizing grab sample technique/low-flow pumps and air sample collection utilizing 2 and 8-hour flow controllers.
- Participation in NY state and city staff meetings, project planning, and conflict resolution.
- Planning and compiling technical reports (Phase-I Reports, Remedial Investigation work plans and reports (RIWP, RIR), Remedial Action Work plans and reports (RAWP, RAR), Site Characterization Report (SCR), Tank Closure Reports (TCR) and Spill Closure Reports for local clients, city, and state projects.

# Walkspan, Inc.: GIS and Data Specialist

August 2020 – July 2021

- Collected and projected GIS data according to a particular coordinate system in ArcGIS Pro, QGIS and ArcGIS Map Products & Online for map-making and feasibility analysis.
- Analyzed the GIS data for Urban mapping of three (3) US cities, namely New York City, Seattle, and Phoenix.
- Designed ArcGIS Story Map for the city of Seattle to showcase the importance and reach of sidewalks.
- Designed web viewing applications utilizing ArcGIS Online to outline the overall idea of Walkability for New York City.

# City of West Haven, Mayor's Office: Sustainability Intern

June 2019 – August 2019

- Achieved "Bronze" certification of sustainable town for West Haven awarded by Sustainable CT and worked with the municipal team to plan and analyze the city management and zoning documents.
- Created outlined professional GIS Web Maps for the City of West Haven as inventories for Open Spaces, Brownfield Sites, and Natural Resources using Web GIS and ArcGIS.
- Exercised remote work to gain knowledge about the city's demographics, Natural Diversity, present Environmental Protection Laws, and city placemaking projects and ideas.

# **ADDITIONAL**

- Technical Expertise: Environmental Impact Site Assessments and reports, OSHA, USEPA RCRA, CERCLA, NYSDEC Rules and Regulation, NYC Rules and Regulations, Environmental Pollution Dynamics, Toxicology, and Chemistry.
- **Certification**: Associate Project Management, 8-hour OSHA HAZWOPER Refresher, 8-hour OSHA Supervisor Initial.

# Appendix H Notice of Significant Threat TO BE ADDED ONCE AVAILABLE

