

Remedial Investigation Work Plan

For:

Irvington Gas Station and Lab Site

BCP Site No. C360250

157 Irving Avenue

Port Chester, New York

Prepared for:

Irving Owner LLC

SESI Project No:
12653

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CERTIFICATIONS

I, Fuad Dahan, certify that I am a professional engineer, and meet the definition of qualified environmental professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation 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).

_____	_____	_____
NY Professional Engineer #090531	Date	Signature

It is a violation of Article 130 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 130, New York State Education Law.

LIST OF ACRONYMS

Acronym	Definition
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below ground surface
COC	Contaminant of Concern
DER	Division of Environmental Remediation
DER-10	NYSDEC Technical Guidance for Site Investigation & Remediation
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Accreditation Program
FWIA	Fish and Wildlife Resources Impact Analysis
ft-bgs	feet below ground surface
IDW	Investigative Derived Waste
msl	Mean Sea Level
	Monitoring Well
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PFAS	Per and Polyfluoroalkyl Substances
RECs	Recognized Environmental Concerns
RI	Remedial Investigation
RIR	Remedial Investigation Report

Acronym	Definition
RIWP	Remedial Investigation Work Plan
RSCO	Residential Soil Cleanup Objective
RRSCO	Restricted-Residential Use Soil Cleanup Objective
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objectives
SESI	SESI Consulting Engineers, DPC
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOGS	Technical and Operations Guidance Series
USCO	Unrestricted Use Soil Cleanup Objectives
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Irving Owner LLC (the “Volunteer”) has entered into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) to investigate and remediate property located at 157 Irving Avenue, Port Chester, Westchester County, New York (the “Site”) (BCP Site No. C360250). A Site Location Map is presented as **Figure 1.1**.

This document comprises a Remedial Investigation Work Plan (RIWP) that describes the investigation activities proposed to be conducted at the Site, as part of the Site’s planned remedial investigation to plan for the Site’s remediation. This RIWP includes a description of the Site, summary of the Site history and previous environmental investigations, a description of the Site’s physical, geologic, hydrogeologic setting and subsurface features and a plan of action for further investigation of the areas of concern identified previously.

This RIWP has been prepared to achieve the following objectives:

- To complete the horizontal and vertical delineation of the nature and extent of contamination on the Site;
- To identify any potential source areas of contamination;
- To determine the remedial action needed to protect human health and the environment; and
- To collect sufficient data to evaluate remedial alternatives for the Site.

This RIWP is developed in general accordance with the Department’s Remediation Technical Guidance for Site Investigation and Remediation (DER-10).

2.0 PROJECT BACKGROUND

2.1 SITE DESCRIPTION

The Site consists of a 0.38-acre parcel and is located at 157 Irving Avenue, Port Chester, Westchester County, New York. The Site is currently one parcel identified as Block 2, Lot 80 on the Westchester County tax map. The Site has been developed with one (1) two-story commercial building that comprises 7,350 square feet (sf) with an associated asphalt-paved parking area, a smaller gravel employee parking area, and a residential home comprising 1,450 sf. A Site Plan is presented as **Figure 2.1**.

The Site is bound to the north by a residential property and a gas station, to the west by Palace Place followed by a residential property and a parking lot, to the south by Irving Avenue followed by Westchester Upholstery, and to the east by NY 120-A followed by restaurants/commercial properties.

A summary of the uses of the adjacent properties is shown on **Table 2.1** below.

Table 2.1—Adjacent Property Uses

Direction	Adjacent Property Use
North	Sinclair Gasoline Filling Station and residential property
South	Irving Ave followed by commercial/residential properties
East	NY 120-A followed by commercial/residential properties
West	Palace Place followed by commercial/residential properties

2.2 PROPOSED DEVELOPMENT

The planned redevelopment of the Site consists of a mixed-use, transit-oriented development containing 181 residential units, approximately 2,100 square feet of neighborhood retail space, 124 on-site parking spaces located on the basement and ground floor levels. The retail/commercial space will be located at street level at the southwest corner of the building. Access to the commercial space will be directly from an entrance on North Pearl Street.

2.3 SITE HISTORY

The Site previously consisted of four separate lots (57, 58, 59, 60) which have been consolidated. Most recently, the Site was improved by supermarket, parking lots and a two (2)-story residence. The Site previously contained residences, a garage, gas station and warehouse prior to the

current operations. Specific uses on each of the historic lots that comprise the Site are summarized in **Table 2.2** below:

Table 2.2 – Historic Property Uses

Historic Lot Number	Years	Usage
57	1934-1990	Residence
	~1990 - Present	Gravel parking lot
58	~1919 - Present	Residence
59	~1919-1934	Residence
	1934-1950	Garage
	1950-2006	Warehouse
	2006 - Present	Grocery Store
60	~1919-1934	Vacant
	1934-1950	Gas Station
	1950 - Present	Parking Lot
	1990-1996	Roscoe Labs (laboratory)

It should be noted that Roscoe Labs, which received hazardous waste as part of their operations (1990-1996 according to the previous owner and operator list in the BCP application), had reported spills that were subsequently closed by cleaning out a non-hazardous defogger fluid from its chemical vats.

2.4 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The following environmental reports that have been previously completed for the Site are summarized below:

- Geotechnical Investigation and Report, 157 Irving Avenue, Port Chester, New York, SESI, September 2022.
- Phase I Environmental Site Assessment Report, 157 Irving Avenue, Port Chester, New York, SESI, November 2022.
- Phase II Environmental Site Assessment Report, 157 Irving Avenue, Port Chester, New York, SESI, January 2023.
- Supplemental Phase II Environmental Site Assessment Report, 157 Irving Avenue, Port Chester, New York, SESI, May 2023.

2.4.1 GEOTECHNICAL INVESTIGATION REPORT, SESI, SEPTEMBER 2022

SESI conducted a geotechnical investigation of the Site. The field investigation consisted of the drilling four (4) exploratory borings and obtaining three (3) rock cores to depths up to 13± feet

below ground surface (ft-bgs). Results of the investigation identified fill that was encountered below the surface materials in all of the borings to depths ranging from 2 to 6.5± feet below the ground surface. The fill typically consists of brown/black/gray sand with varying amounts of silt, gravel, and roots. Beneath the existing fill are the natural soil deposits consisting primarily of a brown/tan coarse to fine sand with varying amounts of silt and coarse to fine gravel (glacial till). Bedrock was encountered in all of the borings at depths ranging from 4 to 8.5± feet below the ground surface. Groundwater was not encountered in the geotechnical borings, however, is anticipated to be found between elevation +18 to +23.0 based on nearby Site information.

2.4.2 PHASE I ENVIRONMENTAL SITE ASSESSMENT REPORT, SESI, NOVEMBER 2022

SESI prepared a Phase I Environmental Site Assessment of the Site in November 2022. Results of the Assessment identified the following Recognized Environmental Conditions (REC):

- **REC 1 – Underground Storage Tanks (USTs) on former Lot 60:** Evidence of four (4) historic gasoline USTs was identified on Sanborn Maps between 1934 and 1950 on Lot 60. Two (2) of the four (4) USTs identified on the Sanborn Maps were possibly investigated as part of a separate investigation. Additionally, semi-volatile organic compounds (SVOCs) contamination was noted to be above the standards in two (2) post-excavation samples. **Further investigation with a ground-penetrating radar (GPR) for the remaining USTs and soil sampling of the subsurface soils is recommended.**
- **REC 2 – Suspected Underground Storage Tank on former Lot 58 and Lot 57:** Based on a review of the Sanborn maps and aerial photos, there were homes on Lots 57 and 58 from as early as 1934. Therefore, the presence or former presence of USTs is likely as oil was likely utilized for heating before a natural gas connection could be established. **Further investigation with a GPR to search for the remaining USTs and soil sampling of the subsurface soils in their vicinity is recommended.**
- **REC 3 – Abandoned in Place UST on former Lot 59:** On August 15, 2002, a 1,500-gallon UST was accessed by Absolute Tank Removal and was subsequently abandoned in place. This was reported to have occurred at the intersection of North Pearl Street and Irving Ave (155 Irving Ave). This area was inspected during the Site walk, and newer concrete sidewalk was observed in this area. No manway or fill pipe was identified; however, the report listed SVOCs above the standards in soil samples collected below the tank. **Further investigation with a GPR to search for the remaining UST and soil sampling of the subsurface soils in their vicinity is recommended.**

- **REC 4 – Loading Dock:** The former Lot 59 building was previously occupied by Roscoe labs and other tenants that may have received hazardous materials as part of their operations. One spill (No. 96-07875) was reported by Roscoe Labs in 1996 due to spillage of fog fluid from chemical vats, which was closed. Additional spills may have occurred when deliveries were made utilizing this loading ramp that leads to the second floor. **Therefore, further investigation at the bottom of the loading dock that leads to the second floor is recommended.**
- **REC 5 – Trash Compactor:** A trash compactor was observed in the back of the grocery store on the first floor. It is believed that this crusher is utilized only for cardboard boxes. However, the machine does utilize hydraulic oil and may have leaked in the past. **Therefore, further investigation is recommended and the subsurface soils beneath the slab should be sampled.**
- **REC 6 – French Drain near Compactor:** Near the compactor is a French drain which may have received lubricating fluid that may have spilled in the nearby compactor. **The subsurface soil in the area should be sampled in conjunction with the nearby REC-4.**
- **REC 7 – Former Oil Burner in Basement:** During the Site walk, an oil burner was discovered in the partial basement of the grocery store. **The area that is currently flooded (BER-3) should be investigated as the water may have washed residual material from the burner into the nearby exposed subsurface soils.**
- **REC 8 – Breached Slab in Basement:** The slab in the partial basement is breached and soil could be seen. It appears a sump pump cut out was installed in the slab and was open at the time of the visit. **The length of time the basement was breached and flooded is reportedly unknown and therefore it is recommended that the soil be sampled.**
- **REC 9 – Adjacent UST Field:** During the Site walk, a tank field adjacent to the Site was present north of former Lot 60. This UST field may have an undetected leak and is adjacent to the Site. **The soil and groundwater near this tank field should be sampled to determine if there are any off-site impacts affecting the Site.**

2.4.3 PHASE II ENVIRONMENTAL SITE INVESTIGATION REPORT, SESI, JANUARY 2023

SESI prepared a Phase II Environmental Site Investigation report dated January 2023. The report summarized the results of environmental soil, groundwater and soil vapor sampling conducted in December 2022. A GPR survey was conducted prior to drilling activities to identify any buried

utilities or USTs. No anomalies consistent with USTs were identified. The report summarized the results of ten (10) soil samples that were collected from eight (8) soil borings, two (2) groundwater samples that were collected from two (2) temporary wells, and two (2) soil vapor samples that were collected from two (2) temporary vapor points.

The field investigation identified historic fill and native soils consisting of coarse to fine sand, gravel, and silt that extends to approximately 3.5-10 ft-bgs. PAHs and metals were found to exceed the residential soil cleanup objectives (RSCOs) and restricted residential soil cleanup objectives (RRSCOs), while PAHs, metals, pesticides and acetone were found to exceed the unrestricted SCOs (USCOs). Additionally, overburden temporary groundwater samples exhibited PAHs and metals exceedances of the ambient water quality standards (AWQS). Furthermore, soil vapor exhibited detections of tetrachloroethene (PCE) and other volatile organic compounds (VOCs).

The report concluded that additional sampling was required to further evaluate the exceedances and sources.

2.4.4 SUPPLEMENTAL PHASE II ENVIRONMENTAL SITE INVESTIGATION REPORT, SESI, MAY 2023

SESI prepared a Phase II Environmental Site Investigation report dated May 2023. The report summarized the results of previous Phase II sampling conducted in December 2022 as well as additional soil and soil vapor sampling conducted in April 2023. The supplemental Phase II event focused on areas that were previously inaccessible in December 2022. The report summarized the results of the additional seven (7) soil samples that were collected from seven (7) soil borings, and two (2) additional soil vapor samples that were collected from two (2) temporary soil vapor points.

Between both Phase II field investigations, historic fill and native soils were identified to be comprised of coarse to fine sand, gravel, and silt extending to bedrock which was encountered between 3.5-10 ft-bgs. No PID readings above zero were recorded, but visual and olfactory evidence of potential petroleum impacts were observed during the fieldwork. PAHs and metals exceedances of the RSCOs and USCOs were detected. Furthermore, PCE, trichloroethene (TCE) and carbon tetrachloride, along with other VOCs, were detected in the soil vapor at the Site.

The report notes Site historic uses may have resulted in several discharges from the former industrial and commercial uses or USTs. Additional delineation of contamination sources, specifically PAHs and metals based on known historic uses was recommended.

2.5 TOPOGRAPHY

According to the United States Geological Survey (USGS) Mamaroneck/Glenville, NY, 2018/2019, 7.5-minute Series topographic map, the Site's average topographic elevation is approximately 48.33' above mean sea level (msl). The topographic map indicates that the topographic gradient at the Site slopes downward from west to the east.

2.6 GEOLOGIC SETTING

Based on soil borings conducted during previous investigations, a historic fill layer was encountered below the surface materials in all borings at depths of 2 to 6.5 ft-bgs. The fill layer appears to be characterized by brown/black/gray sand with varying amounts of silt, gravel, and roots. Beneath the existing fill are the natural soil deposits consisting primarily of a brown/tan coarse to fine sand with varying amounts of silt and coarse to fine gravel (glacial till) that extends to the bedrock. The depth to bedrock at the Site appears to vary significantly from potentially 4 to 8.5± ft-bgs.

2.7 HYDROGEOLOGIC SETTING

During the prior investigations in 2022 and 2023, groundwater was generally encountered during the drilling at depths of approximately 4± and 7± ft-bgs. However, this is likely perched water as the geotechnical investigation did not identify mottling or groundwater. The anticipated depth to groundwater is between elevation +18 to +23 ft-amsl based on data obtained from nearby sites. The direction of groundwater flow has not been calculated at this time but is anticipated to follow the topography and flow in a west to east direction across the Site based on the Site topography.

2.8 SUMMARY OF ENVIRONMENTAL ASSESSMENT

Based on the investigations conducted to date, the primary contaminants of concern (COCs) are anticipated to be PAHs, metals and pesticides in soil, PAHs and metals in groundwater and multiple types of VOCs in soil vapor. COCs will be refined based on the Remedial Investigation (RI) results.

Soil (maximum concentrations):

- **VOCs:** Acetone (0.051 mg/kg).

- **PAHs:** Benzo(a)anthracene (28 mg/kg), benzo(a)pyrene (29 mg/kg), benzo(b)fluoranthene (33 mg/kg), benzo(k)fluoranthene (9.1 mg/kg), chrysene (32 mg/kg), dibenzo(a,h)anthracene (3.6 mg/kg) and indeno(1,2,3-cd)pyrene (18 mg/kg).
- **Pesticides:** Dieldrin (0.0164 mg/kg), 4,4'-DDE (0.0117 mg/kg), 4,4'-DDD (0.00375 mg/kg) and 4,4'-DDT (0.0474 mg/kg).
- **Metals:** Cadmium (5.49 mg/kg), copper (78.9 mg/kg), lead (910 mg/kg), mercury (2.91 mg/kg) and zinc (758 mg/kg).

Groundwater (maximum concentrations):

- **PAHs:** Benzo(a)anthracene (0.12 ug/L), benzo(a)pyrene (0.04 ug/L), Benzo(b)fluoranthene (0.05 ug/L), benzo(k)fluoranthene (0.02 ug/L), chrysene (0.02 ug/L) and indeno(1,2,3-cd)pyrene (0.03 ug/L).
- **Metals:** Beryllium (4.51 ug/L), chromium (258.2 ug/L), copper (520.6 ug/L), iron (57,600 ug/L), lead (177 ug/L), manganese (4,463 ug/L), selenium (15.8 ug/L), sodium (142,000 ug/L) and thallium (0.76 ug/L).

Soil Vapor (maximum concentrations):

- Dichlorodifluoromethane (2.89 ug/m³), chloromethane (0.894 ug/m³), 1,3-butadiene (7.57 ug/m³), ethanol (84.6 ug/m³), acetone (855 ug/m³), trichlorofluoromethane (3.03 ug/m³), isopropanol (29.3 ug/m³), tertiary butyl alcohol (5.67 ug/m³), carbon disulfide (10.7 ug/m³), 2-butanone (74 ug/m³), ethyl acetate (1.8 ug/m³), chloroform (4.04 ug/m³), tetrahydrofuran (7.58 ug/m³), n-hexane (9.34 ug/m³), benzene (5.88 ug/m³), carbon tetrachloride (1.3 ug/m³), cyclohexane (3.39 ug/m³), trichloroethene (3.07 ug/m³), 2,2,4-trimethylpentane (9.9 ug/m³), heptane (14.5 ug/m³), 4-methyl-2-pentanone (4.18 ug/m³), toluene (62.6 ug/m³), 2-hexanone (6.11 ug/m³), tetrachloroethene (45.6 ug/m³), ethylbenzene (4.14 ug/m³), p/m-xylene (13.6 ug/m³), styrene (0.924 ug/m³), o-xylene (5.13 ug/m³), 1,2,4-trimethylbenzene (2.91 ug/m³) and 1,3-dichlorobenzene (2.02 ug/m³).

3.0 FIELD REMEDIAL INVESTIGATION

Soil borings, soil vapor borings, and groundwater monitoring wells are proposed below based on the following rationale to complete the nature and extent delineation of contaminated soil, groundwater, and soil vapor on the Site. The applicable standards criteria and guidance (SCGs) for the Site soil are the NYSDEC Part 375 Soil Cleanup Objectives (SCOs) and the Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS). The applicable criteria for sub-slab vapor are the NYSDOH Decision Matrices (May 2017, updated February 2024). New York State does not have standards, criteria, or guidance values for contaminants in soil vapor. The applicable standards criteria and guidance (SCGs) for the Site groundwater are the applicable 6 NYCRR Part 703 AWQS and Technical and Operational Guidance Series (TOGS) 1.1.1.

3.1 SOIL REMEDIAL INVESTIGATION

To further evaluate the soils, ten (10) soil borings will be advanced on the Site to further evaluate and delineate soil contamination. The proposed soil boring locations are shown on **Figure 3.1**. The proposed soil sample locations and the rationale for their locations are presented in **Table 3.1** below.

The borings will be advanced to a depth of 20 ft-bgs (or refusal) using direct-push or other drilling methods as needed as shown on **Table 3.1** below. Soil samples will be at a minimum of one sample per 5-foot depth interval based on field screening that includes visual observations, photoionization detector (PID) readings and olfactory observations. Boring logs documenting soil classifications, PID readings, and visual observations will be provided in the final report.

Soil samples collected from the boring locations will be analyzed by a NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory for TCL + 30/TAL including VOCs by EPA Method 8260C, SVOCs by EPA Method 8270D, pesticides by EPA Method 8081B, PCBs by EPA Method 8082A, TAL metals by EPA Methods 6010C, 7471B, and 9012. Samples will also be analyzed for the 41 PFASs compounds by EPA Modified Method 1633, and 1-4,dioxane by EPA Method 8270. Category B deliverables will be requested on each sample chain of custody. SESI's field sampling procedures are described in the Quality Assurance Project Plan (QAPP) presented in **Appendix A**. The Sampling Plan for Emerging Contaminants is included as **Appendix B**.

Quality Assurance/Quality Control (QA/QC) samples will be collected and analyzed as specified in the QAPP. The number of duplicate, spiked, and blank samples analyzed will be collected at a frequency of one (1) duplicate for every 20 samples. The inclusion and frequency of analysis of field blanks will be on the order of one per every 20 soil samples but not more than one (1) per day. Samples to be analyzed for volatile organic compounds will be accompanied by a field blank for all matrix types and trip blank for water matrices.

Table 3.1 Summary of Proposed Soil Boring and Sampling

Soil Boring ID	Boring Depth (ft)	Proposed Sampling Interval (ft)	Target Analyses	Sampling Rationale
RI-SB-1	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-2	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-3	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-4	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-5	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-6	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-7	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-8	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-9	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically
RI-SB-10	20	0-5	TCL/TAL+30, 1,4-Dioxane, PFAS	Nature and Extent of Fill layer
		5-10		Characterize Bottom Fill Layer
		10-15		Characterize soil vertically
		15-20		Characterize soil vertically

3.2 GROUNDWATER REMEDIAL INVESTIGATION

The Groundwater RI will be conducted to achieve the following:

- delineate the nature and extent of specific contaminants in the Site groundwater;
- identify actual or potential impacts to sensitive receptors, e.g. surface water;
- determine whether a contaminant plume exists;
- gather sufficient data to determine groundwater flow direction and contour map and evaluate groundwater remedial alternatives, including, as appropriate, and
- provide information on the background quality of the groundwater flowing into the Site.

3.2.1 MONITORING WELL INSTALLATION

To investigate the Site groundwater, a total of eight (8) permanent groundwater monitoring wells will be installed as shown on **Figure 3.2**, including four (4) overburden wells and four (4) bedrock wells. Bedrock wells are proposed due to the presence of shallow bedrock and limited overburden groundwater encountered during the Phase II and geotechnical investigations. The proposed groundwater monitoring wells and sampling details are presented in the **Table 3.2** below. The four (4) bedrock wells will be installed at least 5 feet beneath the encountered water table and sealed in bedrock. The four (4) overburden wells will be installed above bedrock to an anticipated total depth of 15 ft-bgs based on where groundwater was previously encountered in the Phase II ESA. If groundwater is not encountered in the overburden at these locations, wells will be advanced into bedrock until groundwater is encountered. Each monitoring well will be constructed with 2-inch diameter well screens. The well screening will intersect the water table and extend to the bottom of the well boring. The annular space of each well will be filled with well sand to at least 2 feet above the screening and will be sealed with hydrated bentonite or cement grout. Bedrock wells will be sealed into competent rock. Finally, each monitoring well will be completed with a flush-mount road-box or stickup as necessary. A typical boring and well construction log is provided in **Appendix C**.

The wells will be surveyed for location and elevation. The survey data will be provided pursuant to the DER-10 requirements in an acceptable format (e.g., North America Datum 83 [NAD83]). The wells will be gauged for groundwater depth to determine the groundwater elevation. The Site-specific groundwater flow direction and gradient will be determined based on the latest

elevation data and summarized in the Remedial Investigation Report (RIR). The proposed well locations are shown on **Figure 3.2**.

Table 3.2: Summary of Proposed Groundwater Monitoring Wells

Well ID	Type	Estimated Depth (ft)	Screen Interval (ft)	Target Analyses
RI-MW-1	Bedrock	20	15-20	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-2	Bedrock	20	15-20	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-3	Bedrock	20	15-20	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-4	Bedrock	20	15-20	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-5	Overburden	15	10-15	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-6	Overburden	15	10-15	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-7	Overburden	15	10-15	TCL+30/TAL, PFAS, 1,4-Dioxane
RI-MW-8	Overburden	15	10-15	TCL+30/TAL, PFAS, 1,4-Dioxane

3.2.2 MONITORING WELL SAMPLING

Two (2) rounds of sampling will be conducted from each well. The first round will be conducted after monitoring well installations during the RI, and the second round will be conducted prior to remedial action (no sooner than 30 days from the first round). The data will be analyzed to determine whether groundwater contamination exists, the magnitude and the extent of any potential contaminant plume. In addition to the analytical data, field measurements and chemical analyses will be conducted to characterize the impacted groundwater.

All the wells will be sampled for TCL + 30/TAL metals, PFAS, and 1-4 dioxane. The VOCs will be analyzed by EPA Method 8260C, SVOCs by EPA Method 8270D, pesticides by EPA Method 8081B, PCBs by EPA Method 8082A, TAL metals by EPA Methods 6010C, 7471B, and 9012, PFAS compounds by Modified EPA Modified Method 1633, and 1-4,dioxane by EPA Method 8270 SIM. The QAPP, which describes all field sampling procedures, is included as **Appendix A**, and the Sampling Plan for Emerging Contaminants is included as **Appendix B**.

Groundwater samples will be analyzed by a NYSDOH ELAP certified laboratory, and Category B deliverables will be requested on each sample chain of custody. In addition, QA/QC samples will be collected and analyzed as specified in the QAPP. Specifically, the number of duplicate, spiked and blank samples analyzed will be a minimum of one (1) duplicate for every 20 samples. For the aqueous matrix, field blanks will be collected at a frequency of one (1) 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.

All monitoring wells will be developed or cleared of all fine-grained materials and sediments that have settled in or around the well during installation so that the screen is transmitting representative portions of the groundwater. The development will be by one of two methods, pumping or bailing groundwater from the well until it yields relatively sediment-free water.

A decontaminated pump or bailer will be used and subsequently decontaminated after each use following procedures outlined in the Decontamination Protocol. Pumping or bailing will cease when the turbidity falls below 50 NTUs or until specific conductivity, pH, and temperature are stable (i.e., consecutive readings are within 10 percent with no overall upward or downward trends in measurements). Well development water will be contained in drums and appropriately characterized for off-site disposal.

The wells will be sampled using the low-flow technique, when possible. A flow rate of 100 ml to 250 ml per minute is used to purge the wells. Drawdown should not exceed 0.3 feet. At the initiation of low flow purging water levels and field parameters are recorded. Field parameters are then monitored every five minutes during low flow purging using a flow through cell. When three consecutive measurements of pH differ by 0.1 units or less, with ORP within 10 mv or less, turbidity varies 10 percent or less, conductivity differs by 3 percent or less and dissolved oxygen by 10 percent or less, sampling may begin. Flow through cells allow continuous real-time readings. When the parameters stabilize, the flow through cell is disconnected and sample bottles are filled directly from the tubing. If the parameters of a well do not stabilize in a timely manner, the groundwater sample will be collected after emptying three well volumes from the sample well. In addition to water samples collected from the monitoring wells, two types of "blanks" will be collected and submitted to the chemical laboratory for analyses. The blanks will consist of 40 ml VOA vials, as follows:

- A trip blank will be prepared before the sample bottles are sent by the laboratory. It consists of a sample of distilled, deionized water that accompanies the other sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of samples where sampling and analysis for TCL volatiles is planned (water matrix only). The trip blank will be analyzed for TCL VOCs as a measure of potential contamination from background sources and their effect on the results.

- 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 VOCs.

3.3 SOIL VAPOR INVESTIGATION

3.3.1 SOIL VAPOR POINT INSTALLATION

SESI will collect three (3) sub-slab vapor (SSV) samples and three (3) corresponding indoor air (IA) samples within the current building footprints. Additionally, three (3) soil vapor (SV) samples and one (1) ambient air sample will be collected at the building exteriors. The proposed sub-slab and soil vapor point locations are shown on **Figure 3.3**. The purpose of the soil vapor investigation is to assess the potential for vapor intrusion into future buildings.

The sub-slab and soil gas samples will be collected in accordance with the procedures of the NYS Department of Health October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Specifically, the sub-slab soil vapor probes will be advanced using a handheld drill to approximately 2 inches beneath the building slab. Co-located indoor air samples will also be collected at both sub-slab vapor locations. The soil vapor probes will be installed via direct push sampling equipment, with samples being collected by installing vapor implants. The soil vapor sampling depth will be based on the final construction and development plan, which is currently assumed to be 10 ft-bgs. A sacrificial vapor point connected to flexible tubing will be inserted into the borehole. The annular space of the borehole will be filled with sand and the surface will be sealed with bentonite to seal the surface. Prior to sampling the tubing system will be purged of ambient air with a low-flow pump.

3.3.2 SOIL VAPOR POINT SAMPLING

The ambient air, sub-slab, and soil vapor samples will be collected into laboratory supplied certified clean stainless-steel summa canisters. The summa canisters will be equipped with a manometer to verify the canister is under vacuum, and a flow controller will be set to a flow rate not to exceed 200 ml/min. The sample duration will be 8 hours for sub-slab vapor and indoor air samples, and 2 hours for exterior soil vapor and ambient air samples. A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of

the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols. The vapor samples will be sent to an ELAP-certified laboratory for analysis of VOCs in accordance with EPA Method TO-15. The field sampling procedures are described in the QAPP, which is included as **Appendix A**.

As part of the vapor sampling, a tracer gas will be used to serve as a QA/QC device to verify the integrity of the soil vapor probe seal. Helium will be used as the tracer gas, and a box will serve to keep it in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring will be performed a second time to confirm the integrity of the probe seals. SESI's field sampling procedures are described in the QAPP presented in **Appendix A**. The proposed soil vapor sample points are presented in **Table 3.3** below.

Table 3.3: Summary of Proposed Soil Vapor Sampling

Location Name	Sampling Depth (ft)	Sample Media	Summa Type	Sample Type	Analysis
RI-SSV-1	2" below slab	Sub-slab Vapor	Summa Canister	(200 mL/min)	TO-15
RI-SSV-2	2" below slab	Sub-slab Vapor	Summa Canister	(200 mL/min)	TO-15
RI-SV-3	10	Soil Vapor	Summa Canister	(200 mL/min)	TO-15
RI-SSV-4	2" below slab	Sub-slab Vapor	Summa Canister	(200 mL/min)	TO-15
RI-SV-5	10	Soil Vapor	Summa Canister	(200 mL/min)	TO-15
RI-SV-6	10	Soil Vapor	Summa Canister	(200 mL/min)	TO-15
RI-IA-1	NA	Indoor Air	Summa Canister	(200 mL/min)	TO-15
RI-IA-2	NA	Indoor Air	Summa Canister	(200 mL/min)	TO-15
RI-IA-3	NA	Indoor Air	Summa Canister	(200 mL/min)	TO-15
RI-AA-1	NA	Ambient Air	Summa Canister	(200 mL/min)	TO-15

4.0 DECONTAMINATION AND IDW

Equipment utilized for ground intrusive activities (i.e. borings and wells) will be decontaminated between each boring. Equipment utilized for sample collection (i.e. spoons, trowels) will be decontaminated between each sample unless disposable equipment is utilized. Appropriate decontamination areas will be established to support work being conducted in each area of the Site. PFAS free certified deionized water, supplied from the laboratory, will be used for the decontamination of the sampling tools if needed. Locally supplied water, if available, or water supplied by the driller in a tank, will be used to decontaminate the equipment.

All investigative derived waste (IDW) of soil cuttings and purged groundwater will be containerized, sampled, and properly disposed of pursuant to DER-10 requirements. Disposable sampling equipment, including macro core liners, spoons, gloves, bags, paper towels, and PPE that contacts environmental media, will be double bagged and disposed of as municipal trash in a facility trash dumpster as non-hazardous refuse.

5.0 SURVEY

After the RI sampling scope is completed, a survey will be completed, which includes the locations and elevations of all the monitoring wells, soil borings, and soil vapor points. Survey datum will be provided relative to NAD83. Elevation datum will be provided relative to NAVD88.

6.0 HUMAN HEALTH EXPOSURE ASSESSMENT

A qualitative human health exposure assessment will be performed for the Site in accordance with the New York State Department of Health's Qualitative Human Health Exposure Assessment guidance document. Sampling data, along with the physical conditions of the contaminant sources or physical hazards near the Site, will be reviewed. Potential on-site and off-site exposures will be evaluated. The Exposure Assessment will describe the nature and size of the population exposed, or potentially exposed, to the contaminants that are present at, or migrating from the Site, and will characterize the exposure setting, identify exposure pathways, and evaluate contaminant fate and transport.

Several objectives will be met by the exposure assessment. First, applicable Site information and characterization data for environmental media of concern will be evaluated. Applicable SCGs, including Part 375 SCOs and CP-51 SCOs for soil, and AWQS for groundwater and surface water, will be applied. Second, a qualitative assessment will be made if there is a potential for off-Site migration of any contaminants.

An assessment of current and future Site activities and Site use will be conducted in relation to potential human exposure. Next, potential exposure pathways will be identified, and each aspect of the potential exposure pathway will be evaluated. Soil, soil vapor, and groundwater contamination will be addressed appropriately and the impact of remediation on future exposure scenarios will be analyzed.

7.0 FISH AND WILDLIFE IMPACT ANALYSIS

A Fish and Wildlife Resources Impact Analysis (FWIA) Decision Key will be completed prior to the excavation work to determine if a FWIA is needed. Contaminant migration pathways and any fish and wildlife exposure pathways will be identified. As stated in the FWIA, “if no resources are associated with the site or if there is no potential for contaminant migration to the resources, then only the necessary information to support that conclusion should be provided.”

If resources are identified, or migration pathways exist, a FWIA will be completed and submitted as part of the RI Report. The FWIA would include qualitative estimates of the following: 1) the routes, intensity, frequency, and duration of actual or potential exposures to chemicals; 2) the nature and size of the population exposed to the contaminants that are present at or migrating from the site; 3) the exposure setting and possible exposure pathways; and 4) contaminant fate and transport.

A Fish & Wildlife assessment is not anticipated for this Site due to its urban location and distance from surface water bodies and wildlife areas.

8.0 DUSR

Following the completion of the laboratory analysis program, a Data Usability Summary Report (DUSR) will be completed for the lab data generated during the RI and included as part of the RI Report. The DUSR is carried out as specified in DER-10 to evaluate the quality control measures that were implemented during the field and laboratory analytical programs, with the objective of determining whether the reported analytical data are representative and usable for decision making. The DUSR will evaluate whether the data are technically defensible (i.e. were all analytical data requirements met and documented?). Data usability analysis reviews the Site data to determine whether they are adequate to draw conclusions regarding the nature and extent of contamination.

The items that will be reviewed as part of the DUSR will include the following:

- Completeness (number of samples collected and analyzed compared to plans)
- Chains of custody are complete and accurate
- Holding times
- Instrument calibration
- Relative percent difference between field duplicates
- Reasonableness of data (e.g. relationships between total and soluble analytes)
- Blank contamination

The DUSR will be conducted in accordance with guidelines provided under Appendix 2B of DER-10. The site-specific Quality Assurance Project Plan (QAPP) is included in **Appendix A**.

9.0 REMEDIAL INVESTIGATION REPORT

Following the completion of the RI activities and the receipt of sample results, a RIR will be prepared. The RIR report will summarize the activities completed during the RI including analytical results, well construction and sampling logs, conclusions from the human health exposure assessment and from the FWIA if necessary, a DUSR, and laboratory data packages. Scaled figures showing the sample locations and areas of contamination exceeding applicable standards will be prepared for soil, soil vapor, and groundwater. Sampling results will be summarized and discussed and the need for additional investigation and remediation will be evaluated (including the removal of hydraulic lifts, drains, subsurface pits, tanks, drains, etc. if applicable). In addition, analytical summary tables will be prepared for soil, soil vapor, and groundwater compared to applicable standards.

The RIR will also include: 1) a summary of the Site history and previous investigations, 2) a description of current site conditions, 3) the identification of exposure pathways via a Qualitative Human Health Exposure Assessment; an analysis of the results, 4) a description of the nature and extent of the contamination including post remediation soil data collected during prior investigations (i.e., UST, pit, oil/water separator, and lift removals) ; and 5) a detailed conclusions with recommendations.

Analytical data collected during the Remedial Investigation will be submitted in the NYSDEC approved Electronic Data Deliverable (EDD) format. EDDs will be prepared using the NYSDEC's Environmental Information Management System (EIMS) database software application EQuIS™ for submission.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

QA/QC is addressed in the QAPP included as **Appendix A**. The QAPP outlines procedures to be followed for sampling and analysis to ensure quality of the results. A DUSR will be prepared for each laboratory report and will be provided with the final reports to document the reliability of the sample results.

11.0 HEALTH AND SAFETY PLAN

A Site-specific Health and Safety Plan (HASP) has been prepared and is included as **Appendix**

D. All on-site personnel and visitors involved in the RI will be required to read and sign the HASP prior to entry of the Site.

12.0 COMMUNITY AIR MONITORING AND DAILY REPORTING

12.1 COMMUNITY AIR MONITORING

A Community Air Monitoring Plan (CAMP) is provided as **Appendix E**, in accordance with DER-10 requirements for remedial investigation. The CAMP sets forth air monitoring procedures that will be utilized to measure airborne emissions during the RI, to minimize the release of contaminants to off-Site areas during active remediation on the Site. The CAMP will be implemented during all ground-intrusive activities on a continuous basis at upwind and downwind locations throughout the site investigation and remediation. CAMP data summaries will be provided to the NYSDEC and NYSDOH on a weekly basis, at a minimum, and any exceedances of CAMP action levels and corrective measures taken must be reported to the Department within 24 hours.

12.2 DAILY REPORTS

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers following each day of active site investigation work:

- Activities relative to the Site during the previous day and those anticipated for the next reporting day, including a quantitative presentation of work performed (i.e. number of wells sampled, etc.);
- Weather conditions;
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling, when applicable, results received following internal data review and validation, as applicable;
- Photographs of the investigation;
- CAMP data from the previous day; and
- Information regarding any complaints made.

13.0 CITIZEN PARTICIPATION

Citizen participation activities will be performed throughout the RI process to involve and inform the public. The specific citizen participation activities to be performed are outlined in the Citizen Participation Plan (CPP), included as **Appendix F**.

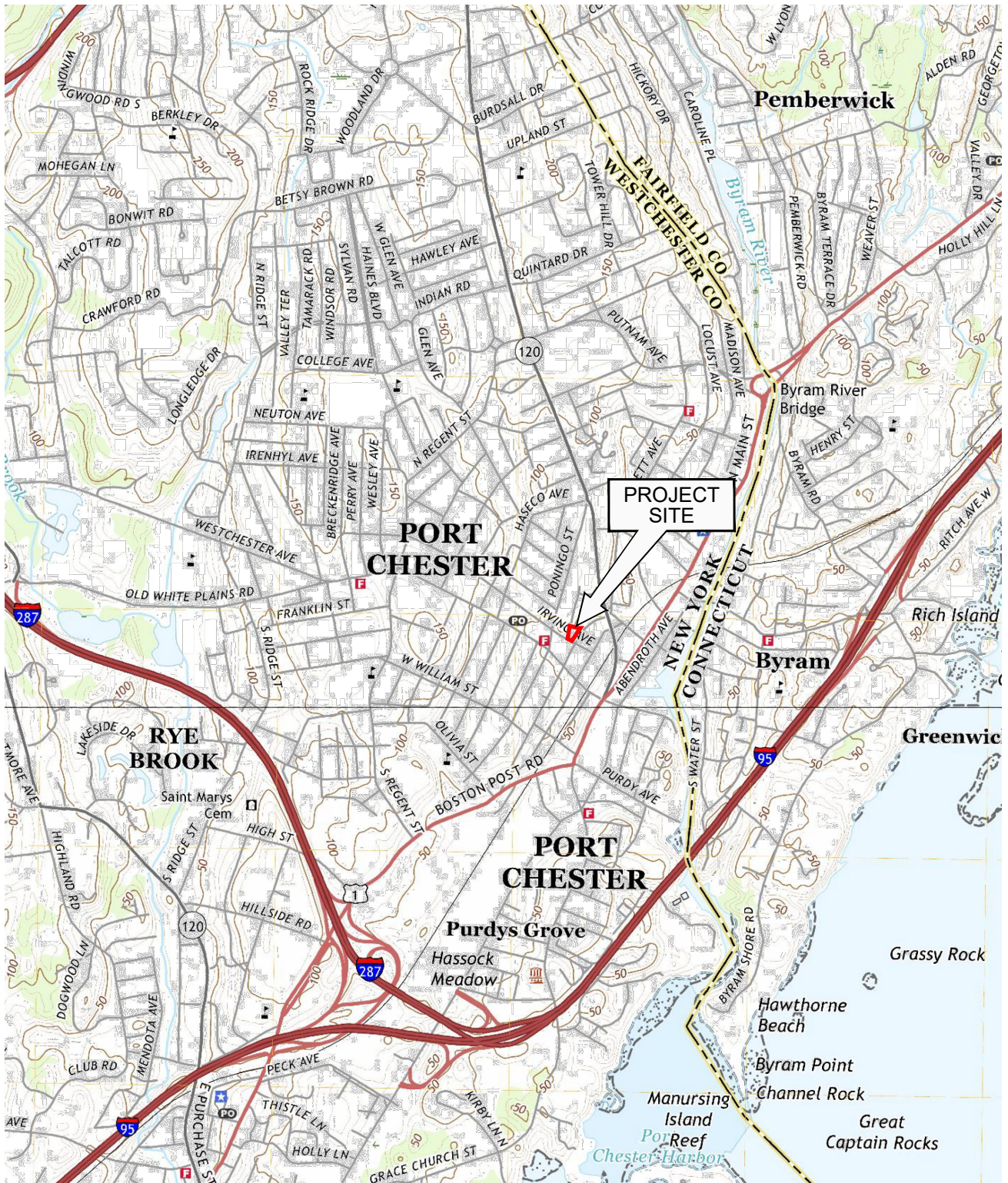
14.0 REMEDIAL INVESTIGATION SCHEDULE

The proposed remedial investigation schedule is presented on **Table 14.1** below.

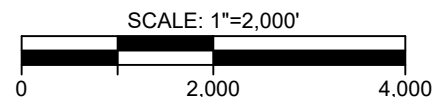
Table 14.1: Proposed Remedial Investigation Schedule

Activity	Scheduled Date
Remedial Investigation – Soil and Soil Vapor Sampling	Summer 2024
Remedial Investigation Groundwater Sampling	Summer/fall 2024
Submit Draft RIR	Fall 2024

Figures



REFERENCE:
 INFORMATION TAKEN FROM EDR HISTORICAL TOPO MAP 2019, 2018
 TP, GLENVILLE, 2018 7.5 MINUTE SERIES.
 S, MAMARONECK, 2019, 7.5-MINUTE SERIES.



157 IRVING AVENUE
 PORT CHESTER, NEW YORK

SITE LOCATION MAP

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 ENGINEERS

GEOTECHNICAL | ENVIRONMENTAL | SITE CIVIL
 959 ROUTE 46E, 3RD FLOOR, PARSIPPANY, NJ 07054 PH: 973.808.9050

FIG-1.1

DRAWN BY: AW

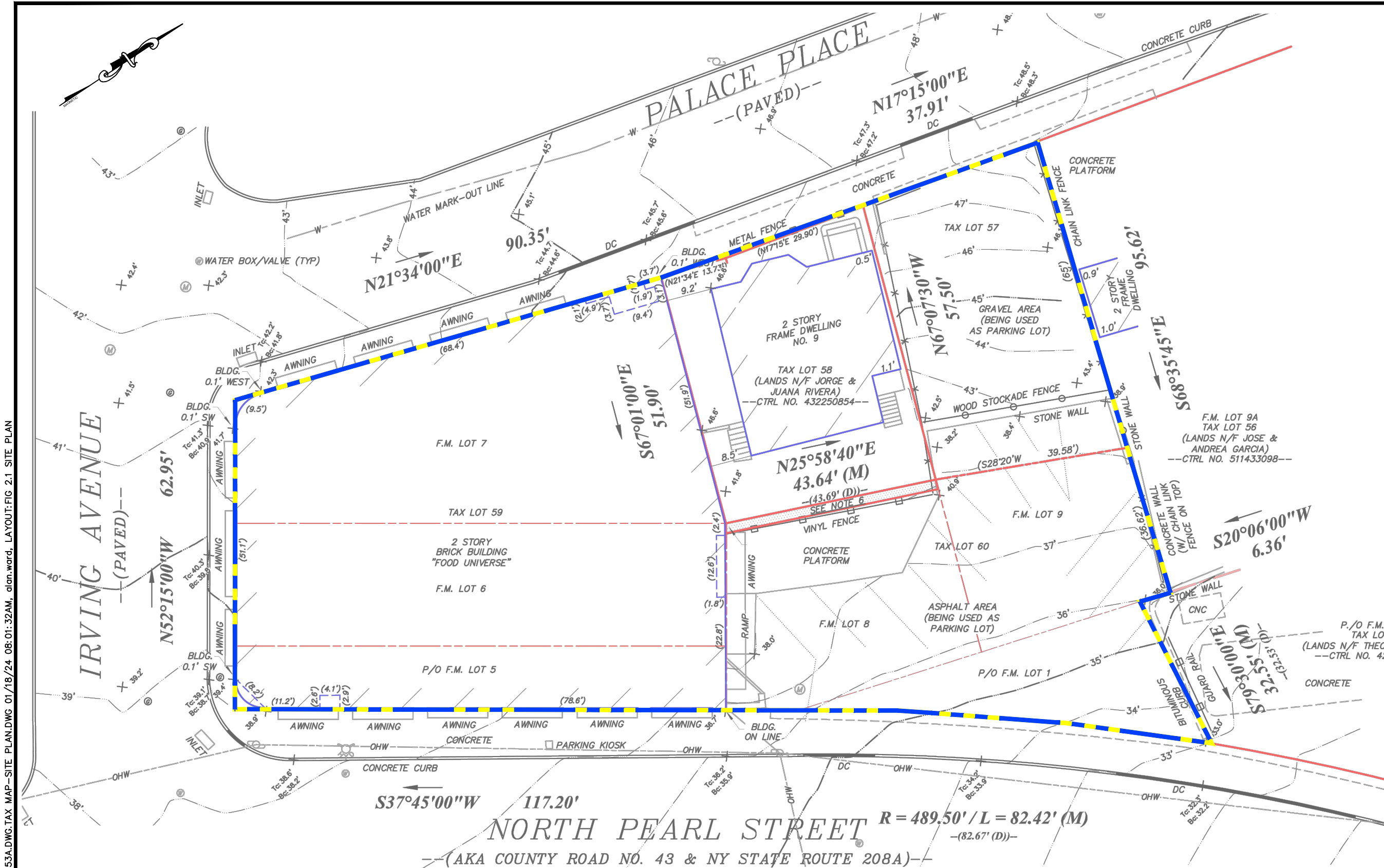
CHECKED BY: JR

SCALE: AS NOTED

DATE: 01/12/2023

JOB NO.: 12653A

N:\ACAD\12653\CAD\12653A.DWG.TAX MAP-SITE PLAN.DWG 01/18/24 08:01:32AM, plan.ward, LAYOUT: FIG 2.1 SITE PLAN



NYS Education Law

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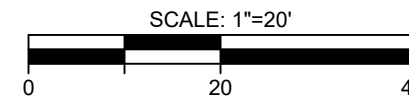
THIS PLAN IS FOR LOCATING SITE BOUNDARY ONLY.
OTHER SITE WORK SHOWN HERE IS NOT INTENDED FOR CONSTRUCTION.

REFERENCE

- EXIST CONDITIONS & BOUNDARY ARE TAKEN FROM "ALTA/ACSM LAND TITLE SURVEY" PREPARED BY BEHAR SURVEYING ASSOCIATES, PC. DATED AUG. 15, 2022.

LEGEND:

- SITE BOUNDARY
- BUILDING OUTLINE
- LOT LINE



dwg by: AW
chk by: NG
scale: AS NOTED
date: 01/12/2024

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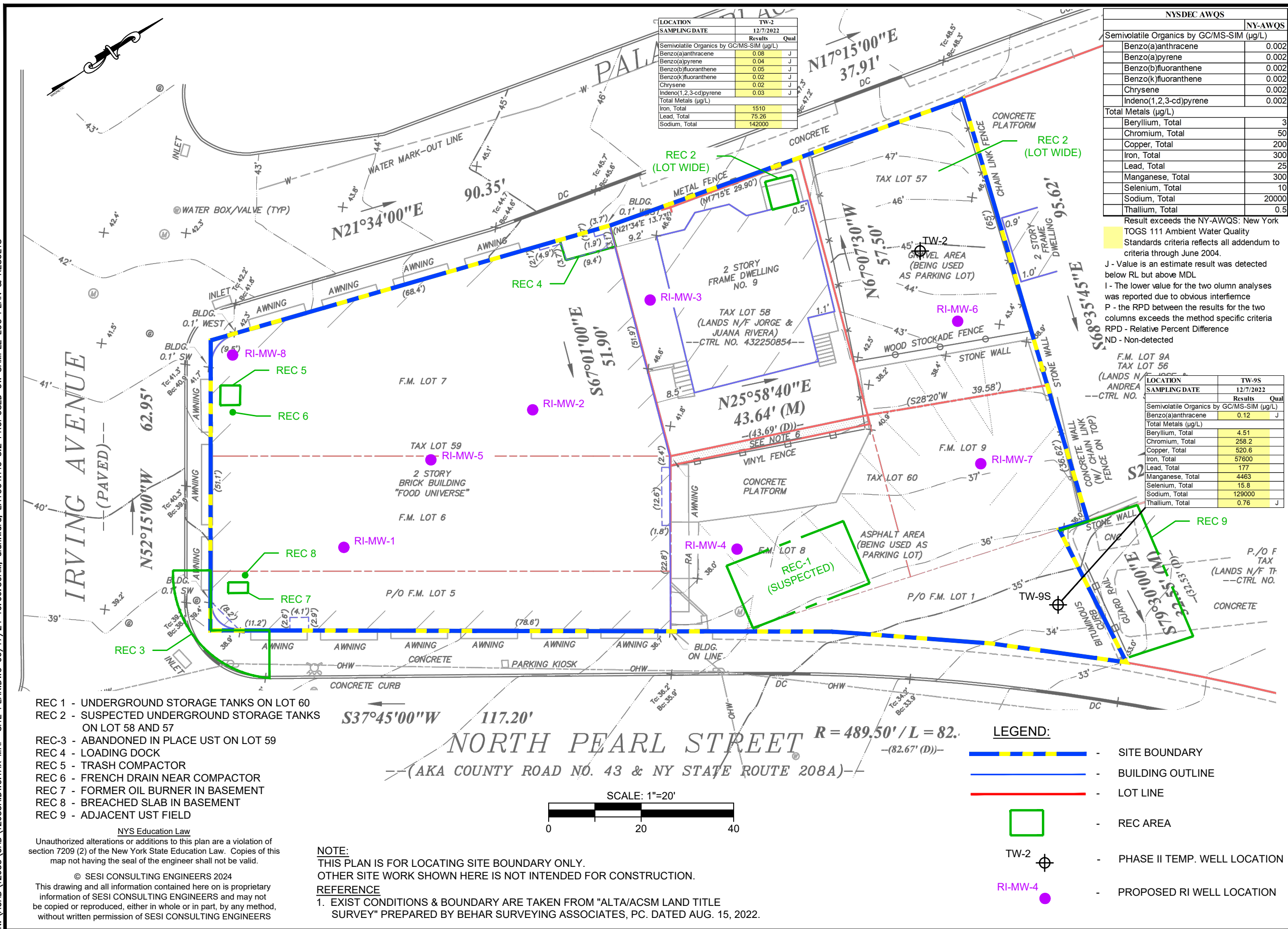
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project:
157 IRVING AVENUE
PORT CHESTER, NY

title:
SITE PLAN

job no: 12653A
drawing no:

FIG 2.1



Result exceeds the NY-AWQS: New York
TOGS 111 Ambient Water Quality
Standards criteria reflects all addendum to
criteria through June 2004.

J - Value is an estimate result was detected
below RL but above MDL

I - The lower value for the two column analyses
was reported due to obvious interference

P - the RPD between the results for the two
columns exceeds the method specific criteria

RPD - Relative Percent Difference

ND - Non-detected

F.M. LOT 9A
TAX LOT 56
(LANDS N/ E OF
ANDREA
-CTRL NO.

LOCATION	TW-9S
SAMPLING DATE	12/7/2022
	Results Qual
Semivolatile Organics by GC/MS-SIM (µg/L)	
Benzo(a)anthracene	0.12 J
Total Metals (µg/L)	
Beryllium, Total	4.51
Chromium, Total	258.2
Copper, Total	520.6
Iron, Total	57600
Lead, Total	177
Manganese, Total	4463
Selenium, Total	15.8
Sodium, Total	129000
Thallium, Total	0.76 J

(W/ CRACK TOP)
FENCE ON

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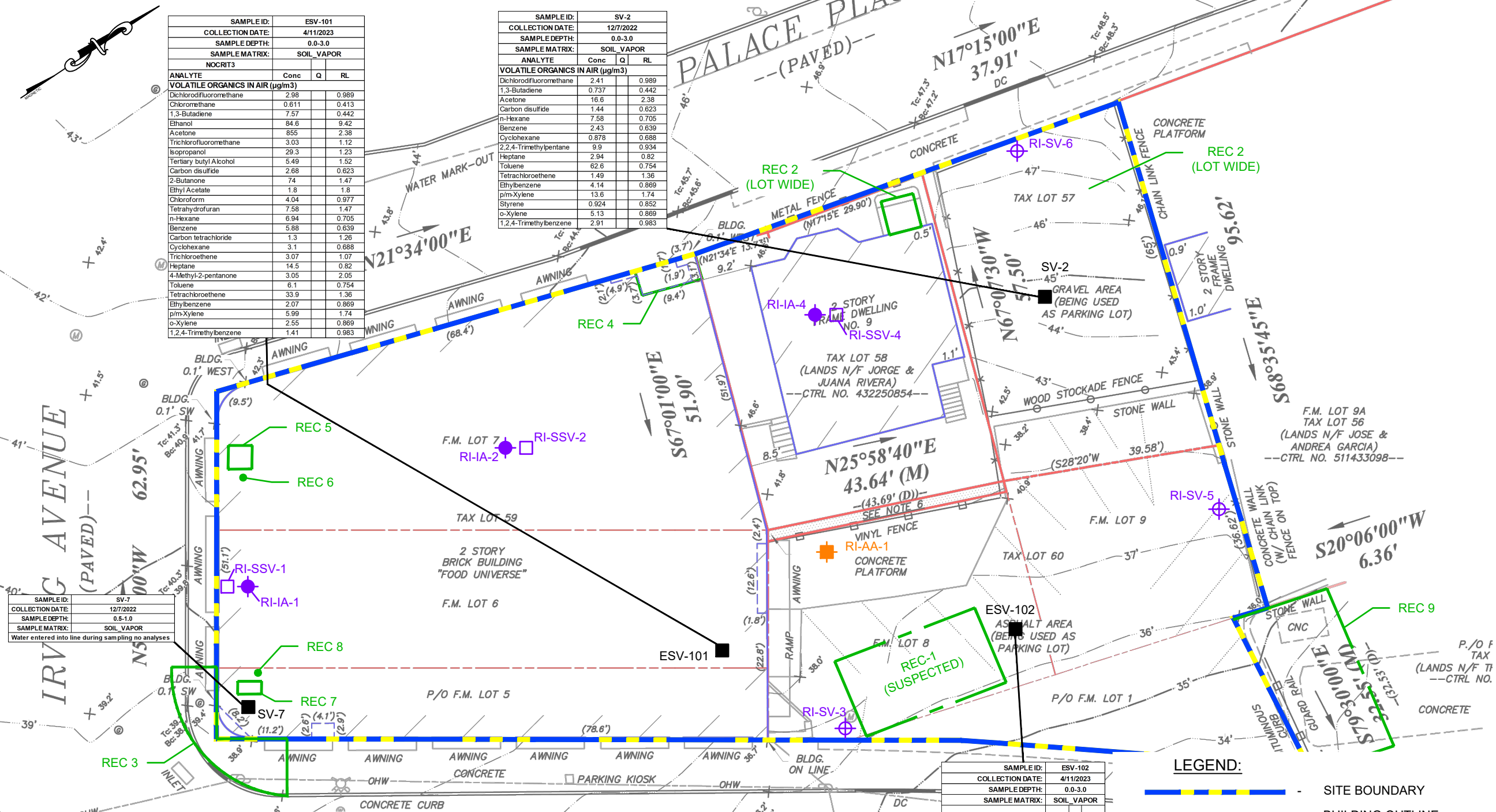
157 IRVING AVENUE
PORT CHESTER, NY

title: PROPOSED GROUNDWATER SAMPLE
LOCATION PLAN AND RESULTS

job no: 12653A
drawing no:

FIG 3.2

N:\ACAD\12653A\CAD\12653A.DWG.TAX MAP-SITE PLAN.DWG 06/17/24 12:18:31PM, plan.ward, LAYOUT: FIG 3.3 SV SAMPLE AND CONCENTRATION PLAN



- REC 1 - UNDERGROUND STORAGE TANKS ON LOT 60
REC 2 - SUSPECTED UNDERGROUND STORAGE TANKS ON LOT 58 AND 57
REC 3 - ABANDONED IN PLACE UST ON LOT 59
REC 4 - LOADING DOCK
REC 5 - TRASH COMPACTOR
REC 6 - FRENCH DRAIN NEAR COMPACTOR
REC 7 - FORMER OIL BURNER IN BASEMENT
REC 8 - BREACHED SLAB IN BASEMENT
REC 9 - ADJACENT UST FIELD

NYS Education Law

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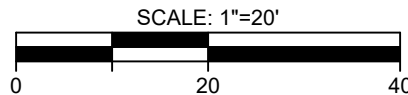
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REFERENCE

- EXIST CONDITIONS & BOUNDARY ARE TAKEN FROM "ALTA/ACSM LAND TITLE SURVEY" PREPARED BY BEHAR SURVEYING ASSOCIATES, PC. DATED AUG. 15, 2022.



SAMPLE ID:		ESV-102	
COLLECTION DATE:		4/11/2023	
SAMPLE DEPTH:		0.0-3.0	
SAMPLE MATRIX:		SOIL VAPOR	
ANALYTE	Conc	Q	RL
VOLATILE ORGANICS IN AIR (µg/m3)			
Dichlorodifluoromethane	2.36	0.989	
Chloromethane	0.894	0.413	
1,3-Butadiene	7.19	0.442	
Ethanol	74.2	9.42	
Acetone	653	2.38	
Trichlorofluoromethane	1.19	1.12	
Isopropanol	16.9	1.23	
Tertiary butyl Alcohol	5.67	1.52	
Carbon disulfide	10.7	0.623	
2-Butanone	67.2	1.47	
Chloroform	1.32	0.977	
Tetrahydrofuran	3.78	1.47	
n-Hexane	9.34	0.705	
Benzene	3.96	0.639	
Cyclohexane	3.39	0.688	
2,2,4-Trimethylpentane	3.19	0.934	
Heptane	7.25	0.82	
4-Methyl-2-pentanone	4.18	2.05	
Toluene	7.16	0.754	
2-Hexanone	6.11	0.82	
Tetrachloroethene	45.6	1.36	
Ethylbenzene	1.55	0.869	
p/m-Xylene	5.82	1.74	
o-Xylene	2.28	0.869	
1,2,4-Trimethylbenzene	2.05	0.983	
1,3-Dichlorobenzene	2.02	1.2	

LEGEND:

- SITE BOUNDARY
- BUILDING OUTLINE
- LOT LINE
- REC AREA
- SV-2
- RI-SV-5
- RI-SSV-5
- RI-IA-2
- RI-AA-1
- PHASE II SOIL VAPOR LOCATION
- PROPOSED RI SOIL VAPOR LOCATION
- PROPOSED SUB-SLAB SOIL VAPOR LOCATION
- PROPOSED INDOOR AIR LOCATION
- PROPOSED RI AMBIENT AIR LOCATION

dwg by: AW

chk by: NG

scale: AS NOTED

date: 01/12/2024

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157 IRVING AVENUE
PORT CHESTER, NY

project:
title: PROPOSED SOIL VAPOR AND AMBIENT
AIR SAMPLE LOCATION AND RESULTS
PLAN

job no: 12653A
drawing no:

FIG 3.3

Appendix A:

Quality Assurance Project Plan



Geotechnical
Environmental
Site Civil

959 Route 46E, Fl 3, Ste 300
Parsippany, NJ 07054
973.808.9050
www.sesi.org

QUALITY ASSURANCE PROJECT PLAN

For

**157 Irving Avenue
Port Chester, Westchester County, NY**

SESI Project No:
12653

Prepared for:
Irving Owner LLC
January 2024 (Revised June 2024)

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LIST OF ACRONYMS

Acronym	Definition
AAS	Absorption Spectroscopy
ASP	Analytical Service Protocol
BCP	Brownfield Cleanup Program
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Accreditation Program
GC/MS	Gas Chromatography/Mass Spectrometry
HAS	Hollow-stem Auger
HDPE	High-Density Polyethylene
LDPE	Low-density Polyethylene
LFPS	Low Flow Purging Sampling
MDL	Method Detection Limit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyls
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PPE	Personal Protective Equipment
PTFE	Polytetrafluoroethylene
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RIWP	Remedial Investigation Work Plan
SESI	SESI Consulting Engineers, Inc.
TIC	Tentatively Identified Compound
TCL	Target Compound List
VOC	Volatile Organic Compound
USEPA	United States Environmental Protection Agency

1.0 PROJECT DESCRIPTION

This document presents the Quality Assurance Project Plan (QAPP) for the Remedial Investigation Work Plan (RIWP) for the proposed development at 157 Irving Avenue, Port Chester, New York (the “Site”). The Site consists of a 0.38-acre area parcel and is identified as Block 2, Lots 57, 58, 59, and 60 on the Westchester County tax map. The lots are to be consolidated on the June 1, 2024 tentative roll and considered Lot 80 (157 Irving Avenue).

The Site is bound to the north by a residential property and a gas station, to the west by Palace Place followed by a residential property and a parking lot, to the south by Irving Avenue followed by Westchester Upholstery, and to the east by NY 120-A followed by restaurants/commercial properties

SESI Consulting Engineers (SESI) prepared the RIWP for 157 Irving Avenue, Port Chester, New York, dated January 2024, which describes the investigation activities to be conducted at the Site, as part of the Site’s planned remedial investigation and remediation.

2.0 PROJECT ORGANIZATION

The RIWP activities will be conducted by SESI and their qualified subcontractors, on behalf of Irving Owner LLC. The organization of SESI’s key project management and field staff, and respective areas of responsibility, is presented below (**Table 2.1**) along with the names of subcontractors.

Table 2.1—SESI Personnel and Subcontractors

Role	Name	Telephone No.
Project Principal	Fuad Dahan, P.E., PhD	973-808-9050 x249
Project Manager	Jesse Mausner	973-808-9050
Principal Engineer	Fuad Dahan, P.E., PhD	973-808-9050 x249
Field Team Leader	TBD	973-808-9050
Quality Assurance Officer	Joe Scardino	973-808-9050 x267
Field Personnel	TBD	973-808-9050
Analytical Laboratory	Alpha Analytical	201-847-9100
Data Validator	Hanibal Tayeh	413-875-5049
Driller	Coastal Environmental Solutions	631-942-9209

2.1 PROJECT PRINCIPAL

Provides technical and administrative oversight and guidance throughout the project, assist in securing company resources, participate in technical review of deliverables, and attend key meetings as needed.

2.2 PRINCIPAL ENGINEER

Provides technical guidance and review of reports, analytical data. Will have key involvement in screening and development of remedial alternatives.

2.3 PROJECT MANAGER

Responsible for maintaining the day-to-day schedule for completing the fieldwork and deliverables according to Brownfield Cleanup Program (BCP) requirements and client expectations.

2.4 FIELD TEAM LEADER

Responsible for overseeing field work during the implementation of the RIWP, including observing subcontractors, maintaining field notes, and collecting samples of various environmental media.

2.5 QUALITY ASSURANCE OFFICER

Responsible for reviewing sampling procedures and certify that the data was collected and analyzed using the appropriate procedures.

3.0 QA/QC OBJECTIVES FOR MEASUREMENT OF DATA

In cases where NYSDOH ELAP Certification exists for a specific group or category of parameters, the laboratory performing analysis in connection with this project will have appropriate New York State Department of Health (NYSDOH) ELAP Certification. Alpha Analytical, an ELAP-certified lab, will be performing the sample analyses for the project. Analytical Service Protocol (ASP, June 2000) Category B deliverables are required for all samples. All data will be sent to a third party, Hanibal Tayeh a data validator, for validation in accordance with NYSDEC BCP requirements.

Detection limits set by New York State Department of Environmental Conservation (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 (QA/QC) objectives for all measurement data include completeness, representativeness, comparability, precision, and accuracy.

3.1 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.

3.2 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. Specific cleaning techniques are described in the Field Sampling Procedure. 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 (VOCs) 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.

3.3 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.

3.4 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, colorimetry, atomic spectroscopy, gravimetric and titrametric 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. Data will be 100 percent compliant with NYSDEC-

ASP requirements. Matrix spike and matrix spike duplicates will be collected to confirm accuracy and precision at a rate of one (1) per 20 soil and/or groundwater samples taken.

The number of duplicate, spiked and blank samples analyzed will be a minimum of one (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 (1) per every 20 samples (soil). For the aqueous matrix field blanks will be collected at a frequency of one (1) 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). An equipment blank for per- and polyfluoroalkyl substances (PFAS) will be collected once per day per matrix, regardless of whether equipment being used is disposable, at a frequency of one (1) per 20 samples taken for both soil and groundwater.

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 (5) 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 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.

4.0 SAMPLING PROCEDURES

4.1 SAMPLING PROGRAM

The sampling program for this project will include soil, groundwater and soil vapor. Soil samples will be collected from split spoon sampling or macrocore devices retrieved from soil borings. Groundwater samples will be collected from groundwater monitoring wells using low flow purging techniques. A description of this method is shown on **Table 4.1**. Soil vapor samples will be collected from vapor points screened in the vadose zone using Summa Canisters. A summary of the sample containers, bottle types, preservatives and holding times is shown on **Table 4.2**.

4.1.1 DRILLING/SAMPLING PROCEDURES

Soil and groundwater samples will be collected by means of a soil boring program. Soil borings shall be completed using the hollow stem auger drilling methods, direct push methods, or rotary drilling methods, whichever methods are determined to be best suited to site conditions by the SESI project manager and SESI field team leader.

Soil samples will be collected from soil borings and analyzed in accordance with the NYSDEC-approved Work Plan. Monitoring wells for groundwater sample collection will be installed in select completed soil borings. Either hollow stem auger (HSA) or direct push drilling methods may be utilized for monitoring well completion.

Soil samples shall be collected continuously during drilling so that a complete soil profile is examined and described by the SESI field geologist. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling using a standard 2-foot long, 2-inch outside diameter split-spoon sampler with a 140-pound hammer, in cases where HSA methods are used. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labeled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility. Chain-of-custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Waste Waters.

A geologist or engineer will be on Site during the drilling operations to fully describe each soil sample, following the New York State Soil Description Procedure, and to retain representative portions of each sample.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts [i.e., the number of blows from a soil sampling drive weight (140 pounds)] required to drive the split-spoon sampler in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

4.1.2 MONITORING WELL COMPLETION

Monitoring wells will be constructed of 0.010-inch slot size PVC well screen and riser casing. Other materials utilized for completion will be washed silica sand (Q-Rock No. 4 or approved equivalent) bentonite grout, Portland cement, and a protective steel locking well casing and cap with locks. The depth of the wells will be determined based on the depth to water, type of contaminant and field conditions encountered.

The monitoring well installation method for wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time, a washed silica sand pack will be placed around the well screen if required to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2 to 3 feet above the top of the screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/bentonite grout will continue to be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets, frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A bolt-down protective curb box will be installed, flush with the ground, or steel "stick-up" protective casing and secured by a Portland cement seal. The cement seal shall extend laterally at least 1 foot in all directions from the protective casing and shall slope gently away to drain water away from the well.

4.1.3 WELL DEVELOPMENT

All monitoring wells will be developed or cleared of all fine-grained materials and sediments that have settled in or around the well during installation so that the screen is transmitting representative portions of the groundwater. The development will be by one (1) of two (2) methods, pumping or bailing groundwater from the well until it yields relatively sediment-free water.

A decontaminated pump or bailer will be used and subsequently decontaminated after each use following procedures outlined in the Decontamination Protocol. Pumping or bailing will cease when the turbidity falls below 50 NTUs or until specific conductivity, pH, and temperature are stable (i.e., consecutive readings are within 10 percent with no overall upward or downward trends in measurements). Well development water will be containerized in drums and sampled for proper offsite disposal in accordance with DER-10 Section 3.3€5.

4.1.4 DECONTAMINATION

All drilling equipment and associated tools including augers, drill rods, sampling equipment, wrenches and any other equipment or tools that have come in contact with contaminated materials will be decontaminated before any drilling on Site begins, between each well, and prior to removing any equipment from the Site. The preferred decontamination procedure will be to scrape the equipment from any residual soils and then rinse with water and Alconox®. Every effort will be made to minimize the generation of contaminated water. Any contaminated water generated will be drummed. The contaminated water drums will be disposed of at an appropriate facility after approval and sampling in accordance with the specific facility requirements.

4.1.5 PFAS SAMPLING CONSIDERATIONS

This section contains the materials limitations for Per- and polyfluoroalkyl substances sampling in accordance with the Draft NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (April 2023).

The groundwater samples will be analyzed for PFAS using Modified USEPA Method 1633. Reporting limits for PFOA and PFOS will not exceed 2 nanograms per liter (ng/L). Category B deliverables and an electronic data deliverable will be completed.

PFAS are very persistent in the environment and in the human body. Due to their presence in a variety of products, persistence in the environment and very low drinking water standards, care must be used when groundwater sampling for PFAS to avoid cross contamination from the sampling equipment and personal protective equipment (PPE).

No fabric softener will be used on clothing to be worn in field. Cosmetics, moisturizers, hand cream, unauthorized sunscreen, insect repellent or other related products will not be used the morning of sampling. The field samplers will wear powder-free nitrile gloves while filling and sealing the sample bottles. The sampling equipment components and sample containers will not come in contact with material that may potentially contain PFAS such as aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Clothing that contains PTFE material

(including GORE-TEX®) or that have been waterproofed with PFAS materials will be avoided. Food and drink packaging materials will be avoided, as well.

Sampling will be performed using certified PFAS-free sampling materials such as stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate or polypropylene pump and tubing. Rinse water must be laboratory-provided certified PFAS-free distilled or de-ionized water. Standard two step decontamination using Alconox® detergent and clean certified PFAS-free water rinse will be performed for equipment that does come in contact with PFAS materials.

No waterproof field books, plastic clipboards, binders, or spiral hard cover will be used for PFAS containers. No adhesives (i.e. Post-It® Notes), sharpies, or permanent markers will be used for PFAS containers. The PFAS containers will be labeled with ballpoint pens. PFAS samples will be stored in separate cooler filled with regular ice only with no chemical (blue) ice packs.

Pre-cleaned sample bottles with closures, coolers, sample labels and a chain of custody form will be provided by the laboratory.

4.2 GROUNDWATER SAMPLING PROGRAM

4.2.1 WELL EVACUATION

Prior to sampling a monitoring well, the static water level will be recorded. All well data will be recorded on a field sampling record. The wells will be sampled in accordance with the USEPA guidelines for the Low Flow Purging Sampling (LFPS). The purpose of LFPS is to collect groundwater samples from monitoring wells that are representative of ambient groundwater conditions in the aquifer. The LFPS method reduces turbidity which is needed particularly when sampling for metals.

4.2.2 SAMPLING PROCEDURE

The wells will be sampled using the USEPA LFPS technique. A flow rate of 100 ml to 250 ml per minute is used to purge the wells. Drawdown should not exceed 0.3 feet. The pump intake is lowered to the mid-point of the water column or as subsurface features such as bedrock fractures or more permeable zones warrant. At the initiation of low flow purging a water level is recorded as well as field parameters. Field parameters are then monitored every five (5) minutes during low flow purging using a flow through cell. When three (3) consecutive measurements of pH differ by 0.1 units or less, with ORP within 10 mv or less, turbidity varies 10 percent or less, conductivity differs by 3 percent or less and dissolved oxygen by 10 percent or less, sampling may begin. Flow through cells are used so continuous real time readings are made. When the parameters stabilize the flow through cell is disconnected and sample bottles are filled directly from the tubing. Low-flow sampling procedures are summarized on **Table 4.1**.

4.3 SOIL VAPOR SAMPLING

Soil vapor sampling will be conducted in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in New York State (October 2006 and the subsequent May 2017 updates to the Soil Vapor/Indoor Air Decision Matrices). Soil vapor samples will be collected in the vadose zone from shallow (five [5] feet) vapor points. Each vapor point will be installed in a shallow boring

drilled either by hand-operated equipment (e.g. hand auger or percussion hammer drill), or by a small truck-mounted drill rig. Drilling equipment used shall be based on soil conditions, and the method that provides the most practical approach.

Each vapor point will consist of an inert sampling tube (polyethylene, stainless steel, or Teflon®) with a six (6)-inch screened section at the bottom through which soil vapors can be sampled. The screen slot size will be 0.0075 inches. A sampling zone will be created around the screened section by backfilling with one (1) to two (2) feet of porous coarse sand or glass beads, and at least three (3) feet of bentonite will be placed above the porous sampling zone to form a seal from the surface. Native clean soil will be packed around the remaining annulus to the ground surface.

The regulator will be set to collect a soil vapor sample at a flow rate of less than 0.2 liters per minute. After the summa canister is filled, the valve will be closed.

Each canister will be listed according to a specific sample I.D. on a chain of custody form. Sample canisters will be delivered to the laboratory within 24 hours and analyzed for VOCs by method TO-15. The detection limit for VOCs will be 1 µg/m³ or less

The soil vapor sampling effort will include the use of inert helium tracer gas to verify that the soil vapor samples are not diluted by ambient air. The atmosphere around the sampling tube will be enriched with the tracer gas, and the soil vapor sample will be collected in the presence of the enriched tracer atmosphere. This will be accomplished by placing an inverted plastic pail over the sampling point and filling the pail with the tracer gas via a small tube penetrating the site of the pail. Refer to NYSDOH Guidance for Evaluating Indoor Air Intrusion in New York State (October 2006).

4.4 SAMPLE PRESERVATION AND SHIPMENT

Since all bottles will contain the necessary preservatives as shown in **Table 4.2**, they need only be filled. The 40 ml VOA vials must be filled brim full with no air bubbles. The other bottles should be filled to within about one (1) inch from the top.

The bottles will be sent from the laboratory in coolers which will be organized on a per site basis. Following sample collection, the bottles should be placed on ice in the shipping cooler. The samples will be cooled to 4°C, but not frozen.

Final packing and shipment of coolers will be performed in accordance with guidelines outlined in the ASP.

5.0 SAMPLE CUSTODY

The program for sample custody and sample transfer is in compliance with the NYSDEC-ASP, as periodically updated. If samples may be needed for legal purposes, chain-of-custody procedures, as defined by NEIC Policies and Procedures (USEPA-330/9-78-001-R, Revised June 1988) will be used. Sample chain-of-custody is initiated by the laboratory with selection and preparation of the sample containers. To reduce the chance for error, the number of personnel handling the samples should be minimized.

5.1 FIELD SAMPLE CUSTODY

A chain-of-custody record accompanies the samples from initial sample container selection and preparation at the laboratory, shipment to the field for sample containment and preservation, and return to the laboratory. Two (2) copies of this record follow the samples to the laboratory. The laboratory maintains one (1) file copy and the completed original is returned to the site inspection team. Individual sample containers provided by the laboratory are used for shipping samples. The shipping containers are insulated and ice is used to maintain samples at approximately 4°C until samples are returned and in the custody of the laboratory. All sample bottles within each shipping container are individually labeled and controlled. Samples are to be shipped to the laboratory within 24 to 48 hours of the day of collection depending on parameter holding times.

Each sample shipping container is assigned a unique identification number by the laboratory. This number is recorded on the chain-of-custody record and is marked with indelible ink on the outside of the shipping container. The field sampler will indicate the sample designation/location number in the space provided on the appropriate chain-of-custody form for each sample collected. The shipping container is closed and a seal provided by the laboratory is affixed to the latch. This seal must be broken to open the container, and this indicates possible tampering if the seal is broken before receipt at the laboratory. The laboratory will contact the site investigation team leader and the sample will not be analyzed if tampering is apparent.

5.2 LABORATORY SAMPLE CUSTODY

The site investigation team leader or Project Quality Assurance Officer notifies the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The laboratory sample program meets the following criteria:

- The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian signs the chain-of-custody record and records the date and time received.
- Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the site investigation team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles.

This assessment is recorded as part of the incoming chain-of-custody procedure:

1. The samples are stored in a secured area at a temperature of approximately 4°C until analyses are to commence.

2. A laboratory chain-of-custody record accompanies the sample or sample fraction through final analysis for control.
3. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the project records.

5.3 FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- It is in your possession; it is in your view, after being in your possession.
- It was in your possession and you placed it in a secure area.
- It is in a designated secure area.

6.0 CALIBRATION PROCEDURES

Instruments and equipment used to gather, generate or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the appropriate manufacturer's specifications or project specific requirements. The procedures for instrument calibration, calibration verification, and the frequency of calibrations are described in the ASP. The calibration of instruments used for the determination of metals will be as described in the appropriate CLP standard operating procedures.

Calibration of other instruments required for measurements associated with these analyses will be in accordance with the manufacturer's recommendations and the standard operating procedures of the laboratory.

7.0 ANALYTICAL PROCEDURES

Analytical procedures shall conform to the most recent revision of the NYSDEC-ASP (June 2005) and are summarized on **Tables 7.1** and **7.2**. In the absence of USEPA or NYSDEC guidelines, appropriate procedures shall be submitted for approval by NYSDEC prior to use.

The procedures for the sample preparation and analysis for organic compounds are as specified in the NYSDEC-ASP. Analytical cleanups are mandatory where matrix interferences are noted. No sample shall be diluted any more than a factor of five. The sample shall be either re-extracted, re-sonicated, re-stream distilled, etc. or be subjected to any one analytical cleanup noted in SW846 or a combination thereof. The analytical laboratory shall expend such effort and discretion to demonstrate good laboratory practice and demonstrate an attempt to best achieve the method detection limit.

7.1 VOLATILE ORGANICS

For the analysis of water samples for Target Compound List VOCs, no sample preparation is required. The analytical procedure for volatiles is detailed in NYSDEC-ASP (Volume I, Section D-I). A measured portion of the sample is placed in the purge and trap apparatus and the sample analysis is performed by gas chromatography/mass spectrometry for the first round. USEPA Method 8260 will be used, plus tentatively identified compounds (TICs). USEPA Methods 8010 or 8020 (gas chromatography with different detectors) will be used if subsequent rounds with lower limits of detection are warranted.

7.2 SEMI-VOLATILE ORGANIC COMPOUNDS

The extraction and analytical procedures used for preparation of water, soil and sediment samples for the analysis of the TCL semi-volatile organic compounds are described in NYSDEC-ASP Volume I, Section D-III. USEPA Method 8270 will be used, plus TICs.

Instrument calibration, compound identification, and quantitation are performed as described in Section 6 of this document and in the NYSDEC-ASP.

7.3 PESTICIDE AND PCB COMPOUNDS

The sample preservation procedures for gas chromatography for pesticides and polychlorinated biphenyls (PCBs) will be as described in the NYSDEC-ASP methods (Section D-IV). The analysis of standard mixes, blanks and spiked samples will be performed at the prescribed frequency with adherence to the 72-hour requirement described in the method.

7.4 METALS

Water, soil and waste samples will be analyzed for the metals listed in Table 7.1. The detection limits for these metals are as specified in the NYSDEC-ASP, Section D-V. The instrument detection limits will be determined using calibration standards and procedures specified in the NYSDEC-ASP. The detection limits for individual samples may be higher due to the sample matrix. The procedures for these analyses will be as described in the NYSDEC-ASP.

The analyses for metals will be performed by atomic absorption spectroscopy (AAS) or inductively-coupled plasma emission spectroscopy (ICPES), as specified in the ASP with regard to AAS flame analysis.

7.5 PER- AND POLYFLUOROALKYL SUBSTANCES

The NYSDEC has developed a list of 40 PFAS Analytes List on Table 7.2 for remedial programs. These are:

- Perfluorobutanesulfonic acid
- Perfluoropentanesulfonic acid
- Perfluorohexanesulfonic acid

- Perfluoroheptanesulfonic acid
- Perfluorooctanesulfonic acid
- Perfluorononanesulfonic acid
- Perfluorodecanesulfonic acid
- Perfluorododecanesulfonic acid
- Perfluorobutanoic acid
- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluorotridecanoic acid
- Perfluorotetradecanoic acid
- Perfluorohexadecanoic acid
- Hexafluoropropylene oxide dimer acid
- 4,8-Dioxa-3H-perfluorononanoic acid
- Perfluoro-3-methoxypropanoic acid
- Perfluoro-4-methoxybutanoic acid
- Nonafluoro-3,6-dioxaheptanoic acid
- 4:2 Fluorotelomer sulfonic acid
- 6:2 Fluorotelomer sulfonate
- 8:2 Fluorotelomer sulfonate
- 3:3 Fluorotelomer carboxylic acid
- 5:3 Fluorotelomer carboxylic acid
- 7:3 Fluorotelomer carboxylic acid
- Perfluorooctane sulfonamide
- N-methylperfluorooctane sulfonamide
- N-ethylperfluorooctane sulfonamide

- N-methyl perfluorooctanesulfonamidoacetic acid
- N-ethyl perfluorooctanesulfonamidoacetic acid
- N-methylperfluorooctane sulfonamidoethanol
- N-ethylperfluorooctane sulfonamidoethanol
- 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)
- 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)
- Perfluoro(2-ethoxyethane) sulfonic acid

Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. Per the NYSDEC July 2023 memo on emergent contaminant sampling, the analytical procedure for soil and groundwater sampling of PFAS is Modified EPA Method 1633. The reporting limit for PFAS in soil samples is 0.5 ug/kg. Reporting limits for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in groundwater should not exceed 2 ng/L.

The laboratory standard operating procedures are included in **Attachment C**. The laboratory method detection limits (MDLs) for PFAS compounds are included in **Attachment D**.

7.6 SITE SPECIFICITY OF ANALYSES

Work plans prepared for remedial actions for sites contain recommendations for the chemical parameters to be determined for each site. Thus, some or all of the referenced methods will apply to the analysis of samples collected at the individual waste sites. Analyses of TCL analytes will be performed on all samples.

To ensure that the field sampling and laboratory analytical practices are acceptable, the data associated with the samples will be validated by a third party (in accordance with requirements of DER-10). The validation approach and results will be presented in a data usability summary report (DUSR) to be included in the Report.

TABLES

**TABLE 4.1--SAMPLING PROCEDURE FOR MONITORING WELLS USING LOW-
STRESS (LOW-FLOW) METHODS**

Step	Description	Details
1	Record initial static water level.	Device: electric contact probe accurate to the nearest 0.1 foot.
2	Lower sampling device into well. Slowly lower the pump, safety cable, tubing and electrical lines into the well to the depth specified for that well.	Pump intake must be no less than 2 feet from the bottom of the well to prevent disturbance and resuspension of sediments which may be at the bottom of the well.
3	Measure water level again: Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.	
4	Purge Well	Start pumping the well at 200 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to ensure stabilization of the water level. As noted above, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing.
5	Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.	
6	Monitor Indicator Parameters	1. During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, and DO) approximately every five minutes. The well is considered stabilized and ready for sample collection

Step	Description	Details
		<p>when the indicator parameters have stabilized for three consecutive readings as follows (Puls and Barcelona, 1996):</p> <ul style="list-style-type: none"> a. 0.1 for pH b. 3% for specific conductance (conductivity) c. 10 mv for redox potential d. 10% for DO and turbidity
7	The pump must not be removed from the well between purging and sampling.	Dissolved oxygen and turbidity usually require the longest time to achieve stabilization.
8	Collect Samples	Collect samples at a flow rate between 100 and 250 ml/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft. VOC samples must be collected first and directly into sample containers. All sample containers should be filled with minimal turbulence by allowing the ground water to flow from the tubing gently down the inside of the container.
9	Ground water samples to be analyzed for volatile organic compounds (VOCs) require pH adjustment. The appropriate EPA Program Guidance should be consulted to determine whether pH adjustment is necessary.	If pH adjustment is necessary for VOC sample preservation, the amount of acid to be added to each sample vial prior to sampling should be determined, drop by drop, on a separate and equal volume of water (e.g., 40 ml). Groundwater purged from the well prior to sampling can be used for this purpose.

Step	Description	Details
10	Remove Pump and Tubing	After collection of the samples, the tubing, unless permanently installed, must be properly discarded or dedicated to the well for resampling by hanging the tubing inside the well.
11	Measure and record well depth.	
12	Close and lock the well.	
13	Samples are capped, labeled and placed in laboratory coolers with ice packs or bagged ice.	
14	All equipment is cleaned with successive rinses of pesticide-grade methanol and distilled water.	Dedicated line is disposed of or left at well site.
15	Equipment/wash blanks are collected when non-dedicated sampling equipment is used.	
16	Chain-of-custody forms are completed in triplicate.	<p>The original and one carbon copy are put into a zip-lock bag and placed into the cooler. The original will be returned following sample analysis.</p> <p>A second carbon copy is kept on file.</p>
17	Cooler is sealed with strapping tape and chain-of-custody seals to assure integrity and to prevent tampering of sample.	

TABLE 4.2--SAMPLE CONTAINERIZATION

PARAMETER & ANALYTICAL METHOD	NO.	BOTTLE TYPE	PRESERVATIVE ⁽¹⁾	HOLDING TIME
Aqueous Samples				
VOCs – USEPA 8260C	3	40 mL, glass vial with septum cap	Hydrochloric Acid to pH <2 Ice to 4°C	14 days
SVOCs (BNAs) and 1,4-Dioxane – USEPA 8270 SIM	2	1-liter amber glass bottle	Ice to 4°C	7 days (until extraction) 40 days (extracted)
Pesticides – USEPA 8081B	2	1-liter amber glass bottle	Ice to 4°C	7 days (until extraction) 40 days (extracted)
PCBs – USEPA 8082A	2	1-liter amber glass bottle	Ice to 4°C	7 days (until extraction) 40 days (extracted)
Metals ⁽²⁾	1	1-liter, plastic bottle	Nitric acid to pH <2 NaOH for cyanide Ice to 4°C	180 days Cyanide: 14 days Mercury: 28 days
Cyanide – USEPA 9010C/9012B	1	1-liter, plastic	Sodium Hydroxide to pH >12 Ice to 4°C	14 days
PFAS Compounds – USEPA Modified Method 537	2	500 ml HDPE or Polypropylene with non-Teflon lid	None	14 days
Soil, Sediment, Solid Waste Samples:				
VOCs – USEPA 8260C	3	5-gram EnCore samplers	Chilled to 0 - 6°C	14 days

PARAMETER & ANALYTICAL METHOD	NO.	BOTTLE TYPE	PRESERVATIVE ⁽¹⁾	HOLDING TIME
SVOCs (BNAs) and 1,4-Dioxane – USEPA 8270D SIM if RL cannot be reached	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	14 days (until extraction, 40 days extracted)
Pesticides – USEPA 8081B	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	14 days (until extraction) 40 days (extracted)
PCBs – USEPA 8082A	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	None
Metals ⁽³⁾	1	4-oz. glass jar with Teflon lid	Chilled to 0 - 6°C	180 days Cyanide: 14 days Mercury: 28 days
PFAS Compounds – USEPA Modified Method 1633	2	500 ml HDPE or Polypropylene with non-Teflon lid	None	28 days
Soil Vapor / Indoor Air Samples:				
VOCs – USEPA TO-15	1	Summa Canister	None	30 days

(1) All samples will be preserved with ice during collection and shipment.

(2) Metals refers to the 24 metals and cyanide in the Target Compound List (NYSDEC-CLP 11/87). Metals will be analyzed by Method 6020B, 7470A for mercury, and 9010C/9012B for cyanide

(3) Metals refers to the 24 metals and cyanide in the Target Compound List (NYSDEC-CLP 11/87). Metals will be analyzed by Method 6010D, 7471B for mercury, and 9010C/9012B for cyanide

(4) A complete list of compounds is provided on Table 7.1.

Table 7.1 PFAS Compound List and Reporting and Method Detection Limits for Soil and Groundwater

Method: EPA 1633 by LC-MS/MS			
	PFAS	Reporting Limit Groundwater (ng/l)	Method Detection Limit Groundwater (ng/l)
1	Perfluorobutanesulfonic acid (PFBS)	1.6	0.245
2	Perfluoropentanesulfonic acid (PFPeS)	1.6	0.204
3	Perfluorohexanesulfonic acid (PFHxS)	1.6	0.217
4	Perfluoroheptanesulfonic acid (PFHpS)	1.6	0.137
5	Perfluorooctanesulfonic acid (PFOS)	1.6	0.327
6	Perfluorononanesulfonic acid (PFNS)	1.6	0.303
7	Perfluorodecanesulfonic acid (PFDS)	1.6	0.334
8	Perfluorododecanesulfonic acid (PFDoS)	1.6	0.179
9	Perfluorobutanoic acid (PFBA)	6.4	0.330
10	Perfluoropentanoic acid (PFPeA)	3.2	0.196
11	Perfluorohexanoic acid (PFHxA)	1.6	0.318
12	Perfluoroheptanoic acid (PFHpA)	1.6	0.221
13	Perfluorooctanoic acid (PFOA)	1.6	0.302
14	Perfluorononanoic acid (PFNA)	1.6	0.221
15	Perfluorodecanoic acid (PFDA)	1.6	0.333
16	Perfluoroundecanoic acid (PFUnA)	1.6	0.264
17	Perfluorododecanoic acid (PFDoA)	1.6	0.379
18	Perfluorotridecanoic acid (PFTrDA)	1.6	0.238
19	Perfluorotetradecanoic acid (PFTeDA)	1.6	0.264
20	Hexafluoropropylene oxide dimer acid (HFPO-DA)	6.4	0.406

Method: EPA 1633 by LC-MS/MS			
21	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	6.4	0.779
22	Perfluoro-3-methoxypropanoic acid (PFMPA)	3.2	0.177
23	Perfluoro-4-methoxybutanoic acid (PFMBA)	3.2	0.117
24	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	3.2	1.384
25	4:2 Fluorotelomer sulfonic acid (4:2-FTS)	6.4	2.281
26	6:2 Fluorotelomer sulfonic acid (6:2-FTS)	6.4	3.973
27	8:2 Fluorotelomer sulfonic acid (8:2-FTS)	6.4	1.566
28	3:3 Fluorotelomer carboxylic acid (3:3 FTCA)	8.0	0.721
29	5:3 Fluorotelomer carboxylic acid (5:3 FTCA)	40	5.066
30	7:3 Fluorotelomer carboxylic acid (7:3 FTCA)	40	5.942
31	Perfluorooctane sulfonamide (PFOSA)	1.6	0.227
32	N-methylperfluorooctane sulfonamide (NMeFOSA)	1.6	0.196
33	N-ethylperfluorooctane sulfonamide (NEtFOSA)	1.6	0.585
34	N-methylperfluorooctane sulfonamidoacetic acid (N-MeFOSAA)	1.6	0.586
35	N-ethylperfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	1.6	0.324
36	N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	16	1.191
37	N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	16	1.022
38	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9CL-PF3ONS)	6.4	0.871
39	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11CL-PF3OUDS)	6.4	0.819
40	Perfluoro(2-ethoxyethane) sulfonic acid (PFEEESA)	3.2	0.137
41	Perfluorohexadecanoic acid (PFHxDA) ¹	~	~

Method: EPA 1633 by LC-MS/MS			
	1,4-dioxane		

Method: EPA 1633 by LC-MS/MS			
	PFAS	Reporting Limit — Soil (ng/g)	Method Detection Limit — Soil (ng/g)
1	Perfluorobutanesulfonic acid (PFBS)	0.2	0.014
2	Perfluoropentanesulfonic acid (PFPeS)	0.2	0.015
3	Perfluorohexanesulfonic acid (PFHxS)	0.2	0.018
4	Perfluoroheptanesulfonic acid (PFHpS)	0.2	0.057
5	Perfluorooctanesulfonic acid (PFOS)	0.2	0.067
6	Perfluorononanesulfonic acid (PFNS)	0.2	0.046
7	Perfluorodecanesulfonic acid (PFDS)	0.2	0.040
8	Perfluorododecanesulfonic acid (PFDoS)	0.2	0.038
9	Perfluorobutanoic acid (PFBA)	0.8	0.401
10	Perfluoropentanoic acid (PFPeA)	0.4	0.021
11	Perfluorohexanoic acid (PFHxA)	0.2	0.020
12	Perfluoroheptanoic acid (PFHpA)	0.2	0.029
13	Perfluorooctanoic acid (PFOA)	0.2	0.037
14	Perfluorononanoic acid (PFNA)	0.2	0.086
15	Perfluorodecanoic acid (PFDA)	0.2	0.031
16	Perfluoroundecanoic acid (PFUnA)	0.2	0.033
17	Perfluorododecanoic acid (PFDoA)	0.2	0.059
18	Perfluorotridecanoic acid (PFTTrDA)	0.2	0.038

Method: EPA 1633 by LC-MS/MS			
19	Perfluorotetradecanoic acid (PFTeDA)	0.2	0.032
20	Hexafluoropropylene oxide dimer acid (HFPO-DA)	0.8	0.136
21	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	0.8	0.057
22	Perfluoro-3-methoxypropanoic acid (PFMPA)	0.4	0.033
23	Perfluoro-4-methoxybutanoic acid (PFMBA)	0.4	0.029
24	Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.4	0.084
25	4:2 Fluorotelomer sulfonic acid (4:2-FTS)	0.8	0.282
26	6:2 Fluorotelomer sulfonic acid (6:2-FTS)	0.8	0.116
27	8:2 Fluorotelomer sulfonic acid (8:2-FTS)	0.8	0.225
28	3:3 Fluorotelomer carboxylic acid (3:3 FTCA)	1.0	0.060
29	5:3 Fluorotelomer carboxylic acid (5:3 FTCA)	5.0	0.363
30	7:3 Fluorotelomer carboxylic acid (7:3 FTCA)	5.0	0.308
31	Perfluorooctane sulfonamide (PFOSA)	0.2	0.068
32	N-methylperfluorooctane sulfonamide (NMeFOSA)	0.2	0.049
33	N-ethylperfluorooctane sulfonamide (NEtFOSA)	0.2	0.038
34	N-methylperfluorooctane sulfonamidoacetic acid (N-MeFOSAA)	0.2	0.030
35	N-ethylperfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	0.2	0.044
36	N-methylperfluorooctane sulfonamidoethanol (NMeFOSE)	2.0	0.203
37	N-ethylperfluorooctane sulfonamidoethanol (NEtFOSE)	2.0	0.247
38	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9CL-PF3ONS)	0.8	0.038
39	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11CL-PF3OUdS)	0.8	0.071

Method: EPA 1633 by LC-MS/MS			
40	Perfluoro(2-ethoxyethane) sulfonic acid (PFEEESA)	0.4	0.018
41	Perfluorohexadecanoic acid (PFHxDA) ¹	~	~

Source: EPA Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS, Second Draft Method 1633, April 2023

Data for this table are derived from the single-laboratory validation study and are only provided as examples for this draft method. The data will be updated to reflect the interlaboratory study results in a subsequent revision. Therefore, these criteria will change after interlaboratory validation.

¹ This compound was not listed in the EPA Method 1633 2nd draft and currently no known values exist

Table 7.1

**Volatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Aqueous Samples**

	Volatile Analyte	CAS Number	Trace Water By SIM (µg/L)	Trace Level Water (µg/L)	Low Level Water (µg/L)
1.	Dichlorodifluoromethane	75-71-8		0.50	5.0
2.	Chloromethane	74-87-3		0.50	5.0
3.	Vinyl Chloride	75-01-4		0.50	5.0
4.	Bromomethane	74-83-9		0.50	5.0
5.	Chloroethane	75-00-3		0.50	5.0
6.	Trichlorofluoromethane	75-69-4		0.50	5.0
7.	1,1-Dichloroethene	75-35-4		0.50	5.0
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		0.50	5.0
9.	Acetone	67-64-1		5.0	10.0
10.	Carbon Disulfide	75-15-0		0.50	5.0
11.	Methyl Acetate	79-20-9		0.50	5.0
12.	Methylene chloride	75-09-2		0.50	5.0
13.	trans-1,2-Dichloroethene	156-60-5		0.50	5.0
14.	Methyl tert-Butyl Ether	1634-04-4		0.50	5.0
15.	1,1-Dichloroethane	75-34-3		0.50	5.0
16.	cis-1,2-Dichloroethene	156-59-2		0.50	5.0
17.	2-Butanone	78-93-3		5.0	10.0
18.	Bromochloromethane	74-97-5		0.50	5.0
19.	Chloroform	67-66-3		0.50	5.0
20.	1,1,1-Trichloroethane	71-55-6		0.50	5.0
21.	Cyclohexane	110-82-7		0.50	5.0
22.	Carbon tetrachloride	56-23-5		0.50	5.0
23.	Benzene	71-43-2		0.50	5.0
24.	1,2-Dichloroethane	107-06-2		0.50	5.0
25.	1,4-Dioxane	123-91-1	1.0	25	125
26.	Trichloroethane	79-01-6		0.50	5.0

Table 7.1

**Volatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Aqueous Samples (Continued)**

	Volatile Analyte	CAS Number	Trace Water By SIM (µg/L)	Trace Level Water (µg/L)	Low Level Water (µg/L)
27.	Methylcyclohexane	108-87-2		0.50	5.0
28.	1,2-Dichloropropane	78-87-5		0.50	5.0
29.	Bromodichloromethane	75-27-4		0.50	5.0
30.	cis-1,3-Dichloropropene	10061-01-5		0.50	5.0
31.	4-methyl-2-pentanone	108-10-1		5.0	10.0
32.	Toluene	108-88-3		0.50	5.0
33.	Trans-1,3-Dichloropropene	10061-02-6		0.50	5.0
34.	1,1,2-Trichloroethane	79-00-5		0.50	5.0
35.	Tetrachloroethene	127-18-4		0.50	5.0
36.	2-Hexanone	591-78-6		5.0	10.0
37.	Dibromochloromethane	124-48-1		0.50	5.0
38.	1,2-Dibromoethane	106-93-4	0.05	0.50	5.0
39.	Chlorobenzene	108-90-7		0.50	5.0
40.	Ethylbenzene	100-41-4		0.50	5.0
41.	Xylenes (Total)	1330-20-7		0.50	5.0
42.	Styrene	100-42-5		0.50	5.0
43.	Bromoform	75-25-2		0.50	5.0
44.	Isopropylbenzene	98-82-8		0.50	5.0
45.	1,1,2,2-Tetrachloroethane	79-34-5		0.50	5.0
46.	1,3-Dichlorobenzene	541-73-1		0.50	5.0
47.	1,4-Dichlorobenzene	106-46-7		0.50	5.0
48.	1,2-Dichlorobenzene	95-50-1		0.50	5.0
49.	1,2-Dibromo-3-chloropropane	96-12-8	0.05	0.50	5.0
50.	1,2,4-Trichlorobenzene	120-82-1		0.50	5.0
51.	1,2,3-Trichlorobenzene	87-61-6		0.50	5.0

Table 7.1

**Volatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Solid Samples**

	Volatile Analyte	CAS Number	Low Level Soil (µg/Kg)	Med. Level Soil (µg/Kg)
1.	Dichlorodifluoromethane	75-71-8	5.0	500
2.	Chloromethane	74-87-3	5.0	500
3.	Vinyl Chloride	75-01-4	5.0	500
4.	Bromomethane	74-83-9	5.0	500
5.	Chloroethane	75-00-3	5.0	500
6.	Trichlorofluoromethane	75-69-4	5.0	500
7.	1,1-Dichloroethene	75-35-4	5.0	500
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5.0	500
9.	Acetone	67-64-1	10.0	1000
10.	Carbon Disulfide	75-15-0	5.0	500
11.	Methyl Acetate	79-20-9	5.0	500
12.	Methylene chloride	75-09-2	5.0	500
13.	trans-1,2-Dichloroethene	156-60-5	5.0	500
14.	Methyl tert-Butyl Ether	1634-04-4	5.0	500
15.	1,1-Dichloroethane	75-34-3	5.0	500
16.	cis-1,2-Dichloroethene	156-59-2	5.0	500
17.	2-Butanone	78-93-3	10.0	1000
18.	Bromochloromethane	74-97-5	5.0	500
19.	Chloroform	67-66-3	5.0	500
20.	1,1,1-Trichloroethane	71-55-6	5.0	500
21.	Cyclohexane	110-82-7	5.0	500
22.	Carbon tetrachloride	56-23-5	5.0	500
23.	Benzene	71-43-2	5.0	500
24.	1,2-Dichloroethane	107-06-2	5.0	500
25.	1,4-Dioxane	123-91-1	125	12500
26.	Trichloroethane	79-01-6	5.0	500
27.	Methylcyclohexane	108-87-2	5.0	500
28.	1,2-Dichloropropane	78-87-5	5.0	500

Table 7.1

**Volatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Solid Samples (Continued)**

	Volatile Analyte	CAS Number	Low Level Soil (µg/Kg)	Med. Level Soil (µg/Kg)
29.	Bromodichloromethane	75-27-4	5.0	500
30.	cis-1,3-Dichloropropene	10061-01-5	5.0	500
31.	4-methyl-2-pentanone	108-10-1	10.0	1000
32.	Toluene	108-88-3	5.0	500
33.	Trans-1,3-Dichloropropene	10061-02-6	5.0	500
34.	1,1,2-Trichloroethane	79-00-5	5.0	500
35.	Tetrachloroethene	127-18-4	5.0	500
36.	2-Hexanone	591-78-6	10.0	1000
37.	Dibromochloromethane	124-48-1	5.0	500
38.	1,2-Dibromoethane	106-93-4	5.0	500
39.	Chlorobenzene	108-90-7	5.0	500
40.	Ethylbenzene	100-41-4	5.0	500
41.	Xylenes (Total)	1330-20-7	5.0	500
42.	Styrene	100-42-5	5.0	500
43.	Bromoform	75-25-2	5.0	500
44.	Isopropylbenzene	98-82-8	5.0	500
45.	1,1,2,2-Tetrachloroethane	79-34-5	5.0	500
46.	1,3-Dichlorobenzene	541-73-1	5.0	500
47.	1,4-Dichlorobenzene	106-46-7	5.0	500
48.	1,2-Dichlorobenzene	95-50-1	5.0	500
49.	1,2-Dibromo-3-chloropropane	96-12-8	5.0	500
50.	1,2,4-Trichlorobenzene	120-82-1	5.0	500
51.	1,2,3-Trichlorobenzene	87-61-6	5.0	500

Table 7.1

**Semivolatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Aqueous Samples**

	Semivolatile Analyte	CAS Number	Low Water By SIM ¹ (µg/L)	Water (µg/L)
1.	Benzaldehyde	100-52-7		5.0
2.	Phenol	108-95-2	0.10	5.0
3.	Bis-(2-chloroethyl) ether	111-44-4		5.0
4.	2-Chlorophenol	95-57-8	0.10	5.0
5.	2-Methylphenol	95-48-7	0.10	5.0
6.	2,2'-Oxybis (1-chloropropane) ³	108-60-1		5.0
7.	Acetophenone	98-86-2		5.0
8.	4-Methylphenol	106-44-5	0.10	5.0
9.	N-Nitroso-di-n-propylamine	621-64-7		5.0
10.	Hexachloroethane	67-72-1		5.0
11.	Nitrobenzene	98-95-3		5.0
12.	Isophorone	78-59-1		5.0
13.	2-Nitrophenol	88-75-5	0.10	5.0
14.	2,4-Dimethylphenol	105-67-9	0.10	5.0
15.	Bis (2-chloroethoxy) methane	111-91-1		5.0
16.	2,4-Dichlorophenol	120-83-2	0.10	5.0
17.	Naphthalene	91-20-3	0.10	5.0
18.	4-Chloroaniline	106-47-8		5.0
19.	Hexachlorobutadiene	87-68-3		5.0
20.	Caprolactam	105-60-2		5.0
21.	4-Chloro-3-methylphenol	59-50-7	0.10	5.0
22.	2-Methylnaphthalene	91-57-6		5.0
23.	Hexachlorocyclopentadiene	77-47-4		5.0
24.	2,4,6-Trichlorophenol	88-06-2	0.10	5.0
25.	2,4,5-Trichlorophenol ⁴	95-95-4	0.20	10.0
26.	1,1'-Biphenyl	92-52-4		5.0
27.	2-Chloronaphthalene	91-58-7		5.0

Source

NYSDEC ASP Exhibit C

Table 7.1

**Semivolatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Aqueous Samples (Continued)**

	Semivolatile Analyte	CAS Number	Low Water By SIM ¹ (µg/L)	Water (µg/L)
28.	2-Nitroaniline ⁴	88-74-4		10.0
29.	Dimethylphthalate	131-11-3		5.0
30.	2,6-Dinitrotoluene	606-20-2		5.0
31.	Acenaphthylene	208-96-8	0.10	5.0
32.	3-Nitroaniline ⁴	99-09-2		10.0
33.	Acenaphthene	83-32-9	0.10	5.0
34.	2,4-Dinitrophenol ⁴	51-28-5	0.20	10.0
35.	4-Nitrophenol ⁴	100-02-7	0.20	10.0
36.	Dibenzofuran	132-64-9		5.0
37.	2,4-Dinitrotoluene	121-14-2		5.0
38.	Diethylphthalate	84-66-2		5.0
39.	Fluorene	86-73-7	0.10	5.0
40.	4-Chlorophenyl-phenyl ether	7005-72-3		5.0
41.	4-Nitroaniline ⁴	100-01-6		10.0
42.	4,6-Dinitro-2-methylphenol ⁴	534-52-1	0.20	10.0
43.	N-Nitrosodiphenylamine	86-30-6		5.0
44.	1,2,4,5-Tetrachlorobenzene	95-34-3		5.0
45.	4-Bromophenyl-phenylether	101-55-3		5.0
46.	Hexachlorobenzene	100-52-7		5.0
47.	Atrazine	108-95-2	0.10	5.0
48.	Pentachlorophenol	111-44-4	0.20	10.0
49.	Phenanthrene	95-57-8	0.10	5.0
50.	Anthracene	95-48-7	0.10	5.0
51.	Carbazole	108-60-1		5.0
52.	Di-n-butylphthalate	98-86-2		5.0

Table 7.1

**Semivolatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Aqueous Samples (Continued)**

	Semivolatile Analyte	CAS Number	Low Water By SIM ¹ (µg/L)	Water (µg/L)
53.	Fluoroanthene	106-44-5	0.10	5.0
54.	Pyrene	621-64-7		5.0
55.	Butylbenzylphthalate	67-72-1		5.0
56.	3,3'-Dichlorobenzidine	98-95-3		5.0
57.	Benzo (a) anthracene	78-59-1		5.0
58.	Chrysene	88-75-5	0.10	5.0
59.	Bis (2-ethylhexyl) phthalate	105-67-9	0.10	5.0
60.	Di-n-octylphthalate	111-91-1		5.0
61.	Benzo (b) fluoranthene	120-83-2	0.10	5.0
62.	Benzo (k) fluoranthene	91-20-3	0.10	5.0
63.	Benzo (a) pyrene	106-47-8		5.0
64.	Indeno (1,2,3-cd) pyrene	87-68-3		5.0
65.	Benzo (a,h) anthracene	105-60-2		5.0
66.	Benzo (g,h,i) perylene	59-50-7	0.10	5.0

Table 7.1

**Semivolatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Solid Samples**

	Semivolatile Analyte	CAS Number	Low Level By SIM ¹ (µg/Kg)	Low Level Solids ² (µg/Kg)	Med. Level Solids ² (µg/Kg)
1.	Benzaldehyde	100-52-7		170	50000
2.	Phenol	108-95-2	3.3	170	50000
3.	Bis-(2-chloroethyl) ether	111-44-4		170	50000
4.	2-Chlorophenol	95-57-8	3.3	170	50000
5.	2-Methylphenol	95-48-7	3.3	170	50000
6.	2,2'-Oxybis (1-chloropropane) ³	108-60-1		170	50000
7.	Acetophenone	98-86-2		170	50000
8.	4-Methylphenol	106-44-5	3.3	170	50000
9.	N-Nitroso-di-n-propylamine	621-64-7		170	50000
10.	Hexachloroethane	67-72-1		170	50000
11.	Nitrobenzene	98-95-3		170	50000
12.	Isophorone	78-59-1		170	50000
13.	2-Nitrophenol	88-75-5	3.3	170	50000
14.	2,4-Dimethylphenol	105-67-9	3.3	170	50000
15.	Bis (2-chloroethoxy) methane	111-91-1		170	50000
16.	2,4-Dichlorophenol	120-83-2	3.3	170	50000
17.	Naphthalene	91-20-3	3.3	170	50000
18.	4-Chloroaniline	106-47-8		170	50000
19.	Hexachlorobutadiene	87-68-3		170	50000
20.	Caprolactam	105-60-2		170	50000
21.	4-Chloro-3-methylphenol	59-50-7	3.3	170	50000
22.	2-Methylnaphthalene	91-57-6		170	50000
23.	Hexachlorocyclopentadiene	77-47-4		170	50000
24.	2,4,6-Trichlorophenol	88-06-2	3.3	170	50000

Table 7.1

**Semivolatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Solid Samples (Continued)**

	Semivolatile Analyte	CAS Number	Low Level By SIM ¹ (µg/Kg)	Low Level Solids ² (µg/Kg)	Med. Level Solids ² (µg/Kg)
25.	2,4,5-Trichlorophenol ⁴	95-95-4	6.7	330	100000
26.	1,1'-Biphenyl	92-52-4		170	50000
27.	2-Chloronaphthalene	91-58-7		170	50000
28.	2-Nitroaniline ⁴	88-74-4		330	100000
29.	Dimethylphthalate	131-11-3		170	50000
30.	2,6-Dinitrotoluene	606-20-2		170	50000
31.	Acenaphthylene	208-96-8	3.3	170	50000
32.	3-Nitroaniline ⁴	99-09-2		330	100000
33.	Acenaphthene	83-32-9	3.3	170	50000
34.	2,4-Dinitrophenol ⁴	51-28-5	6.7	330	100000
35.	4-Nitrophenol ⁴	100-02-7	6.7	330	100000
36.	Dibenzofuran	132-64-9		170	50000
37.	2,4-Dinitrotoluene	121-14-2		170	50000
38.	Diethylphthalate	84-66-2		170	50000
39.	Fluorene	86-73-7	3.3	170	50000
40.	4-Chlorophenyl-phenyl ether	7005-72-3		170	50000
41.	4-Nitroaniline ⁴	100-01-6		330	100000
42.	4,6-Dinitro-2-methylphenol ⁴	534-52-1	6.7	330	100000
43.	N-Nitrosodiphenylamine	86-30-6		170	50000
44.	1,2,4,5-Tetrachlorobenzene	95-34-3		170	50000
45.	4-Bromophenyl-phenylether	101-55-3		170	50000
46.	Hexachlorobenzene	118-74-1		170	10000
47.	Atrazine	1912-24-9		170	50000
48.	Pentachlorophenol	87-86-5	6.7	330	100000

Table 7.1

**Semivolatiles Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
for Solid Samples (Continued)**

	Semivolatile Analyte	CAS Number	Low Level By SIM ¹ (µg/Kg)	Low Level Solids ² (µg/Kg)	Med. Level Solids ² (µg/Kg)
49.	Phenanthrene	85-01-8	3.3	170	50000
50.	Anthracene	120-12-7	3.3	170	50000
51.	Carbazole	86-74-8		170	50000
52.	Di-n-butylphthalate	84-74-2		170	50000
53.	Fluoroanthene	206-44-0	3.3	170	50000
54.	Pyrene	129-00-0	3.3	170	50000
55.	Butylbenzylphthalate	85-68-7		170	50000
56.	3,3'-Dichlorobenzidine	91-94-1		170	50000
57.	Benzo (a) anthracene	56-55-3	3.3	170	50000
58.	Chrysene	218-01-9	3.3	170	50000
59.	Bis (2-ethylhexyl) phthalate	117-81-7		170	50000
60.	Di-n-octylphthalate	117-84-0		170	50000
61.	Benzo (b) fluoranthene	205-99-2	3.3	170	50000
62.	Benzo (k) fluoranthene	207-08-9	3.3	170	50000
63.	Benzo (a) pyrene	50-32-8	3.3	170	50000
64.	Indeno (1,2,3-cd) pyrene	193-39-5	3.3	170	50000
65.	Benzo (a,h) anthracene	53-70-3	3.3	170	50000
66.	Benzo (g,h,i) perylene	191-24-2	3.3	170	50000

Source

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Table 7.1

**Pesticide Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
For Aqueous and Solid Samples**

	Pesticide Analyte	CAS Number	Water (µg/L)	Solids ¹ (µg/Kg)
1.	alpha-BHC	319-84-6	0.050	1.7
2.	beta-BHC	319-85-7	0.050	1.7
3.	delta-BHC	319-86-8	0.050	1.7
4.	gamma-BHC (Lindane)	58-89-9	0.050	1.7
5.	Heptachlor	76-44-8	0.050	1.7
6.	Aldrin	309-00-2	0.050	1.7
7.	Heptachlor epoxide ²	1024-57-3	0.050	1.7
8.	Endosulfan I	959-98-8	0.050	1.7
9.	Dieldrin	60-57-1	0.10	3.3
10.	4,4'-DDE	72-55-9	0.10	3.3
11.	Endrin	72-20-8	0.10	3.3
12.	Endosulfan II	33213-65-9	0.10	3.3
13.	4,4'-DDD	72-54-8	0.10	3.3
14.	Endosulfan sulfate	1031-07-8	0.10	3.3
15.	4,4'-DDT	50-29-3	0.10	3.3
16.	Methoxychlor	72-43-5	0.10	3.3
17.	Endrin ketone	53494-70-5	0.10	3.3
18.	Endrin aldehyde	7421-93-4	0.10	3.3
19.	alpha-Chlordane	5103-71-9	0.050	1.7
20.	gamma-Chlordane	5103-74-2	0.050	1.7
21.	Toxaphene	8001-35-2	5.0	34

Pesticide Notes

¹ There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides.

² Only the exo-epoxy isomer (isomer B) of heptachlor epoxide is reported on the data reporting forms (Exhibit B).

Table 7.1

**PCB Aroclor Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
For Aqueous and Solid Samples**

	Aroclor Analyte	CAS Number	Water (µg/L)	Solids ¹ (µg/Kg)
1.	Arochlor-1016	12674-11-2	1.0	33
2.	Arochlor-1221	11104-28-2	1.0	33
3.	Arochlor-1232	11141-16-5	1.0	33
4.	Arochlor-1242	53469-21-9	1.0	33
5.	Arochlor-1248	12672-29-6	1.0	33
6.	Arochlor-1254	11097-69-1	1.0	33
7.	Arochlor-1260	11096-82-5	1.0	33
8.	Arochlor-1262	37324-23-5	1.0	33
9.	Arochlor-1268	11100-14-4	1.0	33

Aroclor PCB Notes

¹ There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Aroclor PCBs.

Table 7.1

**PCB Congeners Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
For Aqueous and Solid Samples**

	Congener Analyte	IUPAC Number	CAS Number	Water (pg/L)	Solids ¹ (ng/Kg)
1.	2-MoCB	1	2051-60-7	20	2.0
2.	4-MoCB	3	2051-62-9	20	2.0
3.	2,2'-DiCB	4	13029-08-8	20	2.0
4.	4,4'-DiCB	15	2050-68-2	20	2.0
5.	2,2',6'-TrCB	19	38444-73-4	20	2.0
6.	3,4,4'-TrCB	37	38444-90-5	20	2.0
7.	2,2',6,6'-TeCB	54	15968-05-5	20	2.0
8.	3,3',4,4'-TeCB	77	32598-13-3	20	2.0
9.	3,4,4',5-TeCB	81	70362-50-4	20	2.0
10.	2,2',4,6,6'-PeCB	104	56558-16-8	20	2.0
11.	2,3,3',4,4'-PeCB	105	32598-14-4	20	2.0
12.	2,3,4,4',5-PeCB	114	74472-37-0	20	2.0
13.	2,3',4,4',5-PeCB	118	31508-00-6	20	2.0
14.	2',3,4,4',5-PeCB	123	65510-44-3	20	2.0
15.	3,3',4,4',5-PeCB	126	57465-28-8	20	2.0
16.	2,2',4,4',6,6'-HxCB	155	33979-03-2	20	2.0
17.	2,3,3',4,4',5-HxCB	156	38380-08-4	20	2.0
18.	2,3,3',4,4',5'-HxCB	157	69782-90-7	20	2.0
19.	2,3',4,4',5,5'-HxCB	167	52663-72-6	20	2.0
20.	3,3',4,4',5,5'-HxCB	169	32774-16-6	20	2.0
21.	2,2',3,4',5,6,6'-HpCB	188	74487-85-7	20	2.0
22.	2,2',3,4',5,6,6'-HpCB	189	39635-31-9	20	2.0
23.	2,2',3,3',5,5',6,6'-OcCB	202	2136-99-4	20	2.0
24.	2,3,3',4,4',5,5',6-OcCB	205	74472-53-0	20	2.0
25.	2,2',3,3',4,4',5,5',6-NoCB	206	40186-72-9	20	2.0

Source

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Table 7.1

**PCB Congeners Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
For Aqueous and Solid Samples (Continued)**

	Congener Analyte	IUPAC Number	CAS Number	Water (pg/L)	Solids ¹ (ng/Kg)
26.	2,2',3,3',4,5,5',6,6'-NoCB	208	52663-77-1	20	2.0
27.	DeCB	209	2051-24-3	20	2.0

Congener PCB Notes

¹There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of congener PCBs.

Table 7.1

**PCDD/F Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)
For Aqueous and Solid Samples**

	PCDD/F Analyte	CAS Number	Water (pg/L)	Solids ¹ (ng/Kg)
1.	2,3,7,8-TCDD	1746-01-6	10	1.0
2.	1,2,3,7,8-PeCDD	40321-76-4	50	5.0
3.	1,2,3,6,7,8-HxCDD	57653-85-7	50	5.0
4.	1,2,3,4,7,8-HxCDD	39227-28-6	50	5.0
5.	1,2,3,7,8,9-HxCDD	19408-74-3	50	5.0
6.	1,2,3,4,6,7,8-HpCDD	35822-46-9	50	5.0
7.	OCDD	3268-87-9	100	10
8.	2,3,7,8-TCDF	51207-31-9	10	1.0
9.	1,2,3,7,8-PeCDF	57117-41-6	50	5.0
10.	2,3,4,7,8-PeCDF	57117-31-4	50	5.0
11.	1,2,3,6,7,8-HxCDD	57117-44-9	50	5.0
12.	1,2,3,7,8,9-HxCDD	72918-21-9	50	5.0
13.	1,2,3,4,7,8-HxCDD	70648-26-9	50	5.0
14.	2,3,4,6,7,8-HxCDD	60851-34-5	50	5.0
15.	1,2,3,4,6,7,8-HpCDD	67562-39-4	50	5.0
16.	1,2,3,4,7,8,9-HpCDD	55673-89-7	50	5.0
17.	OCDF	39001-02-0	100	10

PCDD/F Notes

¹ There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of PCDDs and PCDFs.

Table 7.1

**Inorganic Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQLs)
For Aqueous and Solid Samples**

	Analyte	CAS Number	ICP-AES ¹ CRQL for Water (µg/L)	ICP-AES ¹ CRQL for Solids (mg/Kg)	ICP-MS ¹ for Water (µg/L)
1.	Aluminum	7429-90-5	200	40	30
2.	Antimony	7440-36-0	60	12	2
3.	Arsenic	7440-38-2	15	3	1
4.	Barium	7440-39-3	200	40	10
5.	Beryllium	7440-41-7	5	1	1
6.	Cadmium	7440-43-9	5	1	1
7.	Calcium	7440-70-2	5000	1000	--
8.	Chromium	7440-47-3	10	2	2
9.	Cobalt	7440-48-4	50	10	0.5
10.	Copper	7440-50-8	25	5	2
11.	Iron	7439-89-6	100	20	--
12.	Lead	7439-92-1	10	2	1
13.	Magnesium	7439-95-4	5000	1000	--
14.	Manganese	7439-96-5	15	3	0.5
15.	Mercury ²	7439-97-6	0.2	0.1	--
16.	Nickel	7440-02-0	40	8	1
17.	Potassium	7440-09-7	5000	1000	--
18.	Selenium	7782-49-2	35	7	5
19.	Silver	7440-22-4	10	2	1
20.	Sodium	7440-23-5	5000	1000	--
21.	Thallium	7440-28-0	25	5	1
22.	Vanadium	7440-62-2	50	10	1
23.	Zinc	7440-66-6	60	12	1
24.	Cyanide ²	57-12-5	10	1	--

Appendix B:

Emerging Contaminant Sampling Plan

**EMERGING CONTAMINANT
SAMPLING PLAN**

For:

**157 Irving Avenue
Port Chester, Westchester County, NY**

Prepared for:

Irving Owner LLC

SESI Project No:
12653

Date:
January 2024
(Revised June 2024)

1.0 PROJECT DESCRIPTION

This document presents the soil and groundwater emergent contaminant sampling plan for the Remedial Investigation Workplan (RIWP) located at 157 Irving Avenue, Port Chester, Westchester County, New York. The Site consists of a 0.38-acre parcel identified as Block 2, Lots 57, 58, 59, and 60 on the Westchester County tax map. The lots are to be consolidated on the June 1, 2024 tentative roll and considered Lot 80 (157 Irving Avenue). The Site is composed of an approximately 0.38-acre combined total from all four lots that has been developed with one (1) two-story building that comprises 7,350 square feet (sf) and a residential home comprising 1,450 sf. The Site is bound to the north by a residential property and a gas station, to the west by Palace Place followed by a residential property and a parking lot, to the south by Irving Avenue followed by Westchester Upholstery, and to the east by NY 120-A followed by restaurants/commercial properties.

Most recently, the Site was improved by supermarket, parking lots and a two (2)-story residence. The Site previously contained residences, a garage, gas station and warehouse prior to the current operations. Specifically, Lot 57 was a residence (circa 1990-1934) and gravel parking lot (circa 1990-present), Lot 58 was a house (circa 1919-present), Lot 59 was a dwelling (circa 1919-1934), garage (circa 1934-1950), warehouse (circa 1950-2006) and grocery store (circa 2006-present), and Lot 60 was vacant (circa 1919-1934), a gas station (circa 1934-1950) and a parking lot (circa 1950-present).

2.0 SOIL SAMPLING PLAN

The sampling will be performed in accordance with the New York State Department of Environmental Conservation (NYSDEC) Guidelines for Sampling and Analysis of Per-and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs, dated April 2023. The soil samples will be sent via chain of custody to an ELAP-certified laboratory and analyzed for TCL/TAL+30, 1,4-dioxane and the PFAS compounds listed in Table 1. The soil samples will be analyzed for PFAS using Modified USEPA Method 1633. Reporting limits for each PFAS compound will not exceed 1 microgram per kilogram (ug/kg). NYSDEC will be informed if detection limits on certain PFAS compounds cannot be met by the laboratory. Category B deliverables and an electronic data deliverable will be completed. A DUSR will be prepared by a data validator for all the analyses including PFAS and 1,4-dioxane. The method detection limit (MDL) for 1,4-dioxane will be no higher than 0.1 mg/kg (ppm).

Because PFAS compounds must be analyzed at concentrations in the ug/kg range, precautions must be taken to prevent cross-contamination during sampling events. Field sampling equipment that is used at multiple sites or sampling locations could become highly contaminated with PFAS. Soil sampling at this site will involve the use of non-dedicated equipment, such as a Geoprobe direct push drill rig, which could be a source of cross-contamination. Decontamination procedures outlined in this document will be followed to avoid cross contamination and equipment will be verified as PFAS-free. Special care and consideration will be given to the field sampling equipment when stored and handled outside the site boundaries or between different sample locations.

Items that may be directly in contact with the soil, including spoons, bowls, and direct push equipment, including any split spoon or sampling barrels, have a high likelihood of cross-contamination occurring if the proper decontamination procedures are not followed. These items should be known to be PFAS free. Item that will not directly contact the soil, including field books, Post-It® Notes, aluminum foil, recycled paper towels, binders, or spiral hard cover, can be a source of PFAS contamination. Every effort will be made to ensure these items are PFAS-free.

For the sampling equipment, the following items, materials, and procedures will be used for decontamination:

- Municipal drinking water may be used for decontamination if it is known to be PFAS-free. Commercially available deionized water in an HDPE container may also be used for decontamination.
- Standard two step decontamination using Alconox® detergent and PFAS-free triple water rinse will be performed for the sampling equipment.
- Sampling equipment may be scrubbed with polyethylene or a polyvinyl chloride (PVC) brush to remove particulates.
- The sampling equipment components will not come in contact with material that may potentially contain PFAS such as aluminum foil, low density polyethylene (LDPE), polytetrafluoroethylene (PTFE, Teflon®) or other fluoropolymers.
- Soil sampling equipment will be decontaminated between each sampling point and at the conclusion of the workday. This is to ensure sampling equipment is decontaminated ahead of time for the next sampling event.

Equipment rinsate blanks will be collected daily for the equipment that comes in contact with the soil samples and is decontaminated and reused. If all the sampling materials are disposable, no

field blanks will be collected. Field duplicates will be collected on a frequency of 1/20 samples. One matrix spike and matrix spike duplicate (MS/MSD) will also be collected on a frequency of 1/20 samples. A trip blank will accompany each laboratory shipment which includes analysis for volatile organic compounds.

3.0 GROUNDWATER SAMPLING PLAN

The sampling will be performed in accordance with the NYSDEC Guidelines for Sampling and Analysis of PFAS Under NYSDEC's Part 375 Remedial Programs, dated April 2023. The groundwater samples will be sent via chain of custody in a cooler at 4 degrees C to an ELAP-certified laboratory and analyzed for TCL/TAL+30, 1,4-dioxane and the PFAS compounds listed in Table 1. The groundwater samples will be analyzed for PFAS using Modified USEPA Method 1633. Reporting limits for PFOA and PFOS will not exceed 2 nanogram per liter (ng/L). Category B deliverables and an electronic data deliverable will be completed. A DUSR will be prepared by a data validator for all the analyses including PFAS and 1,4-dioxane. The method detection limit (MDL) for 1,4-dioxane will be no higher than 0.28 µg/l (ppb). In order to get the appropriate detection limit, the lab will run EPA method 8270 in "selective ion monitoring" (SIM) mode for 1,4-dioxane.

PFAS are very persistent in the environment and in the human body. There is evidence that exposure to PFAS can lead to adverse human health effects. EPA established the health advisory levels for PFAS in drinking water at 70 parts per trillion. Due to their presence in a variety of products, persistence in the environment and very low drinking water standards, care must be used when groundwater sampling for PFAS to avoid cross contamination from the sampling equipment and personal protective equipment (PPE). If PFOAs/PFOS/1,4 Dioxane are detected above the Guidance values on-site, additional groundwater samples will be required off-site.

4.0 SOIL SAMPLE COLLECTION AND HANDLING

The following considerations will be observed:

- No fabric softener will be used on clothing to be worn by the sampling personnel in the field. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS-containing materials will be avoided.

- Cosmetics, moisturizers, hand cream, unauthorized sunscreen, insect repellent or other related products will not be used by the sampling staff on sampling days.
- Food and drink packaging materials such as pre-wrapped food or snacks (i.e. candy bars, microwave popcorn, etc.) will not be used in the sampling and staging areas.
- Sampling will be conducted with powderless nitrile gloves. The gloves will be changed frequently any time there is an opportunity for cross-contamination during sampling, including, but not limited to:
 - a. Immediately prior to sample collection
 - b. Each time sampling equipment is placed in and then removed from soil at a new location
 - c. Handling of any sample, including quality assurance/quality control (QA/QC) samples
 - d. After the handling of any non-dedicated sampling equipment
 - e. After contact with non-decontaminated surfaces
 - f. After decontamination of sampling equipment
 - g. When judged necessary by field personnel
- HDPE or polypropylene sample bottles with Teflon®-free caps, provided by the laboratory will be used. Sample containers will not come in contact with material that may potentially contain PFAS.
- Bottles will only be opened immediately prior to sampling.
- Dust and fibers will be kept out of sample bottles.
- The sample caps will never be placed directly on the ground during sampling. If the sampling staff must set the sample bottle cap down during sample collection and a second member of the sampling crew (wearing a fresh pair of powderless nitrile gloves) is not available, the cap will be set on a clean surface (cotton sheeting, HDPE sheeting, triple rinsed cooler lid, etc.).
- Regular size Sharpie® and thicker markers will be avoided. Fine and Ultra-Fine point Sharpie® markers may be used. Ballpoint pens may be used when labeling sample containers. If ballpoint pens do not write on the sample container labels, preprinted labels from the laboratory may be used.
- Sample bottles, coolers, sample labels and a chain of custody form will be provided by the analytical laboratory.

- PFAS samples will be collected prior to collecting non-PFAS samples.

5.0 SAMPLE SHIPMENT

In the absence of a formal USEPA guidance for PFAS sample storage, the documentation in USEPA Method 1633 will be used as a guide for thermal preservation and holding times for soil or other samples. Samples will be chilled during storage and shipment, and will not exceed 50°F (10° C) during the first 48 hours after collection.

The following procedures will be used by SESI for sample shipment:

- Regular ice will be used to cool and maintain the samples at or below 42.8°F (6°C).
- The coolers will be periodically checked to ensure samples are well iced and at the proper temperature. Refresh with regular ice if needed. The ice may be double bagged in LDPE resealable storage bags. LDPE may be used if an equipment blank demonstrates the LDPE is PFAS-free.
- Chain of Custody and other forms will be single bagged in LDPE (e.g. Ziploc®) storage bags and taped to the inside of the cooler lid. LDPE may be used if an equipment blank demonstrates the LDPE is PFAS-free.
- The cooler(s) will be taped closed with a custody seal and picked up by a ELAP certified lab within 24 hrs.


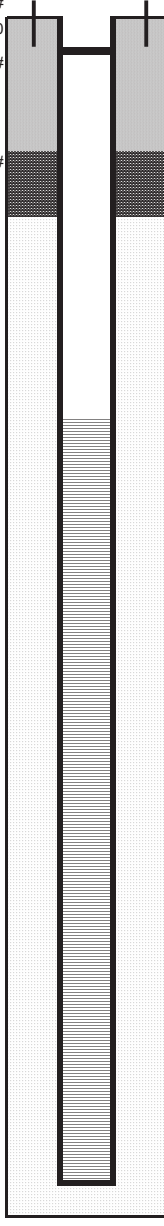
Table 1: PFAS compounds list

- Perfluorobutanesulfonic acid
- Perfluoropentanesulfonic acid
- Perfluorohexanesulfonic acid
- Perfluoroheptanesulfonic acid
- Perfluorooctanesulfonic acid
- Perfluorononanesulfonic acid
- Perfluorodecanesulfonic acid
- Perfluorododecanesulfonic acid
- Perfluorobutanoic acid

- Perfluoropentanoic acid
- Perfluorohexanoic acid
- Perfluoroheptanoic acid
- Perfluorooctanoic acid
- Perfluorononanoic acid
- Perfluorodecanoic acid
- Perfluoroundecanoic acid
- Perfluorododecanoic acid
- Perfluorotridecanoic acid
- Perfluorotetradecanoic acid
- Perfluorohexadecanoic acid
- Hexafluoropropylene oxide dimer acid
- 4,8-Dioxa-3H-perfluorononanoic acid
- Perfluoro-3-methoxypropanoic acid
- Perfluoro-4-methoxybutanoic acid
- Nonafluoro-3,6-dioxaheptanoic acid
- 4:2 Fluorotelomer sulfonic acid
- 6:2 Fluorotelomer sulfonate
- 8:2 Fluorotelomer sulfonate
- 3:3 Fluorotelomer carboxylic acid
- 5:3 Fluorotelomer carboxylic acid
- 7:3 Fluorotelomer carboxylic acid
- Perfluorooctane sulfonamide
- N-methylperfluorooctane sulfonamide
- N-ethylperfluorooctane sulfonamide
- N-methyl perfluorooctanesulfonamidoacetic acid
- N-ethyl perfluorooctanesulfonamidoacetic acid
- N-methylperfluorooctane sulfonamidoethanol
- N-ethylperfluorooctane sulfonamidoethanol
- 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)
- 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)
- Perfluoro(2-ethoxyethane) sulfonic acid

Appendix C:

Typical Boring/Well Construction Log

	PROJECT NAME:					MONITORING WELL NO.				
	PROJECT LOCATION:					JOB NO.				
					GROUND ELEVATION:					
BORING BY:	DATE STARTED		DEVELOPMENT PERIOD			INSIDE CASING DIAMETER (in)				
INSPECTOR:	DATE COMPLETED		DEVELOPMENT METHOD			BOREHOLE DIAMETER (in)				
NJ DEP PERMIT NO.:	DATE DEVELOPED		DEVELOPMENT RATE		# gpm	INITIAL WATER LEVEL (ft):				
WELL CONSTRUCTION		DEPTH (ft)	Sample	Blows on Spoon				REC	SOIL DESCRIPTION AND STRATIFICATION	P.I.D.
		0		0/6	6/12	12/18	18/24	(in)		
Depth (feet below grade) Top of Casing: #  Ground Surface 0 Top of Riser # Top of Seal # Top of Sand Pack Top of Screen Bottom of Screen Bottom of Boring Remarks:										
Casing Type:		5								
Well Cap:										
Grout Type:										
Well Key:		10								
Riser Pipe:										
		15								
Sand/Gravel Pack Size:		20								
Screen Size:										
		25								
		30								
		35								
		40								

Approximate Change in Strata: _____ Inferred Change in Strata: _____

The subsurface information shown hereon was obtained for the design and estimating purposes for our client. It is made available to authorized users only that they may have access to the same information available to our client. It is presented in good faith, but it is not intended as a substitute for investigations, interpretations or judgment of such authorized users. Information on the logs should not be relied upon without the geotechnical engineers recommendations contained in the report from which these logs were extracted. Soil descriptions represent a field identification after D. M. Burmister unless otherwise noted.

Appendix D:

Health and Safety Plan



Geotechnical
Environmental
Site Civil

959 Route 46E, Fl 3, Ste 300
Parsippany, NJ 07054
973.808.9050
www.sesi.org

**Site Specific Health and Safety Plan
For
157 Irving Avenue
Port Chester, Westchester County, New York**

Prepared for:
Irving Owner LLC
January 2024 (Revised June 2024)

SESI Project No:
12653

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Disclaimer: This Health and Safety Plan (HASP) is based upon information provided [and, if applicable, conditions discovered during a site visit], and is limited by the project scope.

The HASP should be periodically reviewed and updated based on a number of factors, including but not limited to: (1) changes in applicable governmental requirements; (2) changes in procedures at the site; and (3) site conditions which were unknown to SESI Consulting Engineers (SESI) as of the time the HASP was prepared.

This HASP has been prepared for the sole and exclusive use of Client listed above, and may not be relied upon by any other person without the express written consent and authorization of SESI.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

For

**157 Irving Avenue
Port Chester, Westchester County, New York**

Prepared by: Christopher Malvicini

Christopher Malvicini
SESI- Asst Project Manager

Approved by: _____

Fuad Dahan
SESI-Principal

LIST OF ACRONYMS

Acronym	Definition
ACGIH	American Conference of Governmental Industrial Hygienists
COC	Contaminants(s) of Concern
CRZ	Contamination Reduction Zone
EMS	Emergency Medical Services
EZ	Exclusion Zone
FS	Field Supervisor
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HSM	Health and Safety Manager
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PFD	Personal Flotation Device
PID	Photoionization Detector
PM	Project Manager
PO	Project Officer
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
SESI	SESI Consulting Engineers
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
SZ	Support Zone
TLV	Threshold Limit Value
USCG	United States Coast Guard

Acronym	Definition
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 PROJECT DESCRIPTION

1.1 OBJECTIVE

The objective of this Health and Safety Plan (HASP) is to provide a mechanism for establishing safe working conditions during activities at 157 Irving Avenue, Port Chester, New York (the Site). The safety organization, procedures, and protective equipment have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of injury, illness, or other hazardous incidents.

The HASP was written to meet the requirements of all applicable Federal, State, and local health and safety regulations, including 29 CFR 1910.120. The HASP is based on current knowledge regarding the specific chemical and physical hazards that are known or anticipated at the Site. This HASP is a dynamic document, for which changes and/or revisions may be realized as changes in scope and/or Site conditions are encountered. Should revised documents be produced, said revised documents will refer to the specific changes and why they were made.

1.2 SITE AND FACILITY DESCRIPTION

The Site is bound to the north by a residential property and a gas station, to the west by Palace Place followed by a residential property and a parking lot, to the south by Irving Avenue followed by Westchester Upholstery, and to the east by NY 120-A followed by restaurants/commercial properties.

1.3 POLICY STATEMENT

The policy of SESI Consulting Engineers (SESI) is to provide a safe and healthful work environment. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety management is that all injuries, illnesses, and incidents are preventable. SESI will take every reasonable step to eliminate or control hazards in order to minimize the possibility of injury, illness, or incident.

This HASP prescribes the procedures that must be followed by SESI personnel during activities at the Site. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Manager (HSM). This document will be reviewed periodically by the HSM to ensure that it is current and technically correct. Any changes in Site conditions and/or the scope of work will require a review and modification to this HASP. Such changes will be completed in the form of an addendum or a revision to the plan.

The provisions of this plan are mandatory for all SESI personnel and are advisory for all contractors, and subcontractors assigned to the project. ***Subcontractors will be responsible for preparing their own Site-specific HASPs that meet the basic requirements outlined in this HASP.*** All visitors to SESI work areas at the Site must abide by the requirements of this plan.

1.4 REFERENCES

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, United States Environmental Protection Agency (USEPA) regulations, and SESI health and safety policies and procedures. This plan follows the guidelines established in the following:

- *Standard Operating Safety Guides*, USEPA (Publication 9285.1-03, June 1992).
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH, OSHA, USCG, USEPA (86116, October 1985).
- *Title 29 of the Code of Federal Regulations* (CFR), Part 1910.
- *Title 29 of the Code of Federal Regulations* (CFR), Part 1926.
- *Pocket Guide to Chemical Hazards*, DHHS, PHS, CDC, NIOSH (2004).
- *Threshold Limit Values*, ACGIH (2005).
- *Guide to Occupational Exposure Values*, ACGIH (2005).
- *Quick Selection Guide to Chemical Protective Clothing*, Forsberg, K. and S.Z. Mansdorf, 2nd Ed. (1993).

1.5 DEFINITIONS

The following definitions (listed alphabetically) are applicable to this HASP:

- *Contamination Reduction Zone (CRZ)* - Area between the exclusion zone and support zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.
- *Exclusion Zone (EZ)* - Any portions of the site where hazardous substances are, or are reasonably suspected to be present, and pose an exposure hazard to on-Site personnel.
- *Incident* - All losses, including first aid cases, injuries, illnesses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions.
- *On-Site Personnel* - All SESI and subcontractors involved with the project.
- *Project* - All on-site work performed under the scope of work.
- *Site* - The area described in Section 1.2, Site and Facility Description, where the work is to be performed by SESI personnel and subcontractors.
- *Support Zone (SZ)* - All areas of the Site except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.
- *Subcontractor* - Includes contractor personnel hired by SESI.
- *Visitor* - All other personnel, except the on-Site personnel.

Work Area - The portion of the Site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ, CRZ, and EZ. If the work area is located in an area on the Site that is not contaminated, or suspected of being contaminated, the entire work area may be a SZ.

2.0 PROJECT SCOPE OF WORK

This HASP contains information for the following tasks that SESI is anticipated to conduct at the Site. Should additional and/or different tasks be identified, amendments to this HASP will be required to address these changed items.

- Mobilization;
- Soil Sampling;
- Soil Vapor Sampling;
- Excavation of Contaminated Soil;
- End Point Chemical Sampling of Soil;
- Installation of a Vapor Barrier for Buildings;
- Groundwater Sampling;
- Decontamination and Demobilization.

3.0 ROLES AND RESPONSIBILITIES

3.1 ALL PERSONNEL

All SESI project personnel must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner that conflicts with these procedures. After due warnings, the PM will dismiss from the site any SESI employee or subcontractor who violates safety procedures.

All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all SESI personnel will attend an initial hazard briefing prior to beginning work at the Site.

The roles of key safety personnel and subcontractors are outlined in the following sections. Key project personnel and contacts are summarized in **Table 3.1**.

3.2 KEY SAFETY PERSONNEL

3.2.1 PROJECT SAFETY OFFICER

The PO is responsible for providing resources to assure project activities are completed in accordance with this HASP, and for meeting all regulatory and contractual requirements.

3.2.2 PROJECT MANAGER (PM)

The PM is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The PM is responsible for confirming that the Field Supervisor (FS) has the equipment, materials, and qualified personnel to fully implement the safety requirements of this HASP, and/or that subcontractors assigned to this project meet the requirements established by SESI. It is also the responsibility of the PM to:

- Consult with the HSM on Site health and safety issues;
- Verify that subcontractors meet health and safety requirements prior to commencing work;
- Verify that all incidents are thoroughly investigated;
- Approve, in writing, addenda or modifications of this HASP; and
- Suspend work or modify work practices, as necessary, for personal safety, protection of property, and regulatory compliance.

3.2.3 HEALTH AND SAFETY MANAGER (HSM)

The HSM or his designee has overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSM or his designee must approve changes or addenda to this HASP.

3.2.4 SITE SAFETY OFFICER (SSO)

The SSO is responsible for field health and safety issues, including the execution of this HASP. Questions in the field regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The SSO will advise the PM on health and safety issues and will establish and coordinate the project air-monitoring program if one is deemed necessary (see Section 5.1, Air Monitoring). The SSO is the primary Site contact on health and safety matters. It is the responsibility of the SSO to:

- Provide on-Site technical assistance, if necessary;
- Participate in all accident/incident reports and ensure that they are reported to the HSM, client, and PM within 24 hours;
- Coordinate Site and personal air monitoring as required, including equipment maintenance and calibration;
- Conduct Site safety orientation training and safety meetings;
- Verify that project personnel have received the required physical examinations and medical certifications;
- Review Site activities with respect to compliance with this HASP;
- Maintain required health and safety documents and records; and
- Assist the FS in instructing field personnel on project hazards and protective procedures.

3.2.5 FIELD SUPERVISOR (FS)

The FS is responsible for implementing this HASP, including communicating requirements to on-Site personnel and subcontractors. The FS will be responsible for informing the PM of changes in the work plan, procedures, or Site conditions so that those changes may be addressed in this HASP. Other responsibilities are to:

- Consult with the SSO on Site health and safety issues;
- Stop work, as necessary, for personal safety, protection of property, and regulatory compliance;

- Obtain a Site map and determine and post routes to medical facilities and emergency telephone numbers;
- Notify local public emergency representatives (as appropriate) of the nature of the Site operations, and post their telephone numbers (i.e., local fire department personnel who would respond for a confined space rescue);
- Observe on-Site project personnel for signs of ill health effects;
- Investigate and report any incidents to the SSO;
- Verify that all on-Site personnel have had applicable training;
- Verify that on-Site personnel are informed of the physical, chemical, and biological hazards associated with the Site activities, and the procedures and protective equipment necessary to control the hazards; and

Issue/obtain any required work permits (hot work, confined space, etc.)

3.3 SUBCONTRACTORS

Subcontractors and their personnel must understand and comply with applicable regulations and Site requirements established in this HASP. Subcontractors will prepare their own Site-specific HASP that must be consistent with the requirements of this HASP.

All subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating Site activities. All subcontractor personnel will attend an initial hazard briefing prior to beginning work at the Site. Additionally, on-Site subcontractor personnel must conduct daily Site safety meetings.

Subcontractors must designate individuals to function as the PM, HSM, SSO, and FS. In some firms the HSM to be carried out by the PM. This is acceptable provided the PM has the required knowledge, training, and experience to properly address all hazards associated with the work, and to prepare, approve, and oversee the execution of the Site-specific HASP. A subcontractor may designate the same person to perform the duties of both the SSO and the FS. However, depending on the level of complexity of a contractor's scope of work, it may be infeasible for one person to perform both functions satisfactorily.

3.4 STOP WORK AUTHORITY

Every SESI employee and subcontractor is empowered, expected, and has the responsibility to stop the work of another co-worker if the working conditions or behaviors are considered unsafe.

3.5 ALL ON-SITE PERSONNEL

All on-Site SESI personnel (including SESI subcontractors) must read and acknowledge their understanding of their respective HASPs before commencing work and abide by the requirements of the plans. All on-Site SESI personnel shall sign their HASP Acknowledgement Form following their review of their HASP.

All SESI project personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating Site

activities. In addition, all on-Site personnel will attend an initial hazard briefing provided by the SSO prior to beginning work at the Site and conduct daily safety meetings thereafter.

On-Site personnel will immediately report the following to the FS or SSO:

- Personal injuries and illnesses no matter how minor;
- Unexpected or uncontrolled release of chemical substances;
- Symptoms of chemical exposure;
- Unsafe or hazardous situations;
- Unsafe or malfunctioning equipment;
- Changes in site conditions that may affect the health and safety of project personnel;
- Damage to equipment or property; and

Situations or activities for which they are not properly trained.

3.6 VISITORS

All SESI personnel and subcontractors visiting the Site must check in with the FS. Visitors will be cautioned to avoid skin contact with surfaces, soils, groundwater, or other materials that may impacted or be suspected to be impacted by contaminants of concern (COCs).

Visitors requesting to observe work at the site must don appropriate personal protective equipment (PPE) prior to entry to the work area and must have the appropriate training and medical clearances to do so. If respiratory protective devices are necessary, visitors who wish to enter the work area must have been respirator-trained and fit tested for a respirator within the past 12 months.

Table 3.1 – Key Safety Personnel

Role	Name	Telephone No.
Project Safety Officer	Christopher Malvicini	973-808-9050
Project Manager	Jesse Mausner, PG	973-808-9050 x282
Health and Safety Manager	Fuad Dahan, P.E., PhD	973-808-9050 x249
Field Supervisor	Shannon Grogan	973-808-9050
Site Safety Officer	Shannon Grogan	973-808-9050

4.0 PERSONAL PROTECTIVE EQUIPMENT

4.1 LEVELS OF PROTECTION

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. A summary of the levels is presented in **Table 4.1**.

4.1.1 LEVEL D PROTECTION

The minimum level of protection that will be required of project personnel at the site will be Level D, which will be worn when site conditions or air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- Work clothing as prescribed by weather;
- Steel toe work boots, meeting American National Standards Institute (ANSI) Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Leather work gloves and/or nitrile surgical gloves;
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used); and

Personal floatation device (PFD) if working on or near the water.

4.1.2 MODIFIED LEVEL D PROTECTION

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- Nitrile gloves worn over nitrile surgical gloves;
- Latex/polyvinyl chloride (PVC) overboots when contact with COC-impacted media is anticipated;
- Steel toe work boots, meeting ANSI Z41;
- Safety glasses or goggles, meeting ANSI Z87;
- Face shield in addition to safety glasses or goggles when projectiles or splash hazards exist (e.g. during Power Washing activities);
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used);
- Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when body contact with COC-impacted media is anticipated; and
- PFD if working on or near the water.

4.1.3 LEVEL C PROTECTION

Level C protection will be required when the airborne concentration of COC reaches one-half of the OSHA Permissible Exposure Limit or ACGIH TLV. The following equipment will be used for Level C protection:

- Full-face, air-purifying respirator with combination organic vapor/HEPA cartridges;
- Polyethylene-coated Tyvek® suit, with ankles and cuffs taped to boots and gloves;
- Nitrile gloves worn over nitrile surgical gloves;
- Steel toe work boots, meeting ANSI Z41;
- Chemical-resistant boots with steel toes or latex/PVC overboots over steel toe boots;
- Hard hat, meeting ANSI Z89;
- Hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used); and
- PFD if working on or near the water.

4.2 SELECTION OF PPE

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising Site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COCs present on the Site.

4.3 SITE RESPIRATOR PROTECTION PROGRAM

Respiratory protection is an integral part of employee health and safety at the Site due to potentially hazardous concentrations of airborne COCs. The Site respiratory protection program will consist of the following (as a minimum):

- All on-Site personnel who may use respiratory protection will have an assigned respirator.
- All on-Site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months. Documentation of the fit test must be provided to the SSO prior to commencement of work.
- All on-Site personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the SSO, prior to commencement of Site work.
- Only cleaned, maintained, NIOSH-approved respirators will be used.
- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All on-Site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected, and a negative pressure test performed prior to each use.

After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

4.4 USING PPE

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must put on the required PPE in accordance with the requirements of this HASP. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of COCs.

4.4.1 DONNING PROCEDURES

These procedures are mandatory only if Modified Level D or Level C PPE is used on the Site:

- Remove bulky outerwear. Remove street clothes and store in clean location;
- Put on work clothes or coveralls;
- Put on the required chemical protective coveralls;
- Put on the required chemical protective boots or boot covers;
- Tape the legs of the coveralls to the boots with duct tape;
- Put on the required chemical protective gloves;
- Tape the wrists of the protective coveralls to the gloves;
- Don the required respirator and perform appropriate fit check (Level C);
- Put hood or head covering over-head and respirator straps and tape hood to facepiece (Level C); and
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

4.4.2 DOFFING PROCEDURES

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the Site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers;
- Clean reusable protective equipment;
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels;
- Wash hands, face, and neck (or shower if necessary);
- Proceed to clean area and dress in clean clothing; and

- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags, labeled for disposal. See Section 6.2, Decontamination, for detailed information on decontamination stations.

4.5 SELECTION MATRIX

The level of personal protection selected will be based on air monitoring of the work environment and an assessment by the FS and SSO of the potential for skin contact with COCs. The PPE selection matrix is presented in **Table 4.1** below. This matrix is based on information available at the time this plan was written. The Airborne Contaminant Action Levels in **Table 5.1**, Airborne Contaminant Action Levels, should be used to verify that the PPE prescribed in these matrices is appropriate.

Table 4.1 – PPE Selection Matrix

Task	Anticipated Level of Protection
Mobilization	Level D
Subsurface Intrusive Activities (Excavation, Drilling)	Modified Level D/Level C
Earthwork/Grading	Level D
Chemical Sampling / Delineation	Modified Level D/Level C
Decontamination	Modified Level D
Demobilization	Level D

5.0 AIR AND NOISE MONITORING

5.1 AIR MONITORING

Air monitoring, sampling, and testing will be conducted to determine employee exposure to airborne constituents. The monitoring results will dictate work procedures and the selection of PPE. The SESI SSO will be responsible for defining appropriate air monitoring procedures and for utilizing the air monitoring results to determine appropriate procedures and PPE for project personnel. Air monitoring results should be recorded in field notebooks or on an air monitoring log (see Attachment 1 for a copy of the Air Monitoring Log). Any deviations from the procedures listed here should be documented and explained in the Air Monitoring Log.

The monitoring devices to be used are a PDR1000 particulate monitor (or equivalent) and a Rae Systems MultiRAE detector (PID with a 11.7 eV lamp/oxygen/LEL/hydrogen sulfide sensors). Colorimetric detector tubes may be utilized to estimate airborne concentrations of benzene and

should be onsite during any activities that may result in elevated PID readings including drilling, excavating, and groundwater sampling.

Air monitoring will be conducted continuously with the LEL/Oxygen meter during drilling in areas where flammable vapors or gases are suspect. All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10% of the LEL at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

5.2 NOISE MONITORING

Noise monitoring may be conducted as required. Hearing protection is mandatory for all employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection.

5.3 MONITORING EQUIPMENT MAINTENANCE AND CALIBRATION

All direct-reading instrumentation calibrations should be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibrations, including the standard used for calibration, must be documented on a calibration log or in the field notebook. All completed health and safety documentation/forms must be reviewed by the SSO and maintained by the FS.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturer's procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

If an instrument is found to be inoperative or suspected of giving erroneous readings, the SSO must be responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The SSO will be responsible for ensuring a replacement unit is obtained and/or repairs are initiated on the defective equipment.

5.4 ACTION LEVELS

Table 5.1 below presents airborne contaminant action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the Site.

Table 5.1 – Airborne Contaminant Action Levels

Parameter	Reading	Action
Total Hydrocarbons	0 ppm to \leq 1 ppm	Normal operations; continue hourly breathing zone monitoring
	> 1 ppm to 5 ppm	Increase monitoring frequency to every 15 minutes and use benzene detector tube to screen for the presence of benzene
	\geq 5 ppm to \leq 50 ppm	Upgrade to Level C PPE; continue screening for benzene
	> 50 ppm	Stop work; investigate cause of reading
	At any reading > 5 ppm	Monitor perimeter per CAMP
Benzene	\geq 1 ppm to 5 ppm	Upgrade to Level C PPE
	> 5 ppm	Stop work; investigate cause of reading
Dust	0 to .05 mg/m ³	Normal operations
	0.05 to 0.1 mg/m ³	Begin soil wetting procedure (Level C protection would be needed beyond this point)
	> 0.15 mg/m ³	Stop work, fully implement dust control plan
Oxygen	\leq 19.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
	> 19.5% to < 23.5%	Normal operations
	\geq 23.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Carbon Monoxide	0 ppm to \leq 20 ppm	Normal operations
	> 20 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Hydrogen Sulfide	0 ppm to \leq 5 ppm	Normal operations
	> 5 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area

Parameter	Reading	Action
Flammable Vapors (LEL)	< 10% LEL	Normal operations
	≥ 10% LEL	Stop work, ventilate area, investigate source of vapors

6.0 WORK ZONES AND DECONTAMINATION

6.1 WORK ZONES

6.1.1 AUTHORIZATION TO ENTER

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project Site. The FS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed to enter the Site work areas.

6.1.2 SITE ORIENTATION AND HAZARD BRIEFING

No person will be allowed in the work area during Site operations without first being given a Site orientation and hazard briefing. This orientation will be presented by the FS or SSO and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. Following this initial meeting, daily safety meetings will be held each day before work begins.

All people entering the Site work areas, including visitors, must document their attendance at this briefing, as well as the daily safety meetings on the forms included with this plan.

6.1.3 CERTIFICATION DOCUMENTS

A training and medical file may be established for the project and kept on Site during all Site operations. Specialty training, such as first aid/cardiopulmonary resuscitation (CPR) certificates, as well as current medical clearances for all project field personnel required to wear respirators, will be maintained within that file. All project personnel must provide their training and medical documentation to the SSO prior to starting work.

6.1.4 ENTRY LOG

A log-in/log-out sheet will be maintained at the Site by the FS. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the FS may document entry and exit in the field notebook.

6.1.5 ENTRY REQUIREMENTS

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any SESI work area unless they are wearing the minimum PPE as described in Section 4.0.

6.1.6 EMERGENCY ENTRANCE AND EXIT

People who must enter the work area on an emergency basis will be briefed of the hazards by the FS or SSO. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a designated safe area for a head count. The FS is responsible for ensuring that all people who entered the work area have exited in the event of an emergency.

6.1.7 CONTAMINATION CONTROL ZONES

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

6.1.8 EXCLUSION ZONE (EZ)

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a posted Site diagram will identify the location of each EZ.

6.1.9 CONTAMINATION REDUCTION ZONE

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on Site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the support zone discussed below.

6.1.10 SUPPORT ZONE (SZ)

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to Site requirements.

6.1.11 POSTING

Work areas will be prominently marked and delineated using cones, caution tape, or a posted Site diagram.

6.2 DECONTAMINATION

6.2.1 PERSONNEL DECONTAMINATION

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1:* Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.
- *Station 2:* Personnel will remove their outer garment and gloves and dispose of it in properly labeled containers. Personnel will then decontaminate their hard hats, and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.
- *Station 3:* Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

6.2.2 EQUIPMENT DECONTAMINATION

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

6.2.3 PERSONAL PROTECTIVE EQUIPMENT DECONTAMINATION

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the Site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift, and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water (mixed at 2% bleach by volume), or by using a spray disinfectant.

7.0 TRAINING AND MEDICAL SURVEILLANCE

7.1 TRAINING

7.1.1 GENERAL

All on-Site project personnel who work in areas where they may be exposed to Site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of three (3) days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an eight (8)-hour refresher course within the past 12 months. The FS must have completed an additional eight (8) hours of supervisory training and must have a current first-aid/CPR certificate (See Attachment 2).

7.1.2 BASIC 40-HOUR COURSE

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures;
- Physical hazards (fall protection, noise, heat stress, cold stress);
- Names and job descriptions of key personnel responsible for site health and safety;
- Safety, health, and other hazards typically present at hazardous waste sites;
- Use, application, and limitations of PPE;
- Work practices by which employees can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements;
- Recognition of symptoms and signs which might indicate overexposure to hazards;
- Worker right-to-know (Hazard Communication OSHA 1910.1200);
- Routes of exposure to contaminants;
- Engineering controls and safe work practices;
- Components of a health and safety program and a site-specific HASP;
- Decontamination practices for personnel and equipment;
- Confined-space entry procedures; and
- General emergency response procedures.

7.1.3 SUPERVISOR COURSE

Management and supervisors must receive an additional eight (8) hours of training, which typically includes:

- General Site safety and health procedures;
- PPE programs; and
- Air monitoring techniques

7.1.4 SITE-SPECIFIC TRAINING

Site-specific training will be accomplished by on-Site personnel reading this HASP, and through a thorough site briefing by the PM, FS, or SSO on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; the protective equipment and safety procedures; and emergency procedures.

7.1.5 DAILY SAFETY MEETINGS

Daily safety meetings will be held to cover the work to be accomplished, the hazards anticipated, the PPE and procedures required to minimize site hazards, and emergency procedures. The FS or SSO should present these meetings prior to beginning the day's fieldwork. No work will be performed in an EZ before a daily safety meeting has been held. An additional safety meeting must also be held prior to new tasks, or if new hazards are encountered. The daily safety meetings will be logged in the field notebook.

7.1.6 FIRST AID AND CPR

At least one (1) employee current in first aid/CPR will be assigned to the work crew and will be on the Site during operations. Site records will document the presence of this individual. Refresher training in first aid (triennially) and CPR (annually) is required to keep the certificate

current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

7.2 MEDICAL SURVEILLANCE

7.2.1 MEDICAL EXAMINATION

All personnel who are potentially exposed to Site contaminants must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

7.2.2 PRE-PLACEMENT MEDICAL EXAMINATION

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable regulations. The pre-placement and periodic medical examinations typically include the following elements:

- Medical and occupational history questionnaire;
- Physical examination;
- Complete blood count, with differential;
- Liver enzyme profile;
- Chest X-ray, at a frequency determined by the physician;
- Pulmonary function test;
- Audiogram;
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination;
- Drug and alcohol screening, as required by job assignment;
- Visual acuity; and
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project Site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each on-site employee.

7.2.3 OTHER MEDICAL EXAMINATIONS

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials; and
- At the discretion of the SSO, HSM, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials.

7.2.4 PERIODIC EXAM

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 24 months.

7.2.5 MEDICAL RESTRICTION

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the SSO. The terms of the restriction will be discussed with the employee and the supervisor.

8.0 GENERAL SAFETY PRACTICES

8.1 GENERAL SAFETY RULES

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the Site that is readily available to personnel, and all project personnel shall review the plan prior to starting work.
- Consume or use food, beverages, chewing gum, and tobacco products only in the SZ or other designated area outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE as required and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and ensure closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COCs must be reported to the FS or SSO immediately. If needed, medical attention should be sought.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COCs, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE as required in the CRZ to limit the spread of COC-containing materials.
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles designated for this purpose.
- Removing soil containing Site COCs from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.
- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.

- Recognize emergency signals used for evacuation, injury, fire, etc.
- Report all injuries, illnesses, and unsafe conditions or work practices to the FS or SSO.
- Use the “buddy system” during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.
- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.
- Use, adjust, alter, and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer’s directions.
- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.
- The presence or consumption of alcoholic beverages or illicit drugs during the workday, including breaks, is strictly prohibited. Notify your supervisor if you must take prescription or over-the-counter drugs that indicate they may cause drowsiness or, that you should not operate heavy equipment.
- Remain upwind during site activities whenever possible.

8.2 BUDDY SYSTEM

On-Site personnel must use the buddy system as required by operations. Use of the “buddy system” is required during all operations requiring Level C to Level A PPE, and when appropriate, during Level D operations. Crewmembers must observe each other for signs of chemical exposure, and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration;
- Changes in coordination;
- Changes in demeanor;
- Excessive salivation and pupillary response; and
- Changes in speech pattern.

Crewmembers must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crewmembers of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- Headaches;
- Dizziness;
- Nausea;
- Blurred vision;
- Cramps; and
- Irritation of eyes, skin, or respiratory tract.

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

8.3 HEAT STRESS

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for six (6) to eight (8) hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

8.4 HEAT STRESS SAFETY PRECAUTIONS

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in **Table 8.1** below.

Table 8.1 – Work/Rest Schedule

Adjusted Temperature ^b	Work/Rest Regimen Normal Work Ensemble ^c	Work/Rest Regimen Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° - 90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° - 87.5°F (28.1° - 30.8°C)	After each 90 minutes of work	After each 60 minutes of work

Adjusted Temperature ^b	Work/Rest Regimen Normal Work Ensemble ^c	Work/Rest Regimen Impermeable Ensemble
77.5° - 82.5°F (25.3° - 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° - 77.5°F (30.8° - 32.2°C)	After each 150 minutes of work	After each 120 minutes of work

- a. For work levels of 250 kilocalories/hour (Light-Moderate Type of Work)
- b. Calculate the adjusted air temperature (ta adj) by using this equation: $ta\ adj\ ^\circ F = ta\ ^\circ F + (13 \times \% \text{ sunshine})$. Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)
- c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
- d. The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) Handbook.

In order to determine if the work rest cycles are adequate for the personnel and specific Site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any Site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-Site drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek-type garments.

All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

8.5 COLD STRESS

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two (2) factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in **Table 8.2** below.

Table 8.2– Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

[This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents)].

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities can be categorized into:

- *Frost Nip or Incipient Frostbite* - characterized by sudden blanching or whitening of skin.
- *Superficial Frostbite* - skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- *Deep Frostbite* - tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and 5) death. Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

8.6 SAFETY PRECAUTIONS FOR COLD STRESS PREVENTION

For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.

At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.

If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must ensure that their clothing is not wet as a consequence of sweating. Wet field personnel must change into dry clothes prior to entering the cold area.

If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

Field personnel handling evaporative liquid (e.g., gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

8.7 SAFE WORK PROCEDURES

Direct contact between bare skin and cold surfaces (< 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.

For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.

Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing. Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

8.8 BIOLOGICAL HAZARDS

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, spiders, and other pests.

8.8.1 TICK BORNE DISEASES

Lyme Disease - The disease commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

Erlchiosis - The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, and swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Rocky Mountain Spotted Fever (RMSF) - This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the

sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control - Tick repellent containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

8.8.2 POISONOUS PLANTS

Poisonous plants may be present in the work area. Personnel should be alerted to its presence and instructed on methods to prevent exposure.

Control - The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water and observed for signs of reddening.

8.8.3 SNAKES

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control - To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes, and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snakebite occurs, an attempt should be made to safely identify the snake via size and markings. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

8.8.4 SPIDERS

Personnel may encounter spiders during work activities.

Two spiders are of concern: the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately one inch long, and has a distinctive red hourglass marking on the underside of its body. The black widow is found throughout the United States. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. It has a distinctive violin shape on the top of its body. The brown recluse is more prevalent in the southern United States. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control - To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs, and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

8.9 NOISE

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

Control - All personnel must wear hearing protection, with a Noise Reduction Rating (NRR) of at least 20, when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss. Noise monitoring is discussed in Section 5.2, Noise Monitoring.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

All personnel must take every precaution to minimize the potential for spills during site operations. All on-Site personnel shall immediately report any discharge, no matter how small, to the FS.

Spill control equipment and materials will be located on the Site at locations that present the potential for discharge. All sorbent materials used for the cleanup of spills will be containerized and labeled appropriately. In the event of a spill, the FS will follow the provisions in Section 10.0, Emergency Procedures, to contain and control released materials and to prevent their spread to off-Site areas.

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8.11 SANITATION

Site sanitation will be maintained according to OSHA requirements.

8.11.1 BREAK AREA

Breaks must be taken in the SZ, away from the active work area after Site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

8.11.2 POTABLE WATER

The following rules apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media, and contaminated clothing or equipment.
- Portable containers used to dispense drinking water must be capable of being tightly closed and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) nor may it be removed from the container by dipping.
- Containers used for drinking water must be clearly marked and shall not be used for any other purpose.
- Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

8.11.3 SANITARY FACILITIES

Access to facilities for washing before eating, drinking, or smoking, or alternate methods such as waterless hand-cleaner and paper towels will be provided.

8.11.4 LAVATORY

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided. This requirement does not apply to mobile crews or to normally unattended Site

locations so long as employees at these locations have transportation immediately available to nearby toilet facilities.

8.12 EMERGENCY EQUIPMENT

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be on Site prior to the commencement of project activities. Personnel will be provided with access to emergency equipment, including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location as required by applicable sections of 29 CFR 1910 and 1926;
- Industrial first aid kits of adequate size for the number of personnel on site; and
- Emergency eyewash and/or shower if required by operations being conducted on Site.

8.13 LOCKOUT/TAGOUT PROCEDURES

Only fully qualified and trained personnel will perform maintenance procedures. Before maintenance begins, lockout/tagout procedures per OSHA 29 CFR 1910.147 will be followed.

Lockout is the placement of a device that uses a positive means, such as lock, to hold an energy or material-isolating device such that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system shall be used. Tagout is the placement of a warning tag on an energy or material isolating device indicating that the equipment controls may not be operated until the personnel who attached the tag remove the tag.

8.14 ELECTRICAL SAFETY

Electricity may pose a particular hazard to Site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or USCG regulations.
- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.

- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension cord outlets must be equipped with ground fault circuit interrupters (GFCI).
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

8.15 LIFTING SAFETY

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

8.16 LADDER SAFETY

When portable ladders are used for access to an upper landing surface, the ladder side rails shall extend at least three (3) feet (9 m) above the upper landing surface to which the ladder is used to gain access; or, when such an extension is not possible because of the ladder's length, then the ladder shall be secured at its top to a rigid support that will not deflect, and a grasping device, such as a grabrail, shall be provided to assist employees in mounting and dismounting the ladder. In no case shall the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.

- Ladders shall be maintained free of oil, grease, and other slipping hazards.

- Ladders shall not be loaded beyond the maximum intended load for which they were built, or beyond their manufacturer's rated capacity.
- Ladders shall be used only for the purpose for which they were designed.
- Non-self-supporting ladders shall be used at an angle such that the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder (the distance along the ladder between the foot and the top support).
- Wood job-made ladders with spliced side rails shall be used at an angle such that the horizontal distance is one-eighth the working length of the ladder.
- Fixed ladders shall be used at a pitch no greater than 90 degrees from the horizontal, as measured to the back side of the ladder.
- Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.
- Ladders shall not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental displacement. Slip-resistant feet shall not be used as a substitute for care in placing, lashing, or holding a ladder that is used upon slippery surfaces, including, but not limited to, flat metal or concrete surfaces that are constructed so they cannot be prevented from becoming slippery.
- Ladders placed in any location where they can be displaced by workplace activities or traffic, such as in passageways, doorways, or driveways, shall be secured to prevent accidental displacement, or a barricade shall be used to keep the activities or traffic away from the ladder.
- The area around the top and bottom of ladders shall be kept clear.
- The top of a non-self-supporting ladder shall be placed with the two rails supported equally unless it is equipped with a single support attachment.
- Ladders shall not be moved, shifted, or extended while occupied.
- Ladders shall have non-conductive side rails if they are used where the employee or the ladder could contact exposed energized electrical equipment.
- The top, top step, or the step labeled that it or any step above it should not be used as a step.
- Cross-bracing on the rear section of stepladders shall not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- Ladders shall be inspected by the HSM for visible defects on a daily basis and after any occurrence that could affect their safe use.
- Portable ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components shall either be immediately marked in a manner that readily identifies them as defective or be tagged with "Do Not Use" or similar language and shall be withdrawn from service.
- Fixed ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps; broken or split rails; or corroded components; shall be withdrawn from service.
- Ladder repairs shall restore the ladder to a condition meeting its original design criteria, before the ladder is returned to use.
- Single-rail ladders shall not be used.
- When ascending or descending a ladder, the user shall face the ladder.
- Each employee shall use at least one hand to grasp the ladder when progressing up and/or down the ladder.
- An employee shall not carry any object or load that could cause the employee to lose balance and fall.

8.17 TRAFFIC SAFETY

The project Site may be located adjacent to a public roadway where exposure to vehicular traffic is likely. Traffic may also be encountered as vehicles enter and exit the area. To minimize the likelihood of project personnel and activities being affected by traffic, the following procedures will be implemented.

Cones must be placed along the shoulder of the roadway starting 100 feet from the work area to alert passing motorists to the presence of personnel and equipment. A “Slow” or “Men Working” sign must be placed at the first cone. Barricades with flashing lights should be placed between the roadway and the work area.

During activities along a roadway, equipment will be aligned parallel to the roadway to the extent feasible, facing into the oncoming traffic so as to place a barrier between the work crew and the oncoming traffic. All crewmembers must remain behind the equipment and the traffic barrier.

All Site personnel who are potentially exposed to vehicular traffic must wear an outer layer of orange warning garments, such as vests, jackets, or shirts. If work is performed in hours of dusk or darkness, workers will be outfitted with reflective garments either orange, white (including silver-coated reflective coatings or elements that reflect white light), yellow, fluorescent red-orange, or fluorescent yellow-orange.

The flow of traffic into and out of the adjacent business must be assessed, and precautions taken to warn motorists of the presence of workers and equipment. Where possible, vehicles should be aligned to provide physical protection of people and equipment.

9.0 SITE-SPECIFIC HAZARDS AND CONTROL MEASURES

9.1 EVALUATION OF HAZARDS

The evaluation of hazards is provided as a quick reference as to the known conditions for the Site, wherein the level of detail for each of the subsections is identified.

9.1.1 HAZARD CHARACTERISTICS

Existing information for Site:

 X Detailed Preliminary None

Hazardous/Contaminated Material Form(s):

 X Solid X Liquid Sludge Gas X Vapor

Containment Type(s):

_____ Drum _____ Tank _____ Pit _____ Debris
_____ Pond _____ Lagoon Other: None known

Hazardous Material Characteristics:

_____ X _____ Volatile _____ Corrosive _____ Reactive
_____ Radioactive
_____ Ignitable _____ X _____ Toxic _____ X _____ Unknown

Routes of Exposure:

_____ X _____ Oral _____ Dermal _____ X _____ Eye _____ X _____ Respiratory

9.1.2 POTENTIAL HEALTH AND SAFETY HAZARDS

_____ X _____ Heat _____ X _____ Congested areas
_____ X _____ Cold _____ X _____ General Construction
_____ Confined space entry _____ X _____ Physical injury
_____ Oxygen depletion _____ X _____ Electrical hazards
_____ Asphyxiation _____ X _____ Handling and product transfer
_____ X _____ Excavation _____ X _____ Fire
_____ X _____ Cave-ins _____ X _____ Explosion
_____ X _____ Falls, slippage _____ X _____ Biological Hazards
_____ X _____ Plants – Poison Ivy, Poison Oak
_____ X _____ Insects – Ticks
_____ X _____ Insects – Mosquitoes
_____ X _____ Insects – Bees and Wasps
_____ X _____ Rats and Mice
_____ X _____ Heavy equipment _____ Non-ionizing Radiation (i.e. UV, IR, etc.)
_____ Other: Potential Ignition Hazard

9.2 FIELD ACTIVITIES, HAZARDS AND CONTROL PROCEDURES

The following task-specific safety analyses identify potential health, safety, and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the Site to identify hazards that may affect on-Site personnel, the community, or the environment. The FS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment, or performance of the project. The FS will keep on-Site personnel informed of the changing conditions, and the PM will write and/or approve addenda or revisions to this HASP as necessary.

9.2.1 MOBILIZATION/CONSTRUCTION STAKEOUT

Description of Tasks

Site mobilization will include establishing excavation locations, determining the location of utilities and other installations, and establishing work areas. Mobilization will also include setting up equipment and establishing a temporary Site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During this initial phase, project personnel will walk the Site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this plan.

Hazard Identification

The hazards of this phase of activity are associated with heavy equipment operation, manual materials handling, installation of temporary on-site facilities, and manual site preparation.

Manual materials handling and manual site preparation may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Installation of temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to the manual lifting and moving of materials. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Controls

Control procedures for these hazards are discussed in Section 8.0, General Safety Practices.

9.2.2 DEMOLITION/SITE-CLEARING

Description of Tasks

Site clearance will involve manual or mechanical removal of objects impeding access to the construction footprint. These obstructions are both natural and man-made items and will include, but not be limited to, fabricated metal and concrete structures, trees, vegetation, rubble, and miscellaneous trash/debris.

Hazard Identification

Hazards associated with demolition and site clearance include personnel working in and around potentially unstable structures, or locations of potential contact with hazardous chemicals, utilities, and/or falling objects. This task will involve manual, as well as mechanical demolition/clearance efforts so exertion and equipment hazards exist.

Controls

PPE – Personnel shall be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.

Preparatory Operations – Prior to permitting employees to start demolition operations, an engineering survey shall be made, by a licensed Professional Engineer, of the structure to determine the stability of the structure. Any adjacent structure shall where personnel may be exposed shall also be similarly checked. The PO shall have in writing evidence that such a survey has been performed. All structural instabilities shall be shored or braced, under the supervision of a licensed Professional Engineer, prior to access by an FP.

Utilities – All electric, gas, water, steam, sewer, and other service lines shall be shut off, capped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company that is involved shall be notified in advance. If it is necessary to maintain any power, water or other utilities during demolition, such lines shall be temporarily relocated, as necessary.

Hazardous Substances – It shall also be determined if any type of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

Falling Debris/Objects – No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected. Access to the area where falling objects/debris may be encountered must be gated and controlled.

Structural Collapse – Structural or load supporting members on any floor shall not be cut or removed until all stories above such a floor have been demolished and removed. Walls, which are to serve as retaining walls against which debris will be piled, shall not be so used unless capable of safely supporting the imposed load. Mechanical equipment shall not be used on floors or working surfaces unless such floors or surfaces are not of sufficient strength to support the imposed load.

Rollover Guards – All equipment used in site clearing operations shall be equipped with rollover guards meeting the applicable requirements. In addition, rider-operated equipment shall be equipped with an overhead and rear canopy guard meeting the applicable requirements.

Inspections – During demolition, continuing inspections by a licensed Professional Engineer shall be made as the work progresses to detect hazards resulting from weakened or deteriorated floors, walls, or loosened material. No FP shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

9.2.3 EXCAVATION AND CUT/FILL OPERATIONS

9.2.3.1 EXCAVATION TRENCHING

Description of Tasks

This task includes the excavation of contaminated soils and superficial debris. Excavation depths vary across the Site.

Hazard Identification

The hazards of this activity are associated with heavy equipment operation, subsurface intrusion, manual materials handling, stockpiling, and disposal. Subsurface intrusion presents hazards associated with negotiating buried utilities, cave-ins of the excavated areas, and regress methods for personnel working inside the excavated areas. Disruption of contaminated soil also presents a health hazard.

Controls

Underground Utilities – The estimated locations of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during the excavation work, shall be determined prior to opening an excavation. Utility companies or owners shall be contacted (“Call Before You Dig”) within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation.

When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed, as necessary, to safeguard site personnel.

Cave-Ins – Project personnel in an excavation shall be protected from cave-ins by an adequate protective system, except when:

- Excavations are made entirely in stable rock or excavations are less than five feet in depth and examination of the ground by the SSO provides no indication of a potential cave-in.
- Protective systems shall have the capacity to resist, without failure, all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

Project personnel shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least two feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the SSO for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the SSO prior to the start of work and as needed throughout operations. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence. These inspections are only required when project personnel exposure can be reasonably anticipated.

Where the SSO finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed personnel shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

Excavation Egress – A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are four feet or more in depth so as to require no more than 25 feet or lateral travel for project personnel.

9.2.3.2 HEAVY EQUIPMENT OPERATION

Description of Tasks

Heavy equipment to be used for this task include, but are not limited to, excavators, dozers, dump trucks, and water sprayers (if required).

Hazard Identification

The most common type of accident that occurs in material handling operations is the “caught between” situation when a load is being handled and an object gets caught between two moving parts of the equipment. Operation of the heavy construction equipment may produce harmful noise.

Controls

Equipment Inspection – All vehicles in use shall be checked prior to operation to ensure that all parts, equipment, and accessories that affect safe operations are in proper operating condition and free from defects. All defects shall be corrected before the vehicle is placed in service.

Ground Guides – No personnel shall use any motor vehicle, earthmoving, or compacting equipment having an obstructed view to the rear, unless:

- The vehicle has a reverse signal alarm distinguishable from the surrounding noise level;
or
- The vehicle is backed up only when an observer signals that it is safe to do so.

Blocking – Heavy machinery, equipment, or parts thereof that are suspended or held aloft shall be substantially blocked to prevent falling or shifting before employees are permitted to work under or between them.

Noise – Control measures for noise are addressed in Section 8.9.

Traffic – Control measures for traffic are addressed in Section 8.17.

9.2.3.3 DISTURBANCE/HANDLING OF CONTAMINATED MATERIAL

Description of Tasks

After the contaminated soil is excavated from below the Site's surface, the material will be stockpiled, dried, and either transported off Site or relocated and backfilled on Site.

Hazard Identification

The hazards associated with materials handling include contact of the contaminated material with project personnel, or cross contamination with other site soil.

Controls

Cross Contamination – Following excavation, contaminated soil stockpiles will be placed on a structure constructed to separate the material from the site soil and collect any groundwater leachate. The material shall be covered to prevent storm water erosion or migration of contaminants through storm water.

Air Monitoring – Air and particulate monitoring will be conducted during soil excavation activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors or particulates in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 5.1, Air Monitoring, for a description of air monitoring requirements and action levels. Air monitoring protocols are also presented in the Community Air Monitoring Plan (Appendix E of this RIWP). A description of each level of personal protection is included in Section 4.0, Personal Protective Equipment.

Traffic – Control measures for traffic are addressed in Section 8.17.

9.2.4 DRILLING/SUBSURFACE INTRUSION ACTIVITIES

Description of Tasks

Site mobilization will include establishing excavation locations, determining the location of utilities and other installations, and establishing work areas. Mobilization will also include setting up equipment and establishing a temporary Site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During this

initial phase, project personnel will walk the Site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this plan.

Hazard Identification

The primary physical hazards for this activity are associated with the use of soil boring and grouting equipment. The equipment is hydraulically powered and uses static force and dynamic percussion force to advance sampling and penetrating tubes.

Accidents can occur as a result of improperly placing the equipment on uneven or unstable terrain or failing to adequately secure the equipment prior to the start of operations. Overhead utility lines can create hazardous conditions if contacted by the equipment. Underground installations such as electrical lines, conduit, and product lines pose a significant hazard if contacted.

Controls

Geoprobe and Drill Rig Safety Procedures - The operator of the equipment must possess required state or local licenses to perform such work. All members of the crew shall receive Site-specific training prior to beginning work.

The operator is responsible for the safe operation of the rig, as well as the crew's adherence to the requirements of this HASP. The operator must ensure that all safety equipment is in proper condition and is properly used. The members of the crew must follow all instructions of the operator, wear all personal protective equipment, and be aware of all hazards and control procedures. The operator and crew must participate in the Daily Safety Meetings and be aware of all emergency procedures.

Equipment Inspection - Each day, prior to the start of work, the rig and associated equipment must be inspected by the operator. The following items must be inspected:

- Vehicle condition;
- Proper storage of equipment;
- Condition of all hydraulic lines;
- Fire extinguisher; and
- First aid kit.

Equipment Set Up - The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels which remain on the ground must be chocked. The leveling jacks shall not be raised until the derrick is lowered. The rig shall be moved only after the derrick has been lowered.

All well sites will be inspected by the driller prior to the location of the rig to verify a stable surface exists. This is especially important in areas where soft, unstable terrain is common.

The drill rig must be properly blocked and leveled prior to raising the derrick. Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that differential settling of the rig does not occur.

When the ground surface is soft or otherwise unstable, wooden blocks, at least 24" by 24" and 4" to 8" thick shall be placed between the jack swivels and the ground. The emergency brake shall be engaged, and the wheels that are on the ground shall be chocked.

Rules for Intrusive Activity - Before beginning any intrusive activity, the existence and location of underground pipe, conduit, electrical equipment, and other installations will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. "Call Before You Dig" will verify the potential for encountering subsurface utilities. If the client's knowledge of the area is incomplete, an appropriate device, such as a magnetometer, will be used to locate the line.

Combustible gas readings of the general work area will be made regularly in areas where and/or during operations when the presence of flammable vapors or gases is suspected, such as during intrusive activities (see Section 5.1). Operations must be suspended and corrective action taken if the airborne flammable concentration reaches 10% of the LEL in the immediate area (a one-foot radius) of the point of drilling, or near any other ignition sources.

Overhead Electrical Clearances - If equipment is operated in the vicinity of overhead power lines, the power to the lines must be shut off or the equipment must be positioned and blocked such that no part, including cables, can come within the minimum clearances as indicated on **Table 8.2** below:

Table 8.3– Voltage versus Required Clearance

Nominal Voltage	System	Minimum Clearance	Required
0-50kV		10 feet	
51-100kV		12 feet	
101-200kV		15 feet	
201-300kV		20 feet	
301-500kV		25 feet	
501-750kV		35 feet	
751-1,000kV		45 feet	

When the drill rig is in transit, with the boom lowered and no load, the equipment clearance must be at least four (4) feet for voltages less than 50kV, 10 feet for voltages of 50 kV to 345 kV, and 16 feet for voltages above 345 kV.

Hoisting Operations - Drillers should never engage the rotary clutch without watching the rotary table, and ensuring it is clear of personnel and equipment.

Unless the drawworks is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

Drill pipe, auger strings or casing should be picked up slowly. Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrickman has signaled that he may safely hoist the pipe.

During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor; no one else should be on the rig or derrick.

The brakes on the drawworks of the drill rig should be tested by the driller each day. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the borehole whenever any wire line device is being run.

Hoisting control stations should be kept clean and controls labeled as to their functions.

Catline Operations - Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the catline. The cathead area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or catline which is under tension.

Employees rigging loads on catlines shall:

- Keep out from under the load;
- Keep fingers and feet where they will not be crushed;
- Be sure to signal clearly when the load is being picked;

- Use standard visual signals only and not depend on shouting to coworkers; and
- Make sure the load is properly rigged, since a sudden jerk in the catline will shift or drop the load.

Wire Rope - When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or re-socketed. Special attention shall be given to the inspection of end fittings on boom support, pendants, and guy ropes.

Wire rope removed from service due to defects shall be cut up or plainly marked as being unfit for further use as rigging.

Wire rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope; the clip nuts shall be re-tightened immediately after initial load carrying use and at frequent intervals thereafter.

When a wedge socket fastening is used, the dead or short end of the wire rope shall have a clip attached to it or looped back and secured to itself by a clip; the clip shall not be attached directly to the live end.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted.

Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, shall consist of one continuous piece without knot or splice.

An eye splice made in any wire rope shall have not less than five full tucks.

Wire rope shall not be secured by knots. Wire rope clips shall not be used to splice rope.

Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire clips or knots.

Pipe/Auger Handling - Pipe and auger sections shall be transported by cart or carried by two persons. Individuals should not carry auger or pipe sections without assistance.

Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.

Slip handles should be used to lift and move slips. Employees are not permitted to kick slips into position.

When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.

Pipe and augers stored in racks, catwalks or on flatbed trucks should be secured to prevent rolling.

9.2.5 SUBSURFACE CHEMICAL SAMPLE/COLLECTION ANALYSIS

Description of Tasks

This sub-task consists of the collection of soil samples for subsequent field and laboratory analysis. The physical hazards of soil sampling are primarily associated with the sample collection methods, procedures utilized, and the environment itself.

Hazard Identification

Incidental contact with COCs is the primary hazard associated with sampling the stabilized material. This contact may occur through the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. The primary hazards associated with these sampling procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards directly associated with sampling procedures are generally limited to strains/sprains and potential eye hazards. Potential chemical hazards may include contact with media containing Site COCs and potential contact with chemicals used for equipment decontamination.

Controls

PPE – To control dermal exposure during sampling activities, a minimum of Level D protection will be worn. If necessary, based on field observations and site conditions, air monitoring may be conducted during sediment sampling activities. If the results of air monitoring indicate the presence of airborne contaminants in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 5.1, Air Monitoring, for a description of air monitoring requirements and action levels. Air monitoring protocols are also presented in the Community Air Monitoring Plan (Appendix E of this RIWP). A description of each level of personal protection is included in Section 4.0, Personal Protective Equipment.

9.2.6 UST CLOSURE

9.2.6.1 WORKING IN CONFINED SPACES

Description of Tasks

The project may involve the closure of several underground storage tanks (USTs).

Hazard Identification

Closure activities may require the entrance into confined spaces to facilitate cleaning and removal of the USTs.

Controls

All personnel required to enter confined or enclosed spaces must be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of required protective and emergency equipment. The PO shall comply with all specific regulations that apply to work in dangerous or potentially dangerous areas. All personnel entering the confined space will have achieved the appropriate OSHA training and the operation will be permitted, as necessary.

9.2.6.2 WORKING WITH COMPRESSED AIR

Description of Tasks

The proposed method of purging the USTs includes the injection of compressed gas into the tank and attached piping network.

Hazard Identification

Uncontrolled release of the highly pressured air can cause injury to FP during this task. Cylinders must also be properly managed to ensure they are not compromised during storage and/or use.

Controls

Pressure Regulation – Compressed air used for cleaning purposes shall be reduced to less than 30 pounds per square inch and then only with effective chip guarding and personal protective equipment.

Cylinder Storage – Valve protection caps shall be in place and secured when compressed gas cylinders are transported, moved, or stored. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved. Compressed gas cylinders shall be secured in an upright position at all times, except if necessary for short periods of time when cylinders are actually being hoisted or carried. Cylinders shall be placed in a location where they cannot become part of an electrical circuit.

9.2.7 DECONTAMINATION

All equipment will be decontaminated before leaving the Site. Personnel involved in decontamination activities may be inadvertently exposed to skin contact with contaminated materials and chemicals brought from the EZ. Personnel involved in decontamination activities must wear PPE that is, at a minimum, one level below the level worn by personnel working in the EZ.

9.2.8 DEMOBILIZATION

Demobilization involves the removal of all tools, equipment, supplies, and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards, and hot surfaces, to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat-or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

Control procedures for these hazards are discussed in Section 8.0, General Safety Practices.

9.3 CHEMICAL HAZARDS

The chemical hazards associated with Site operations are related to inhalation, ingestion, and skin exposure to Site COCs. Concentrations of airborne COCs during Site tasks may be measurable and will require air monitoring during certain operations. Air monitoring requirements for Site tasks are outlined in Section 5.1. Air monitoring protocols are also presented in the Community Air Monitoring Plan (Appendix E of this RIWP).

COCs at the Site include VOCs, SVOCs, pesticides, metals, and PFAS.

The potential for inhalation of site COCs is low. The potential for dermal contact with soils containing Site COCs during remedial operations is moderate. **Table 9.1** lists the primary contaminants that have been identified at the Site and the media in which they are present.

Table 9.1 – List of Primary Contaminants

Media: Soil		
Metals	Maximum Concentration (mg/kg)	Applicable Monitoring Instrument
Cadmium	5.49	Not Applicable
Copper	78.9	Not Applicable
Lead	910	Not Applicable
Mercury	2.91	Not Applicable
Zinc	758	Not Applicable
VOCs	Maximum Concentration (mg/kg)	Applicable Monitoring Instrument
Acetone	0.051	PID
SVOCs	Maximum Concentration (mg/kg)	Applicable Monitoring Instrument
benzo(a)anthracene	28	PID
benzo(a)pyrene	29	PID
benzo(b)fluoranthene	33	PID
benzo(k)fluoranthene	9.1	PID
Chrysene	32	PID
dibenzo(a,h)anthracene	3.6	PID
ideno(1,2,3-cd)pyrene	18	PID
Pesticides	Maximum Concentration (mg/kg)	Applicable Monitoring Instrument
Dieldrin	0.0164	N/A
4,4'-DDE	0.0117	N/A

4,4'-DDD	0.00375	N/A
4,4'-DDT	0.0474	N/A

Media: Groundwater		
SVOCs	Maximum Concentration (ug/L)	Applicable Monitoring Instrument
Benzo(a)anthracene	0.12	PID
Benzo(a)pyrene	0.04	PID
Benzo(b)fluoranthene	0.05	PID
Benzo(k)fluoranthene	0.02	PID
Chrysene	0.02	PID
Ideno(1,2,3-Cd)pyrene	0.03	PID
Metals	Maximum Concentration (ug/L)	Applicable Monitoring Instrument
Beryllium	4.51	N/A
Chromium	258.2	N/A
Copper	520.6	N/A
Iron	57,600	N/A
Lead	177	N/A
Manganese	4,463	N/A
Selenium	15.8	N/A
Sodium	142,000	N/A
Thallium	0.76	N/A

Media: Soil Vapor		
Contaminants	Maximum Concentration (ug/m³)	Applicable Monitoring Instrument
Dichlorodifluoromethane	2.89	PID
chloromethane	0.894	PID
1,3-butadiene	7.57	PID
ethanol	84.6	PID
acetone	855	PID
trichlorofluoromethane	3.03	PID
isopropanol	29.3	PID
tertiary butyl alcohol	5.67	PID
carbon disulfide	10.7	PID
2-butanone	74	PID
ethyl acetate	1.8	PID
chloroform	4.04	PID
tetrahydrofuran	7.58	PID
n-hexane	9.34	PID
benzene	5.88	PID
carbon tetrachloride	1.3	PID
cyclohexane	3.39	PID
trichloroethene	3.07	PID
2,2,4-trimethylpentane	9.9	PID
heptane	14.5	PID
4-methyl-2-pentanone	4.18	PID
toluene	62.6	PID
2-hexanone	6.11	PID

Media: Soil Vapor		
Contaminants	Maximum Concentration (ug/m³)	Applicable Monitoring Instrument
tetrachloroethene	45.6	PID
ethylbenzene	4.14	PID
p/m-xylene	13.6	PID
styrene	0.924	PID
o-xylene	5.13	PID
1,2,4-trimethylbenzene	2.91	PID
1,3-dichlorobenzene	2.02	PID

10.0 EMERGENCY PROCEDURES

10.1 GENERAL

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the FS/SSO immediately.

The FS/SSO will establish evacuation routes and assembly areas for the Site. All personnel entering the Site will be informed of this route and the assembly area.

10.2 EMERGENCY RESPONSE

If an incident occurs, the following steps will be taken:

- The FS/SSO will evaluate the incident and assess the need for assistance and/or evacuation;
- The FS/SSO will call for outside assistance as needed;
- The FS/SSO will ensure the PM is notified promptly of the incident; and
- The FS/SSO will take appropriate measures to stabilize the incident scene.

10.2.1 FIRE

In the case of a fire at the Site, the FS/SSO will assess the situation and direct fire-fighting activities. The FS/SSO will ensure that the PM is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a

fire that Site personnel are unable to safely extinguish with one (1) fire extinguisher, the local fire department will be summoned.

10.2.2 CONTAMINANT RELEASE

In the event of a contaminant release, the following steps will be taken:

- Notify FS/SSO immediately;
- Evacuate immediate area of release;
- Conduct air monitoring to determine needed level of PPE; and
- Don required level of PPE and prepare to implement control procedures.

The FS/SSO has the authority to commit resources as needed to contain and control released material and to prevent its spread to off-Site areas.

10.3 MEDICAL EMERGENCY

All employee injuries must be promptly reported to the SSO/FS, who will:

- Ensure that the injured employee receives prompt first aid and medical attention;
- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room); and
- If the injured person is a SESI employee, notify SESI at 973-808-9050.

10.3.1 EMERGENCY CARE STEPS

Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.

- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victim's condition, and help being given.
- Maintain airway and perform rescue breathing as necessary.
- Perform CPR as necessary.
- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.

Treat other conditions as necessary. If the victim can be moved, take him/her to a location away from the work area where EMS can gain access.

10.4 FIRST AID GENERAL

All persons must report any injury or illness to their immediate supervisor or the FS. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The FS and SSO must fill out an accident/incident report as soon as emergency conditions no longer exist and first aid and/or medical treatment has been ensured. The report must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the injured person is not ambulatory or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

10.4.1 FIRST AID—INHALATION

Any employee complaining of symptoms of chemical overexposure as described in Section 4, General Site Safety Procedures, will be removed from the work area and transported to the designated medical facility for examination and treatment.

10.4.2 FIRST AID—INGESTION

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information. If the victim is unconscious, keep them on their side and clear the airway if vomiting occurs.

10.4.3 FIRST AID—SKIN CONTACT

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ, to the wash area. Personnel will remove any contaminated clothing, and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he/she requests a medical examination.

10.4.4 FIRST AID—EYE CONTACT

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the EZ, must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

10.5 REPORTING INJURIES, ILLNESSES, AND SAFETY INCIDENTS

Injuries and illnesses, however minor, will be reported to the FS immediately. The FS will complete an injury report and submit it to the HSM, and the PM by end of shift.

10.6 EMERGENCY INFORMATION

he means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in **Table 10.1** below.

Table 10.1 – Emergency Contacts

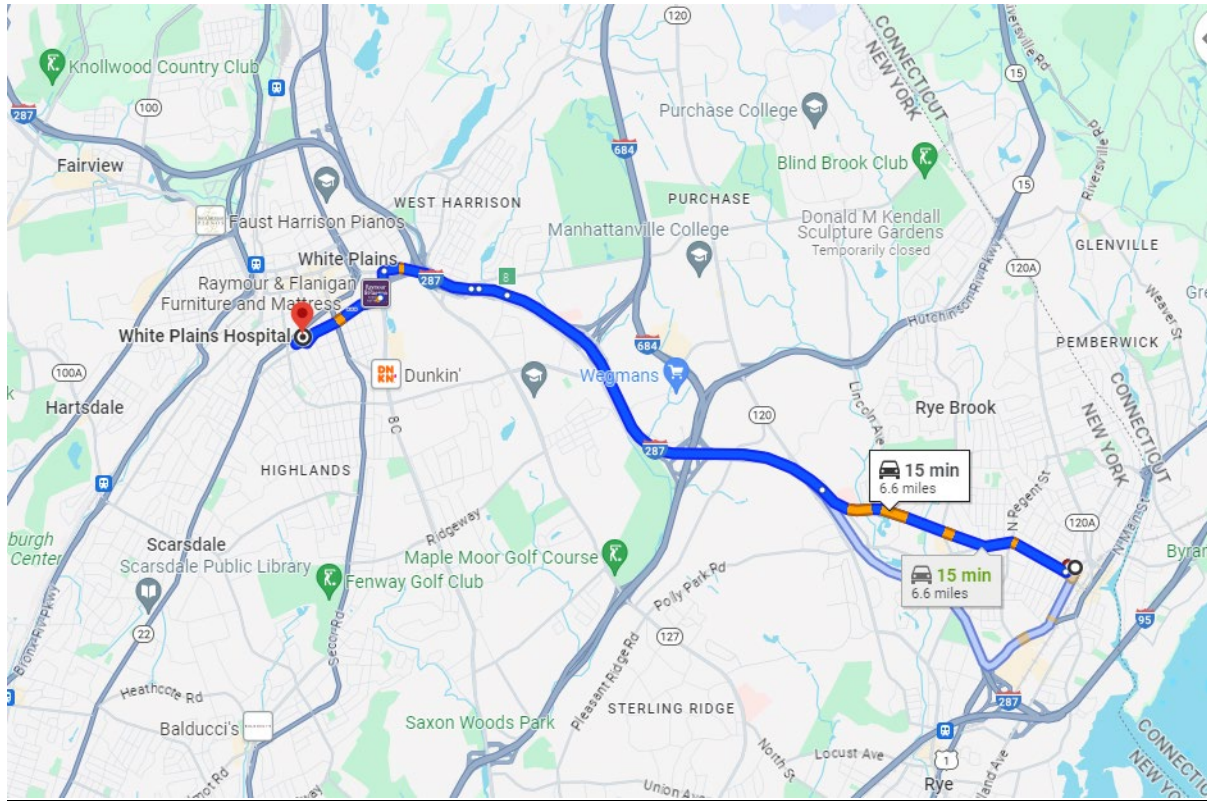
Local Emergency Contacts	Telephone No.
EMERGENCY	911
White Plains Hospital	(914) 681-0600
Police Emergency	911
Fire Emergency	911
Rescue Squad	911
Ambulance	911
Miscellaneous Contacts	Telephone No.
N.Y. Poison Control Center	(800) 222-1222
National Response Center and Terrorist Hotline	(800) 424-8802
Center for Disease Control	(800) 311-3435
Utility Mark-Out	(800) 962-7962

10.6.1 DIRECTIONS TO HOSPITAL

White Plains Hospital
41 E Post Road, White Plains, NY
(914) 681-0600

Directions to Hospital:

Figure10.1



157 Irving Ave
Port Chester, NY 10573

Take Irving Ave to Westchester Ave

- 59 sec (0.1 mi)
- ↑ 1. Head northwest on Irving Ave toward Palace Pl
299 ft
 - ↩ 2. Turn left onto Poningo St
269 ft

Continue on Westchester Ave to your destination in White Plains

- 14 min (6.4 mi)
- ↘ 3. Turn right onto Westchester Ave
1.9 mi
 - ⬆ 4. Use the left lane to merge onto I-287 W via the ramp to White Plains/Tappan Zee Br
2.8 mi
 - ↘ 5. Take exit 8 for Westchester Avenue toward Westchester Mall Pl/White Plains
0.2 mi
 - ⬆ 6. Merge onto Westchester Ave
295 ft
 - ↩ 7. Keep left to stay on Westchester Ave
0.6 mi
 - ↩ 8. Use the left 2 lanes to turn left onto Bloomingdale Rd
0.2 mi
 - ↘ 9. Turn right onto Maple Ave
0.6 mi
 - ↘ 10. Turn right
 ⓘ Destination will be on the right
 1 min (449 ft)

White Plains Hospital
41 E Post Rd, White Plains, NY 10601

White Plains Hospital is depicted on **Figure 10.1**

11.0 LOGS, REPORTS, AND RECORDKEEPING

11.1 HASP AND FIELD CHANGE REPORT

The following is a summary of required health and safety logs, reports, and record keeping for the operations at the subject Site. The field change request form is presented as Attachment 3.

11.2 MEDICAL AND TRAINING RECORDS

The HSM must obtain and keep a log of personnel meeting appropriate training and medical qualifications for the site work. The log will be kept in the project file. Each company's Human Resources Department will maintain medical records, in accordance with 29 CFR 1910.1020.

11.3 EXPOSURE RECORDS

Any personnel monitoring results, laboratory reports, calculations, and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR 1910.1020. For SESI employees, the originals will be sent to the Human Resources Manager. For subcontractor employees, the original file will be sent to the subcontractor employer with a copy maintained in the SESI project file.

11.4 ACCIDENT/INCIDENT REPORT

Any accident/incident reports must be completed following procedures given in Section 10.5 of this HASP. The originals will be sent to the HSM for maintenance. A copy of the forms will be kept in the project file. (See Attachment 4).

11.5 OSHA FORM 200

An OSHA Form 200 (Log of Occupational Injuries and Illnesses) will be kept at the project Site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the Human Resources Manager for maintenance. Subcontractor employees must also meet the requirements of maintaining an OSHA 200 Form. The accident/incident report meets the requirements of OSHA Form 101 (Supplemental Record), which must be maintained with the OSHA Form 200 for all recordable injuries or illnesses.

11.6 ON-SITE HEALTH AND SAFETY FIELD LOGBOOK

The HSM or designee will maintain an on-Site health and safety logbook in which daily Site conditions, activities, personnel, and significant events will be recorded. Calibration records and personnel monitoring results, if available, will also be recorded in the field logbook. The original logbook will be kept in the project file.

Whenever any personnel monitoring is conducted onsite, the monitoring results will be noted in the filed logbook. These will become part of the exposure records file and will be maintained by the HSM.

A signatory page is included (See Attachment 5) and is to be signed by those working on and/or visiting the Site.

11.7 SAFETY DATA SHEETS

Safety Data Sheets (SDS) will be obtained and kept on file at the project site for each hazardous chemical brought to, use, or stored at the Site (See Attachment 6).

12.0 COVID RESPONSE ACTION PLAN

SESI is concerned with the safety and well-being of its employees, vendors, subcontractors, and others with access to its offices and job sites, with particular emphasis on the unique challenges posed by COVID-19.

SESI has established the following protocols in keeping with the recommendations of the CDC and other sources including State Governor Executive Orders for work taking place on construction sites.

We request that all SESI employees, vendors, and subcontractors help with our prevention efforts while at work.

In order to minimize the spread of COVID-19, we must all cooperate in doing the following:

- Frequently wash your hands with soap and water for at least 20 seconds. When soap and running water are unavailable, use an alcohol-based hand rub with at least 60% alcohol. Always wash hands that are visibly soiled.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
- Discourage handshaking, avoid touching your eyes, nose, or mouth with unwashed hands.
- Limit the sharing of tools, machinery, equipment, phones, desks, and computers.
- Wear cloth face coverings on all construction sites.
- Avoid close contact with people who are sick.
- Employees who have symptoms (i.e., fever, cough, or shortness of breath) should notify their supervisor and stay home—DO NOT GO TO WORK.
- Sick employees should follow CDC-recommended steps. Employees should not return to work until the criteria to discontinue home isolation are met, in consultation with healthcare providers and state and local health departments.

The following are the specific jobsite protocols and response actions to be taken in the event someone on Site has been in contact with, or has themselves, the COVID-19 virus:

OFFICE/JOBSITE PROTOCOL

- If an employee/worker exhibits COVID-19 symptoms, the employee/worker must remain at home until he or she is symptom free for 72 hours (three [3] full days) without the use of fever-reducing or other symptom-altering medicines (e.g. acetaminophen, cough suppressants). SESI will similarly require an employee or worker that reports to work with symptoms to return home until they are symptom free for 72 hours (three [3] full days).
- Limit person to person contact, and when unavoidable, maintain CDC distancing guidelines.
- Avoid eating lunch in groups.
- Avoid in-person meetings if possible. If an in-person meeting is necessary, conduct it in a well-ventilated area with enough space for attendees to distance themselves from one another. Field jobsite meetings should be conducted in smaller group meetings (no more than five [5] persons when possible) versus one large meeting.
- Only workers necessary to the execution of the work should be at the jobsites. No non-essential visitors should be permitted at the worksite.

RESPONSE ACTION TRIGGER EVENTS:

- an employee/worker at work has tested positive for COVID-19
- an employee/worker at work has suspected, but unconfirmed, case of COVID-19
- an employee/worker self-reported that they came in contact with someone who had a presumptive positive case of COVID-19
- an employee/worker has been exposed to the virus but only found out after they have interacted with others

RESPONSE ACTIONS:

- Upon occurrence of any of the Trigger Events above, employees/subcontractors shall notify SESI Management about the suspected employee/worker infected with, or exposed to, COVID-19.
- SESI Management will investigate the incident to confirm the report is valid.
- Employees/Subcontractors shall investigate their respective infected employee(s) and report the following to SESI Management and HR:
 - Identify all individuals who worked in proximity (six feet) of the infected employee/worker,
 - Employee(s)/Worker(s) infected with the COVID-19 virus, and employee(s)/worker(s) that came in contact with the infected employee/worker shall be sent home for a period of 14 days,
 - Do not identify the infected employee/worker by name to avoid violation of privacy/confidentiality laws, and,
 - Keep SESI Management informed of progress and updates.
- If an infected person was in the office, SESI will clean and disinfect common areas and surfaces, in accordance with CDC recommendations.
- SESI Management will notify affected employees/workers of the Trigger Event and instruct them to take the response actions above.
- **SESI Management policy requires written documentation from a health care professional that confirmed infected employees can return to work.**

Except for circumstances in which SESI is legally required to report workplace occurrences of communicable disease, the confidentiality of all medical conditions will be maintained in accordance with applicable law and to the extent practical under the circumstances. When required, the number of persons who will be informed of an employee's/worker's condition will be kept at the minimum needed to appropriately notify other potentially affected employees/workers of Trigger Events and to attempt to minimize the potential for transmission of the virus.

Attachment 1:

Air Monitor Log

Air Monitoring: Sample Collection and Analysis

Date & Time of Monitoring	Task / Operation Being	Substance(s)/ Hazard(s) Being	Monitoring Location	Type/Method of Monitoring	Monitoring Results	Exposure Limits	Required Action

Attachment 2: OSHA Poster

Job Safety and Health

It's the law!



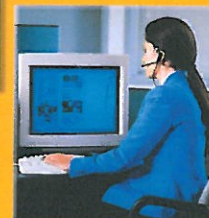
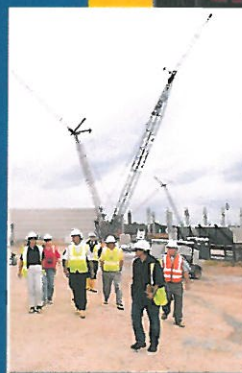
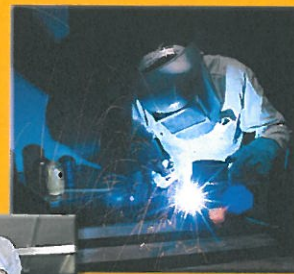
EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

This free poster available from OSHA –
The Best Resource for Safety and Health



Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

1-800-321-OSHA (6742)
www.osha.gov

OSHA 3165-02 2012R



Attachment 3:
Field Change Request Form

HEALTH & SAFETY PLAN CHANGE NOTICE

Pages ____ of ____

Project: _____ H&S-CN

1) HASP VERSION: _____ SECTION: _____ PAGE (s): _____
RE: --- Change to existing HASP Anticipated Revision Date: _____
--- Addition to existing HASP
--- Other: _____
_____ CONT. _____

2) PROPOSED CHANGE: _____

3) REASON FOR PROPOSED CHANGE(s):
--- Required by SPEC or Change Order --- Other: _____
--- Disposition of Deficiency _____ CONT. _____
--- Change in Regulatory or Other Requirements
--- Operational Experience

4) EXHIBITS ATTACHED ____ NO ____ YES (If YES, describe) _____
_____ CONT. _____

5) PMK APPROVALS PROJECT MANAGER: _____ Date: _____
SITE MANAGER: _____ Date: _____
H&S MANAGER: _____ Date: _____
Client Approval Required: ____ NO ____ YES (If YES, date submitted) _____

6) CLIENT APPROVAL ____ APPROVED ____ REMANDED ____ REJECTED
Comments: _____

_____ CONT. _____
Client Representative: _____ Date: _____

7) DISTRIBUTION AFTER APPROVAL
☒ HASP UPDATE LIST --- OTHER: _____
☒ CLIENT _____
☒ PROJECT FILES _____

8) PREPARED BY: _____ Date: _____
Title: _____

Attachment A:
Injury Report Form

OSHA's Form 301

Injury and Illness Incident Report

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

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



Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Information about the employee

- 1) Full name _____
- 2) Street _____
City _____ State _____ ZIP _____
- 3) Date of birth ____/____/____
- 4) Date hired ____/____/____
- 5) ☐ Male
☐ Female

Information about the physician or other health care professional

- 6) Name of physician or other health care professional _____

- 7) If treatment was given away from the worksite, where was it given?
Facility _____
Street _____
City _____ State _____ ZIP _____

- 8) Was employee treated in an emergency room?
☐ Yes
☐ No

- 9) Was employee hospitalized overnight as an inpatient?
☐ Yes
☐ No

Information about the case

- 10) Case number from the *Log* _____ (Transfer the case number from the *Log* after you record the case.)
- 11) Date of injury or illness ____/____/____
- 12) Time employee began work ____ AM / PM
- 13) Time of event ____ AM / PM ☐ Check if time cannot be determined

- 14) **What was the employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

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

- 16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." *Examples:* "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

- 17) **What object or substance directly harmed the employee?** *Examples:* "concrete floor"; "chlorine"; "radial arm saw." *If this question does not apply to the incident, leave it blank.*

- 18) **If the employee died, when did death occur?** Date of death ____/____/____

Completed by _____
Title _____
Phone (____) _____ Date ____/____/____

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

Form approved OMB no. 1218-0176


City _____ State _____


Describe the case


(F)
Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., *Second degree burns on right forearm from acetylene torch*)


CHECK ONLY ONE box for each case based on the most serious outcome for that case:


Check the "Injury" column or choose one type of illness:


Injury 

Skin disorder 

Respiratory condition 

Poisoning 

Hearing loss 

All other illnesses 

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slightly textured appearance and is set against a dark background.

Page ____ of ____

(1)	Injury
(2)	Skin disorder
(3)	Respiratory condition
(4)	Poisoning
(5)	Hearing loss
(6)	All other illnesses

Summary of Work-Related Injuries and Illnesses

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entire from every page of the Log. If you had no cases, write "0."

Employers, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
(g) _____	(h) _____	(i) _____	(j) _____

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
(k) _____	(l) _____

Injury and Illness Types

Total number of ... (m) _____	
(1) Injuries _____	(4) Poisonings _____
(2) Skin disorders _____	(5) Hearing loss _____
(3) Respiratory conditions _____	(6) All other illnesses _____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspect of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name _____

Street _____

City _____ State _____ ZIP _____

Industry description (e.g., *Manufacture of motor truck trailers*) _____

Standard Industrial Classification (SIC), if known (e.g., 3715) _____

OR

North American Industrial Classification (NAICS), if known (e.g., 336212) _____

Employment information (If you don't have these figures, see the Worksheet on the back of this page to estimate.)

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive _____ Title _____
() _____ / /
Phone _____ Date _____

Attachment 5: Signatory Page

Attachment 5 – Site-Specific Health and Safety Orientation Signatory Page
HEALTH AND SAFETY PLAN

Title	Name	Signature
Project Manager:	TBD	
Health and Safety Manager:	TBD	

I have read the attached Health and Safety Plan (HASP) and have received site-specific information and orientation regarding the identified physical, chemical, and biological hazards anticipated at this site. My signature certifies that I understand the procedures, equipment, and restrictions applicable to this project site and agree to abide by them.

Signature	Printed Name	Company	Date

Attachment 5– Health and Safety Orientation Signatory Page (continued)

[illegible]

Attachment 6:
Safety Data Sheets

SAFETY DATA SHEET

Version 4.7
Revision Date 05/27/2016
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,3-Butadiene

Product Number : 295035
Brand : Aldrich
Index-No. : 601-013-00-X

CAS-No. : 106-99-0

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H220 : Extremely flammable gas.
H280 : Contains gas under pressure; may explode if heated.
H340 : May cause genetic defects.
H350 : May cause cancer.

Precautionary statement(s)

P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and understood.
P210 : Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₄ H ₆
Molecular weight	: 54.09 g/mol
CAS-No.	: 106-99-0
EC-No.	: 203-450-8
Index-No.	: 601-013-00-X

Hazardous components

Component	Classification	Concentration
1,3-Butadiene		
	Flam. Gas 1; Press. Gas Liquefied gas; Muta. 1B; Carc. 1A; H220, H280, H340, H350	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

Contents under pressure. Air sensitive. Light sensitive. Shock or heat may detonate May explode when heated. Handle and store under inert gas.

Storage class (TRGS 510): Gases

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Potential Occupational Carcinogen See Appendix A		
1,3-Butadiene	106-99-0	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cancer Suspected human carcinogen		
		TWA	2.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cancer Suspected human carcinogen		
		TWA	1 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		

		TWA	1.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		
		STEL	5.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		
		STEL	5 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Substance listed; for more information see OSHA document 29 CFR 1910.1051; 29 CFR 1910.19(1)		
		See 1910.1051		
		PEL	1.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1051 This section applies to all occupational exposures to 1,3-Butadiene (BD), Chemical Abstracts Service Registry No. 106-99-0, except as provided in paragraph (a)(2) of this section. Except for the recordkeeping provisions in paragraph (m)(1) of this section, this section does not apply to the processing, use, or handling of products containing BD or to other work operations and streams in which BD is present where objective data are reasonably relied upon that demonstrate the work operation or the product or the group of products or operations to which it belongs may not reasonably be foreseen to release BD in airborne concentrations at or above the action level or in excess of the STEL under the expected conditions of processing, use, or handling that will cause the greatest possible release or in any plausible accident. This section also does not apply to work operations, products or streams where the only exposure to BD is from liquid mixtures containing 0.1% or less of BD by volume or the vapors released from such liquids, unless objective data become available that show that airborne concentrations generated by such mixtures can exceed the action level or STEL under reasonably predictable conditions of processing, use or handling that will cause the greatest possible release. Except for labeling requirements and requirements for emergency response, this section does not apply to the storage, transportation, distribution or sale of BD or liquid mixtures in intact containers or in transportation pipelines sealed in such a manner as to fully contain BD vapors or liquid. Where products or processes containing BD are exempted under paragraph (a)(2) of this section, the employer shall maintain records of the objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in paragraph (m)(1) of this section 1,3-Butadiene means an organic compound with chemical formula $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$ that has a molecular weight of approximately 54.15 g/mole OSHA specifically regulated carcinogen		
		STEL	5.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1051 This section applies to all occupational exposures to 1,3-Butadiene (BD), Chemical Abstracts Service Registry No. 106-99-0, except as provided in paragraph (a)(2) of this section. Except for the recordkeeping provisions in paragraph (m)(1) of this section, this section does not apply to the processing, use, or handling of		

		<p>products containing BD or to other work operations and streams in which BD is present where objective data are reasonably relied upon that demonstrate the work operation or the product or the group of products or operations to which it belongs may not reasonably be foreseen to release BD in airborne concentrations at or above the action level or in excess of the STEL under the expected conditions of processing, use, or handling that will cause the greatest possible release or in any plausible accident. This section also does not apply to work operations, products or streams where the only exposure to BD is from liquid mixtures containing 0.1% or less of BD by volume or the vapors released from such liquids, unless objective data become available that show that airborne concentrations generated by such mixtures can exceed the action level or STEL under reasonably predictable conditions of processing, use or handling that will cause the greatest possible release. Except for labeling requirements and requirements for emergency response, this section does not apply to the storage, transportation, distribution or sale of BD or liquid mixtures in intact containers or in transportation pipelines sealed in such a manner as to fully contain BD vapors or liquid. Where products or processes containing BD are exempted under paragraph (a)(2) of this section, the employer shall maintain records of the objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in paragraph (m)(1) of this section</p> <p>1,3-Butadiene means an organic compound with chemical formula $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$ that has a molecular weight of approximately 54.15 g/mole</p> <p>OSHA specifically regulated carcinogen</p>		
		PEL	1 ppm 2.2 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		see section 5201		
		STEL	5 ppm 11 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		see section 5201		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,3-Butadiene	106-99-0	1,2 Dihydroxy-4-(N-acetylcysteinyl)-butane	2.5000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Mixture of N-1 and N-2(hydroxybutenyl)valine	2.5pmol/g	Hemoglobin (Hb) adducts in blood	ACGIH - Biological Exposure Indices (BEI)
		Not critical			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|--|
| a) Appearance | Form: Liquefied gas |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -109 °C (-164 °F) - lit. |
| f) Initial boiling point and boiling range | -4.5 °C (23.9 °F) - lit. |
| g) Flash point | -76 °C (-105 °F) - closed cup - Tested according to Annex V of Directive 67/548/EEC. |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |

j) Upper/lower flammability or explosive limits	Upper explosion limit: 16.3 %(V) Lower explosion limit: 1.4 %(V)
k) Vapour pressure	ca.2,400 hPa (1,800 mmHg) at 20 °C (68 °F) 3,200 hPa (2,400 mmHg) at 30 °C (86 °F) 5,700 hPa (4,275 mmHg) at 50 °C (122 °F)
l) Vapour density	No data available
m) Relative density	0.62 g/cm ³ at 20 °C (68 °F)
n) Water solubility	0.5 g/l at 20 °C (68 °F) - Tested according to Annex V of Directive 67/548/EEC.
o) Partition coefficient: n-octanol/water	log Pow: 1.85 at 23 °C (73 °F)
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Test for peroxide formation before using or discard after 3 months.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents, Oxygen, Copper, Copper alloys, Carbides, Halogens, Metal oxides, Metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 5,480 mg/kg

LC50 Inhalation - Rat - 4 h - 285 mg/l

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

In vivo tests showed mutagenic effects

Carcinogenicity

Carcinogenicity - Rat - Inhalation

Tumorigenic: Carcinogenic by RTECS criteria. Cardiac: Tumors. Lungs, Thorax, or Respiration: Tumors.

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

Human carcinogen.

IARC: 1 - Group 1: Carcinogenic to humans (1,3-Butadiene)

NTP: Known to be human carcinogen (1,3-Butadiene)

OSHA: OSHA specifically regulated carcinogen (1,3-Butadiene)

Reproductive toxicity

No data available

Reproductive toxicity - Mouse - Inhalation

Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

No data available

Developmental Toxicity - Rat - Inhalation

Specific Developmental Abnormalities: Musculoskeletal system.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Cholinesterase inhibitors can cause heavy salivation and secretion in the lungs, lachrymation, blurred vision, involuntary defecation, diarrhea, tremor, ataxia, sweating, hypothermia, lowered heart rate, and/or a fall in blood pressure as a result of their action at cholinergic nerve sites., narcosis, Headache, Nausea, Vomiting, Dizziness, Drowsiness, Confusion., Weakness, Muscle cramps/spasms., Change in pupil size., Tremors, Seizures., Incoordination., Convulsions, Coma

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - other fish - 71.5 mg/l - 24 h

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1010 Class: 2.1
Proper shipping name: Butadienes, stabilized
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1010 Class: 2.1
Proper shipping name: BUTADIENES, STABILIZED

EMS-No: F-D, S-U

IATA

UN number: 1010 Class: 2.1
Proper shipping name: Butadienes, stabilized
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

SARA 311/312 Hazards

Fire Hazard, Sudden Release of Pressure Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,3-Butadiene	106-99-0	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the		

State of California to cause cancer.
1,3-Butadiene

106-99-0

2007-09-28

WARNING: This product contains a chemical known to the
State of California to cause birth defects or other reproductive
harm.
1,3-Butadiene

CAS-No.
106-99-0

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H340	May cause genetic defects.
H350	May cause cancer.
Muta.	Germ cell mutagenicity
Press. Gas	Gases under pressure

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	3

NFPA Rating

Health hazard:	0
Fire Hazard:	4
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7

Revision Date: 05/27/2016

Print Date: 10/19/2018

SAFETY DATA SHEET

Version 6.0
Revision Date 05/26/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,3-Dichlorobenzene

Product Number : 113808

Brand : Aldrich

Index-No. : 602-067-00-7

CAS-No. : 541-73-1

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 4), H227

Acute toxicity, Oral (Category 4), H302

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 2), H411

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)
H227
H302

Combustible liquid.
Harmful if swallowed.

H411	Toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular weight	: 147.00 g/mol
CAS-No.	: 541-73-1
EC-No.	: 208-792-1
Index-No.	: 602-067-00-7

Hazardous components

Component	Classification	Concentration
1,3-Dichlorobenzene		
	Flam. Liq. 4; Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H227, H302, H411	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 10: Combustible liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 37 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -25 - -22 °C (-13 - -8 °F) - lit. |
| f) Initial boiling point and boiling range | 172 - 173 °C (342 - 343 °F) - lit. |
| g) Flash point | 67.0 °C (152.6 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |

m) Relative density	1.288 g/cm ³ at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 5
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 1,062 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (1,3-Dichlorobenzene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 7.8 mg/l - 96.0 h(1,3-Dichlorobenzene)

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 1.7 mg/l - 48 h(1,3-Dichlorobenzene)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Pimephales promelas (fathead minnow) - 32 d
- 0.3 mg/l(1,3-Dichlorobenzene)

Bioconcentration factor (BCF): 97

12.4 Mobility in soil

No data available(1,3-Dichlorobenzene)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (1,3-Dichlorobenzene)
Reportable Quantity (RQ) : 100 lbs

Marine pollutant: no

Poison Inhalation Hazard: No

IMDG

UN number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (1,3-Dichlorobenzene)
Marine pollutant : yes

IATA

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (1,3-Dichlorobenzene)

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	2007-07-01

California Prop. 65 Components

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

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H227	Combustible liquid.
H302	Harmful if swallowed.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	
Flammability:	2
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/26/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Creation Date 01-Feb-2005

Revision Date 24-Dec-2021

Revision Number 5

1. Identification

Product Name 1,2,4-Trimethylbenzene

Cat No. : AC140090000; AC140090010; AC140090025; AC140090100;
AC140090250

CAS No 95-63-6
Synonyms Pseudocumene

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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	Category 3
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Warning

Hazard Statements

Flammable liquid and vapor
Causes skin irritation
Causes serious eye irritation
Harmful if inhaled
May cause respiratory irritation

**Precautionary Statements****Prevention**

Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

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 skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing 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 eye irritation persists: Get medical advice/attention

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

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)

Toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Benzene, 1,2,4-trimethyl-	95-63-6	> 95

4. First-aid measures

General Advice

If symptoms persist, call a physician.

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 plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water.
Most important symptoms and effects	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	48 °C / 118.4 °F
Method -	No information available
Autoignition Temperature	500 °C / 932 °F
Explosion Limits	
Upper	6.4%
Lower	0.9%
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).

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
2

Flammability
2

Instability
0

Physical hazards
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.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Remove all sources of ignition. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.
Storage.	Keep away from heat, sparks and flame. Flammables area. Keep container tightly closed in a dry and well-ventilated place. Incompatible Materials. Oxidizing agent.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Benzene, 1,2,4-trimethyl-			TWA: 25 ppm TWA: 125 mg/m ³	

Legend

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures	Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting equipment.
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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	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-44 °C / -47.2 °F
Boiling Point/Range	168 °C / 334.4 °F @ 760 mmHg
Flash Point	48 °C / 118.4 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.4%
Lower	0.9%
Vapor Pressure	7 mmHg @ 44.4 °C
Vapor Density	4.15 (Air = 1.0)
Specific Gravity	0.880
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	500 °C / 932 °F

Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C ₉ H ₁₂
Molecular Weight	120.19

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	No information available.
Conditions to Avoid	Keep away from open flames, hot surfaces and sources of ignition. Incompatible products.
Incompatible Materials	Oxidizing agent
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Benzene, 1,2,4-trimethyl-	LD50 = 3280 mg/kg (Rat)	LD50 > 3160 mg/kg (Rabbit)	LC50 = 18 g/m ³ (Rat) 4 h

Toxicologically Synergistic Products No information available

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
Benzene, 1,2,4-trimethyl-	95-63-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects	No information available
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
Symptoms / effects, both acute and delayed	Symptoms of overexposure may be 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**

The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Benzene, 1,2,4-trimethyl-	Not listed	LC50: 7.19 - 8.28 mg/L, 96h flow-through (Pimephales promelas)	Not listed	EC50: = 6.14 mg/L, 48h (Daphnia magna)

Persistence and Degradability

Persistence is unlikely

Bioaccumulation/ Accumulation

No information available.

Mobility

. Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Benzene, 1,2,4-trimethyl-	3.63

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 UN1993
 Proper Shipping Name Flammable liquid, n.o.s.
 Technical Name Benzene, 1,2,4-trimethyl-
 Hazard Class 3
 Packing Group III

TDG

UN-No UN1993
 Proper Shipping Name Flammable liquid, n.o.s.
 Hazard Class 3
 Packing Group III

IATA

UN-No UN1993
 Proper Shipping Name Flammable liquid, n.o.s.
 Hazard Class 3
 Packing Group III

IMDG/IMO

UN-No UN1993
 Proper Shipping Name Flammable liquid, n.o.s.
 Hazard Class 3
 Packing Group III

15. Regulatory information**United States of America Inventory**

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Benzene, 1,2,4-trimethyl-	95-63-6	X	ACTIVE	-

Legend:

TSCA US EPA (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/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Benzene, 1,2,4-trimethyl-	95-63-6	X	-	202-436-9	X	X	X	X	X	KE-34410

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)**U.S. Federal Regulations****SARA 313**

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Benzene, 1,2,4-trimethyl-	95-63-6	> 95	1.0

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 Not applicable

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
Benzene, 1,2,4-trimethyl-	X	X	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

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Benzene, 1,2,4-trimethyl-	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Benzene, 1,2,4-trimethyl-	95-63-6	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Benzene, 1,2,4-trimethyl-	95-63-6	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information**Prepared By**

Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date

01-Feb-2005

Revision Date

24-Dec-2021

Print Date

24-Dec-2021

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

End of SDS

SAFETY DATA SHEET

Creation Date 22-Jun-2009

Revision Date 26-Dec-2021

Revision Number 6

1. Identification

Product Name 2,2,4-Trimethylpentane

Cat No. : AC421980000; AC421980025; AC421980040; AC421985000

CAS No 540-84-1
Synonyms Isooctane

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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	Category 2
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Aspiration Toxicity	Category 1

Label Elements**Signal Word**

Danger

Hazard Statements

Highly flammable liquid and vapor

May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause drowsiness or dizziness

**Precautionary Statements****Prevention**

Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response

Get medical attention/advice 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 skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing 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 eye irritation persists: Get medical advice/attention

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Isooctane	540-84-1	>95

4. First-aid measures

General Advice	If symptoms persist, call a physician.
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 plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).
Ingestion	Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.
Most important symptoms and effects	None reasonably foreseeable. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	Water may be ineffective, Do not use a solid water stream as it may scatter and spread fire
Flash Point	-12 °C / 10.4 °F
Method -	No information available
Autoignition Temperature	410 °C / 770 °F
Explosion Limits	
Upper	6.0 vol %
Lower	1.1 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

Protective Equipment and Precautions for Firefighters

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

NFPA

Health
3

Flammability
3

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
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Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Soak up with inert absorbent material. 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 Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage. Keep away from open flames, hot surfaces and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat, sparks and flame. Incompatible Materials. Strong oxidizing agents. Strong acids. Strong bases.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Isooctane	TWA: 300 ppm			TWA: 300 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

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

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Petroleum distillates
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-107 °C / -160.6 °F
Boiling Point/Range	98 - 99 °C / 208.4 - 210.2 °F @ 760 mmHg
Flash Point	-12 °C / 10.4 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable

Flammability or explosive limits

Upper	6.0 vol %
Lower	1.1 vol %
Vapor Pressure	51 mbar @ 20 °C
Vapor Density	3.94
Specific Gravity	0.690
Solubility	Immiscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	410 °C / 770 °F
Decomposition Temperature	No information available
Viscosity	0.51 mPa s at 22 °C
Molecular Formula	C8 H18
Molecular Weight	114.23

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Heat, flames and sparks. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong acids, Strong bases
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity**Product Information****Component Information**

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Isooctane	LD50 5000 mg/kg (Rat)	2000 mg/kg (Rabbit)	LC50 = 33.52 mg/L (Rat) 4 h

Toxicologically Synergistic Products	No information available
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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
Isooctane	540-84-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects	No information available
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Reproductive Effects	No information available.
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Developmental Effects	No information available.
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Teratogenicity	No information available.
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STOT - single exposure	Central nervous system (CNS)
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STOT - repeated exposure	None known
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	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

Very toxic 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
Isooctane	EC50= 2.94 mg/l, 72h	LC50 = 0.11 mg/l, 96h, (Rainbow trout)	Not listed	EC50= 0.4 mg/l, 48h (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available. Immiscible with water

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility. Is not likely mobile in the environment due its low water solubility.

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	UN1262
Proper Shipping Name	OCTANES
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1262
Proper Shipping Name	OCTANES
Hazard Class	3
Packing Group	II

IATA

UN-No	UN1262
Proper Shipping Name	OCTANES
Hazard Class	3
Packing Group	II

IMDG/IMO

UN-No	UN1262
Proper Shipping Name	OCTANES
Hazard Class	3
Packing Group	II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification -	TSCA - EPA Regulatory
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			Active-Inactive	Flags
Isooctane	540-84-1	X	ACTIVE	-

Legend:

TSCA US EPA (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/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Isooctane	540-84-1	X	-	208-759-1	X	X	X	X	X	KE-34634

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)**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

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Isooctane	X		-

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
Isooctane	1000 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
Isooctane	X	X	X	X	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y

DOT Marine Pollutant Y

DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Isooctane	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Isooctane	540-84-1	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Isooctane	540-84-1	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By

Regulatory Affairs
Acros Organics BVBA
Tel: 800-ACROS-01

Creation Date

22-Jun-2009

Revision Date

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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

End of SDS

SAFETY DATA SHEET

Version 4.16
Revision Date 06/21/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 2-Butanone

Product Number : 443468
Brand : Sigma-Aldrich
Index-No. : 606-002-00-3

CAS-No. : 78-93-3

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H319

Causes serious eye irritation.

H336

May cause drowsiness or dizziness.

Precautionary statement(s)

P210

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Methyl ethyl ketone MEK Ethyl methyl ketone
Formula	: C ₄ H ₈ O
Molecular weight	: 72.11 g/mol
CAS-No.	: 78-93-3
EC-No.	: 201-159-0
Index-No.	: 606-002-00-3
Registration number	: 01-2119457290-43-XXXX

Hazardous components

Component	Classification	Concentration
Ethyl methyl ketone		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Flash back possible over considerable distance., Container explosion may occur under fire conditions.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Store under inert gas. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Hygroscopic.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethyl methyl ketone	78-93-3	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		
		STEL	300 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		
		TWA	200 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	300 ppm 885 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	200 ppm 590 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		PEL	200 ppm 590 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	300 ppm 885 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	methyl ethyl ketone	2 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 292 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | -87 °C (-125 °F) |
| f) Initial boiling point and boiling range | 80 °C (176 °F) - lit. |
| g) Flash point | -3 °C (27 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 10.1 %(V)
Lower explosion limit: 1.8 %(V) |
| k) Vapour pressure | 95 hPa (71 mmHg) at 20 °C (68 °F) |
| l) Vapour density | 2.49 - (Air = 1.0) |
| m) Relative density | 0.805 g/mL at 25 °C (77 °F) |
| n) Water solubility | soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 0.29 |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

- | | |
|-------------------------|----------------------------|
| Surface tension | 24.6 mN/m at 20 °C (68 °F) |
| Relative vapour density | 2.49 - (Air = 1.0) |

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Exposure to moisture

Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents, Strong reducing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,737 mg/kg

LC50 Inhalation - Mouse - 4 h - 32,000 mg/m³

LC50 Inhalation - Mammal - 38,000 mg/m³

LD50 Dermal - Rabbit - 6,480 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irritating to eyes.

(OECD Test Guideline 405)

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: EL6475000

Central nervous system depression, Gastrointestinal disturbance, narcosis

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish	mortality NOEC - <i>Cyprinodon variegatus</i> (sheepshead minnow) - 400 mg/l - 96 h
	LC50 - <i>Pimephales promelas</i> (fathead minnow) - 3,130 - 3,320 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - <i>Daphnia magna</i> (Water flea) - > 520 mg/l - 48 h
	EC50 - <i>Daphnia magna</i> (Water flea) - 7,060 mg/l - 24 h

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

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1193	Class: 3	Packing group: II
Proper shipping name: Ethyl methyl ketone		
Reportable Quantity (RQ): 5000 lbsReportable Quantity (RQ): 5000 lbsReportable Quantity (RQ): 100 lbs		
Poison Inhalation Hazard: No		

IMDG

UN number: 1193	Class: 3	Packing group: II	EMS-No: F-E, S-D
Proper shipping name: ETHYL METHYL KETONE			

IATA

UN number: 1193 Class: 3
Proper shipping name: Ethyl methyl ketone

Packing group: II

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity :
D035 lbs
F005 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethyl methyl ketone	78-93-3	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethyl methyl ketone	78-93-3	1993-02-16

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.16

Revision Date: 06/21/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Creation Date 13-Feb-2015

Revision Date 24-Dec-2021

Revision Number 4

1. Identification

Product Name 2-Hexanone

Cat No. : AC146880000; AC146880025; AC146881000; AC146885000

CAS No 591-78-6
Synonyms Butyl methyl ketone; Methyl butyl ketone

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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	Category 3
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Peripheral Nervous System (PNS).	

Label Elements**Signal Word**

Danger

Hazard Statements

Flammable liquid and vapor
May cause drowsiness or dizziness

Suspected of damaging fertility
Causes damage to organs through prolonged or repeated exposure



Precautionary Statements

Prevention

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

None identified

WARNING. Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
2-Hexanone	591-78-6	98

4. First-aid measures

General Advice

Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO ₂ , dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	23 °C / 73.4 °F
Method -	No information available
Autoignition Temperature	423 °C / 793.4 °F
Explosion Limits	
Upper	8.00 vol %
Lower	1.2 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
2

Flammability
2

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. 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	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe mist/vapors/spray. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.
Storage.	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong bases. Reducing Agent.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
2-Hexanone	TWA: 5 ppm STEL: 10 ppm Skin	(Vacated) TWA: 5 ppm (Vacated) TWA: 20 mg/m ³ TWA: 100 ppm TWA: 410 mg/m ³	IDLH: 1600 ppm TWA: 1 ppm TWA: 4 mg/m ³	TWA: 5 ppm STEL: 10 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures	Ensure adequate ventilation, especially in confined areas. Use explosion-proof 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	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Light yellow
Odor	pungent
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-57 °C / -70.6 °F
Boiling Point/Range	127 °C / 260.6 °F
Flash Point	23 °C / 73.4 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	8.00 vol %
Lower	1.2 vol %

Vapor Pressure	20 @ 10 mmHg °C
Vapor Density	3.5 (Air = 1.0)
Specific Gravity	0.810
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	423 °C / 793.4 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C6 H12 O
Molecular Weight	100.16

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Keep away from open flames, hot surfaces and sources of ignition. Incompatible products.
Incompatible Materials	Strong bases, Reducing Agent
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-Hexanone	LD50 = 2590 mg/kg (Rat)	LD50 = 4840 mg/kg (Rabbit)	LC50 = 8000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	No information available
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
2-Hexanone	591-78-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)

STOT - repeated exposure Central nervous system (CNS) Peripheral Nervous System (PNS)

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Symptoms of overexposure may be 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

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
2-Hexanone	Not listed	LC50: = 428 mg/L, 96h flow-through (Pimephales promelas)	Not listed	Not listed

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
2-Hexanone	1.38

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 UN1224
 Proper Shipping Name KETONES, LIQUID, N.O.S.
 Hazard Class 3
 Packing Group III

TDG

UN-No UN1224
 Proper Shipping Name KETONES, LIQUID, N.O.S.
 Hazard Class 3
 Packing Group III

IATA

UN-No UN1224
 Proper Shipping Name KETONES, LIQUID, N.O.S.*
 Hazard Class 3
 Packing Group III

IMDG/IMO

UN-No UN1224
 Proper Shipping Name KETONES, LIQUID, N.O.S.
 Hazard Class 3
 Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
2-Hexanone	591-78-6	X	ACTIVE	S

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

- - Not Listed

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule.

TSCA 12(b) - Notices of Export

Component	CAS No	TSCA 12(b) - Notices of Export
2-Hexanone	591-78-6	Section 5

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
2-Hexanone	591-78-6	X	-	209-731-1	X	X	X	X	X	KE-19818

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)**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** Not applicable**California Proposition 65** This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
2-Hexanone	591-78-6	Developmental Male Reproductive	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
2-Hexanone	X	X	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**Authorisation/Restrictions according to EU REACH**

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
2-Hexanone	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
2-Hexanone	591-78-6	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
2-Hexanone	591-78-6	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By

Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date

13-Feb-2015

Revision Date

24-Dec-2021

Print Date

24-Dec-2021

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

End of SDS

SAFETY DATA SHEET

Version 5.5
Revision Date 06/13/2014
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : 4,4'-DDD

Product Number : 49009
Brand : Supelco

CAS-No. : 72-54-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 Toxic if swallowed.
H312 Harmful in contact with skin.
H351 Suspected of causing cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane
Formula	: C ₁₄ H ₁₀ Cl ₄
Molecular Weight	: 320.04 g/mol
CAS-No.	: 72-54-8
EC-No.	: 200-783-0

Hazardous components

Component	Classification	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410	-

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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, Hydrogen chloride gas
Nature of decomposition products not known.

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

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

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. Normal measures for preventive fire protection.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: solid
b) Odour	no data available
c) Odour Threshold	no data available
d) pH	no data available
e) Melting point/freezing point	94.0 - 96.0 °C (201.2 - 204.8 °F)
f) Initial boiling point and boiling range	193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)
g) Flash point	no data available
h) Evaporation rate	no data available
i) Flammability (solid, gas)	no data available
j) Upper/lower flammability or explosive limits	no data available
k) Vapour pressure	< 0.00001 hPa (< 0.00001 mmHg) at 25.0 °C (77.0 °F)
l) Vapour density	no data available
m) Relative density	1.38 g/cm ³
n) Water solubility	no data available
o) Partition coefficient: n-octanol/water	log Pow: 6.02
p) Auto-ignition temperature	no data available
q) Decomposition temperature	no data available
r) Viscosity	no data available
s) Explosive properties	no data available
t) Oxidizing properties	no data available

9.2 Other safety 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

Other decomposition products - no data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

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

TDLo Oral - Human - 428.5 mg/kg

Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - rat - 6,000 mg/kg

Remarks: Cardiac:Other changes. Gastrointestinal:Other changes. Kidney, Ureter, Bladder:Changes in both tubules and glomeruli.

TDLo Oral - rat - 14 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Estrogenic. Musculoskeletal:Other changes.

TDLo Oral - rat - 2,100 mg/kg

Remarks: Behavioral:Altered sleep time (including change in righting reflex).

Inhalation: no data available

LD50 Dermal - rabbit - 1,200 mg/kg

Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

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

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

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

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

Reproductive toxicity

no data available

no data available

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard

no data available

Additional Information

RTECS: KI0700000

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

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

12.2 Persistence and degradability

no data available

12.3 Bioaccumulative potential

Indication of bioaccumulation.

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2811	Class: 6.1	Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)		
Marine pollutant: No		

Poison Inhalation Hazard: No

IMDG

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

IATA

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-04-24

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5

Revision Date: 06/13/2014

Print Date: 10/19/2018

SAFETY DATA SHEET

Version 5.6
Revision Date 05/07/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 4,4'-DDT

Product Number : 386340
Brand : Aldrich
Index-No. : 602-045-00-7

CAS-No. : 50-29-3

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 : Toxic if swallowed or in contact with skin.
H351 : Suspected of causing cancer.
H372 : Causes damage to organs through prolonged or repeated exposure if swallowed.
H410 : Very toxic to aquatic life with long lasting effects.

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/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
1,1-Bis(4-chlorophenyl)-2,2,2-trichloroethane

Formula : C₁₄H₉Cl₅
Molecular weight : 354.49 g/mol
CAS-No. : 50-29-3
EC-No. : 200-024-3
Index-No. : 602-045-00-7

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane		
	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H372, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: solid

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 107 - 110 °C (225 - 230 °F) - lit.
f) Initial boiling point and boiling range	260.0 °C (500.0 °F)
g) Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	0.99 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 6.91
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Oxidizing agents, Iron and iron salts.

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 87.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: KJ3325000

CNS stimulation.

Pancreas. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d - 0.001 mg/l
	Bioconcentration factor (BCF): 46,670

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Reportable Quantity (RQ): 1 lbsMarine pollutant:yes
Poison Inhalation Hazard: No

IMDG

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

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

Pennsylvania Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

New Jersey Right To Know Components

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	CAS-No. 50-29-3	Revision Date 1993-02-16
---	--------------------	-----------------------------

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 50-29-3	Revision Date 2008-06-17
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No. 50-29-3	Revision Date 2008-06-17
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 50-29-3	Revision Date 2008-06-17
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No. 50-29-3	Revision Date 2008-06-17
---	--------------------	-----------------------------

1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin.
H311	Toxic in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 05/07/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 5.6
Revision Date 05/07/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 4,4'-DDT

Product Number : 386340
Brand : Aldrich
Index-No. : 602-045-00-7

CAS-No. : 50-29-3

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Dermal (Category 3), H311
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 : Toxic if swallowed or in contact with skin.
H351 : Suspected of causing cancer.
H372 : Causes damage to organs through prolonged or repeated exposure if swallowed.
H410 : Very toxic to aquatic life with long lasting effects.

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/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P281	Use personal protective equipment as required.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane
1,1-Bis(4-chlorophenyl)-2,2,2-trichloroethane

Formula : C₁₄H₉Cl₅
Molecular weight : 354.49 g/mol
CAS-No. : 50-29-3
EC-No. : 200-024-3
Index-No. : 602-045-00-7

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane		
	Acute Tox. 3; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H372, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

- 5.1 Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.
- 5.4 Further information**
No data available

6. ACCIDENTAL RELEASE MEASURES

- 6.1 Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.
- 6.2 Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
- 6.3 Methods and materials for containment and cleaning up**
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.
- 6.4 Reference to other sections**
For disposal see section 13.

7. HANDLING AND STORAGE

- 7.1 Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects
- 7.3 Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: solid

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 107 - 110 °C (225 - 230 °F) - lit.
f) Initial boiling point and boiling range	260.0 °C (500.0 °F)
g) Flash point	72.0 - 77.0 °C (161.6 - 170.6 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	0.0000021 hPa (0.0000016 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	0.99 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 6.91
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Oxidizing agents, Iron and iron salts.

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 87.0 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 300.0 mg/kg

Remarks: Behavioral:Tremor. Behavioral:Muscle weakness. Behavioral:Ataxia.

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

IARC: 2A - Group 2A: Probably carcinogenic to humans (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: KJ3325000

CNS stimulation.

Pancreas. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.01 mg/l - 96.0 h LC50 - Lepomis macrochirus (Bluegill) - 0.01 mg/l - 96.0 h LC50 - Oncorhynchus mykiss (rainbow trout) - 0.003400 mg/l - 96.0 h LOEC - Oncorhynchus mykiss (rainbow trout) - 150 mg/l - 3.0 d NOEC - Oncorhynchus mykiss (rainbow trout) - 113 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.00108 mg/l - 48 h
Toxicity to algae	LC100 - Scenedesmus quadricauda (Green algae) - > 20 mg/l - 7 d

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 20 d - 0.001 mg/l
	Bioconcentration factor (BCF): 46,670

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)
Reportable Quantity (RQ): 1 lbsMarine pollutant:yes
Poison Inhalation Hazard: No

IMDG

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

IATA

UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane)

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	1993-02-16

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane	50-29-3	2008-06-17

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311	Toxic if swallowed or in contact with skin.
H311	Toxic in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

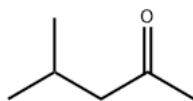
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 05/07/2018

Print Date: 06/22/2019

4-Methyl-2-pentanone



[4-Methyl-2-pentanone structure](#)

CAS No.	108-10-1
Chemical Name:	4-Methyl-2-pentanone
CBNumber:	CB8691781
Molecular Formula:	C ₆ H ₁₂ O Lewis structure
Molecular Weight:	100.16
MDL Number:	MFCD00008938
MOL File:	108-10-1.mol
MSDS File:	SDS
Last updated:	2023-11-28 16:31:44

[Request For Quotation](#)

4-Methyl-2-pentanone Properties ☐

SAFETY ☐

4-Methyl-2-pentanone price ☐

[More Price\(56\)](#)

4-Methyl-2-pentanone Chemical Properties,Uses,Production ☐

[4-Methyl-2-pentanone synthesis](#) ☐

4-Methyl-2-pentanone Preparation Products And Raw materials ☐

[4-Methyl-2-pentanone Suppliers](#) ☐

Related articles ☐

View Lastest Price from 4-Methyl-2-pentanone manufacturers



4-Methyl-2-pentanone Spectrum



108-10-1(4-Methyl-2-pentanone)Related Search:



SAFETY DATA SHEET

Version 3.21
Revision Date 08/21/2018
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Acetone

Product Number : 650501

Brand : Sigma-Aldrich

Index-No. : 606-001-00-8

CAS-No. : 67-64-1

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H319

Causes serious eye irritation.

H336

May cause drowsiness or dizziness.

Precautionary statement(s)

P210

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₃ H ₆ O
Molecular weight	: 58.08 g/mol
CAS-No.	: 67-64-1
EC-No.	: 200-662-2
Index-No.	: 606-001-00-8
Registration number	: 01-2119471330-49-XXXX

Hazardous components

Component	Classification	Concentration
Acetone		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Acetone	67-64-1	TWA	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		

		Not classifiable as a human carcinogen		
		STEL	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	250 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000 ppm 2,400 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		STEL	750 ppm 1,780 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	3,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	500 ppm 1,200 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Acetone	25 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	33.3 mg/kg
Marine water	1.06 mg/l
Fresh water	10.6 mg/l
Marine sediment	3.04 mg/kg
Fresh water sediment	30.4 mg/kg
Onsite sewage treatment plant	100 mg/l

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -94 °C (-137 °F) |
| f) Initial boiling point and boiling range | 56 °C (133 °F) at 1,013 hPa (760 mmHg) |
| g) Flash point | -17.0 °C (1.4 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 13 %(V)
Lower explosion limit: 2 %(V) |
| k) Vapour pressure | 533.3 hPa (400.0 mmHg) at 39.5 °C (103.1 °F)
245.3 hPa (184.0 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.791 g/mL at 25 °C (77 °F) |
| n) Water solubility | completely miscible |
| o) Partition coefficient: n-octanol/water | log Pow: -0.24 |
| p) Auto-ignition temperature | 465.0 °C (869.0 °F) |
| q) Decomposition temperature | No data available |

- | | |
|-------------------------|-------------------|
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

Surface tension	23.2 mN/m at 20.0 °C (68.0 °F)
-----------------	--------------------------------

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Bases, Oxidizing agents, Reducing agents, Acetone reacts violently with phosphorous oxychloride.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 5,800 mg/kg

Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Tremor. Behavioral:Headache. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

LC50 Inhalation - Rat - 8 h - 50,100 mg/m³

Remarks: Drowsiness Dizziness Unconsciousness

LD50 Dermal - Guinea pig - 7,426 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation - 24 h

Respiratory or skin sensitisation

- Guinea pig

Result: Does not cause skin sensitisation.

Germ cell mutagenicity

No data available

Carcinogenicity

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

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as

probable, possible or confirmed human carcinogen by IARC.

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: AL3150000

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

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

Kidney - Irregularities - Based on Human Evidence

Skin - Dermatitis - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - *Oncorhynchus mykiss* (rainbow trout) - 5,540 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates LC50 - *Daphnia magna* (Water flea) - 8,800 mg/l - 48 h

Toxicity to algae Remarks: No data available

12.2 Persistence and degradability

Biodegradability Result: 91 % - Readily biodegradable.
(OECD Test Guideline 301B)

12.3 Bioaccumulative potential

Does not bioaccumulate.

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1090 Class: 3 Packing group: II
Proper shipping name: Acetone
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1090 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ACETONE

IATA

UN number: 1090 Class: 3 Packing group: II
Proper shipping name: Acetone

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Acetone	CAS-No. 67-64-1	Revision Date 1993-02-16
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Pennsylvania Right To Know Components

Acetone	CAS-No. 67-64-1	Revision Date 1993-02-16
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California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

Further information

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Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.21

Revision Date: 08/21/2018

Print Date: 10/19/2018



Benzene Safety Data Sheets

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SAFETY DATA SHEETS

According to the UN GHS revision 8

Creation
Revision

SECTION 1: Identification

1.1 GHS Product identifier

Product name Benzene

1.2 Other means of identification

Product number -
Other names Benzole; Fenzen; Benzeen

1.3 Recommended use of the chemical and restrictions on use

Identified uses Hydrocarbons (contain hydrogen and carbon atoms), Volatile organic compounds
Uses advised against no data available

1.4 Supplier's details

Company Echemi.com
Address Echemi.com
Telephone Echemi.com

1.5 Emergency phone number

Emergency phone number Echemi.com
Service hours Monday to Friday, 9am-5pm (Standard time zone: UTC/GMT +8 hours).

SECTION 2: Hazard identification

2.1 Classification of the substance or mixture

Flammable liquids, Category 2
Skin irritation, Category 2
Eye irritation, Category 2
Aspiration hazard, Category 1
Germ cell mutagenicity, Category 1B
Carcinogenicity, Category 1A
Specific target organ toxicity â repeated exposure, Category 1

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Hazard statement(s)

Danger
H225 Highly flammable liquid and vapour
H315 Causes skin irritation
H319 Causes serious eye irritation
H304 May be fatal if swallowed and enters airways
H340 May cause genetic defects
H350 May cause cancer
H372 Causes damage to organs through prolonged or repeated exposure

Precautionary statement(s)
Prevention

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 Keep container tightly closed.
P240 Ground and bond container and receiving equipment.
P241 Use explosion-proof [electrical/ventilating/lighting/...] equipment.
P242 Use non-sparking tools.
P243 Take action to prevent static discharges.
P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection/...

TOP



RFQ

Response	<p>P264 Wash ... thoroughly after handling.</p> <p>P203 Obtain, read and follow all safety instructions before use.</p> <p>P260 Do not breathe dust/fume/gas/mist/vapours/spray.</p> <p>P270 Do not eat, drink or smoke when using this product.</p> <p>P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse affected areas with water (shower).</p> <p>P370+P378 In case of fire: Use ... to extinguish.</p> <p>P302+P352 IF ON SKIN: Wash with plenty of water/...</p> <p>P321 Specific treatment (see ... on this label).</p> <p>P332+P317 If skin irritation occurs: Get medical help.</p> <p>P362+P364 Take off contaminated clothing and wash it before reuse.</p> <p>P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to remove. Continue rinsing.</p> <p>P301+P316 IF SWALLOWED: Get emergency medical help immediately.</p> <p>P331 Do NOT induce vomiting.</p> <p>P318 IF exposed or concerned, get medical advice.</p> <p>P319 Get medical help if you feel unwell.</p>
Storage	<p>P403+P235 Store in a well-ventilated place. Keep cool.</p>
Disposal	<p>P405 Store locked up.</p> <p>P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.</p>

2.3 Other hazards which do not result in classification

no data available

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
Benzene	Benzene	71-43-2	200-753-7	100%

SECTION 4: First-aid measures

4.1 Description of necessary first-aid measures

If inhaled

Fresh air, rest. Refer for medical attention.

Following skin contact

Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .

Following eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Following ingestion

Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

4.2 Most important symptoms/effects, acute and delayed

Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, nausea, and vomiting. Coma and possible death. (USCG, 1999)

4.3 Indication of immediate medical attention and special treatment needed, if necessary

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Get medical attention. Benzene and Related Compounds

SECTION 5: Fire-fighting measures

5.1 Suitable extinguishing media

Approach fire from upwind to avoid hazardous vapors. Use water spray, dry chemical, foam, or carbon dioxide. Use water spray to keep fire-exposed containers cool.

5.2 Specific hazards arising from the chemical

Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. (USCG, 1999)

5.3 Special protective actions for fire-fighters

Use foam, water spray, carbon dioxide, powder. In case of fire: keep drums, etc., cool by spraying with water.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT wash 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.

6.2 Environmental precautions

Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT wash 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.

6.3 Methods and materials for containment and cleaning up

For spills on water, contain with booms or barriers, use surface acting agents to thicken spilled materials. Remove trapped materials with suction hoses.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding). Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

7.2 Conditions for safe storage, including any incompatibilities

Fireproof. Separated from food and feedstuffs, oxidants and halogens. Store in an area without drain or sewer access.Keep in well closed containers in a cool place and away from fire.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1 (confirmed human carcinogen); BEI issued.EU-OEL: 3.25 mg/m3, 1 ppm as TWA; (skin).MAK: carcinogen category: 1; germ mutagen group: 3A; skin absorption (H)

Biological limit values

no data available

8.2 Appropriate engineering controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

8.3 Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection

Wear face shield or eye protection in combination with breathing protection.

Skin protection

Protective gloves. Protective clothing.

Respiratory protection

Use ventilation, local exhaust or breathing protection.

Thermal hazards

no data available

SECTION 9: Physical and chemical properties and safety characteristics

Physical state	Liquid.
Colour	Clear, colourless.
Odour	Aromatic odor
Melting point/freezing point	5.49 Å°C. Atm. press.:1 013 hPa.
Boiling point or initial boiling point and boiling range	80.09 Å°C. Atm. press.:1 013.5 hPa.
Flammability	Highly flammable.
Lower and upper explosion limit/flammability limit	Lower flammable limit: 1.2% by volume; Upper flammable limit: 7.8% by volume
Flash point	-11 Å°C. Atm. press.:1 013.5 hPa.
Auto-ignition temperature	498 Å°C. Atm. press.:1 013.5 hPa.
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	dynamic viscosity (in mPa s) = 0.604. Temperature:25.0Å°C.
Solubility	1 to 5 mg/mL at 64Å° F (NTP, 1992)
Partition coefficient n-octanol/water	log Pow = 2.13. Temperature:25 Å°C.
Vapour pressure	10 kPa. Temperature:20 Å°C.;100 kPa. Temperature:79.7 Å°C.
Density and/or relative density	0.876 g/cmÅ³. Temperature:20 Å°C.
Relative vapour density	2.77 (vs air)
Particle characteristics	no data available

SECTION 10: Stability and reactivity

10.1 Reactivity

NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration. Reacts violently with oxidants, nitric acid, sulfuric acid and halogens. This generates fire and explosion hazard. Attacks plastics and rubber. See Explosion Hazards.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

A dangerous fire hazard when exosed to heat or flame. ... Ignites on contact with sodium peroxide + water, dioxygenyl tetrafluoroborate, iodine heptafluoride, and dioxygenyl pentachloride. Benzene 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. Benzene vapors are heavier than air. They will spread along the ground and collect and stay in poorly-ventilated, low-lying, or confined areas (e.g., sewers, basements, and tanks). Hazardous concentrations may develop quickly in enclosed, poorly-ventilated, or low-lying areas. Keep out of these areas. Stay upwind. Benzene liquid is less dense than water and will float on the surface of water. BENZENE reacts vigorously with allyl chloride or other alkyl halides even at -70Å° C in the presence of ethyl aluminum dichloride or ethyl aluminum sesquichloride. Explosions have been reported [NFPA 491M 1991]. Ignites in contact with powdered chromic anhydride [Mellor 11:235 1946-47]. Incompatible with oxidizing agents such as nitric acid. Mixtures with bromine trifluoride, bromine pentafluoride, iodine pentafluoride, iodine heptafluoride and other interhalogens can ignite upon heating [Bretherick 5th ed. 1995]. Benzene and chlorides yield HCl as a byproduct (Hagedorn, F. H. Gelbke, and Federal Republic of Germany. 2002. Nitriles. In Ullmann's Encyclopedia of Industrial Chemistry. Wiley-VCH Verlag & Co. KGaA.). The reaction of benzene and trichloroacetonitrile evolves toxic chloroform and HCl gases. (Hagedorn, F., H.-P. Gelbke, and Federal Republic of Germany. 2002. Nitrogen. In Ullmann's Encyclopedia of Industrial Chemistry. Wiley-VCH Verlag GmbH & Co. KGaA.).

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

Reacts violently with iodine pentafluoride.

10.6 Hazardous decomposition products

no data available

SECTION 11: Toxicological information

Acute toxicity

Oral: LD50 - rat (male) - > 2 000 mg/kg bw. Remarks: Young and older adults had LD50 of 3.8 (2.9-4.8) and 5.6 (4.0-7.8) mL/kg respectively.
Inhalation: LC50 - rat (female) - 13 700 ppm.
Dermal: LD50 - guinea pig and rabbit - > 9.4 mL/kg bw.

Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

TOP



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Germ cell mutagenicity

no data available

Carcinogenicity

NTP: Known to be a human carcinogen. EPA: Known human carcinogen. IARC: Carcinogenic to humans

Reproductive toxicity

There is some evidence from human epidemiological studies of reproductive and developmental toxicity of benzene, however the data do not provide conclusive evidence of a link between exposure and effect (4). Animal studies have provided limited evidence that exposure to benzene may affect reproductive organs, however these effects were only observed at exposure levels over the maximum tolerated dose. Adverse effects on the fetus, including low birth weight, delayed bone formation, and bone marrow damage, have been observed where pregnant animals were exposed to benzene by inhalation.

STOT-single 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.

STOT-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.

Aspiration hazard

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish: LC50 - *Oncorhynchus mykiss* (previous name: *Salmo gairdneri*) - 5.3 mg/L - 96 h.
Toxicity to daphnia and other aquatic invertebrates: EC50 - *Daphnia magna* - 10 mg/L - 48 h.
Toxicity to algae: EC50 - *Pseudokirchneriella subcapitata* (previous names: *Raphidocelis subcapitata*, *Selenastrum capricornutum*) - 32 mg/L - 72 h.
Toxicity to microorganisms: IC50 - *Nitrosomonas* sp. - 13 mg/L - 24 h.

12.2 Persistence and degradability

AEROBIC: Benzene present at 100 mg/L, reached 40% of its theoretical BOD in 2 weeks using an activated sludge inoculum at 30 mg/L in the Japanese MITI test(1). Benzene reached 24% of its theoretical oxygen demand in a non-acclimated microbial population after 15 days(2). Aerobic biodegradation of benzene was studied in pre-equilibrated soil-water slurry microcosms(3). Using an enriched aerobic bacterial culture, benzene began to degrade 12 hrs after incubation in an aqueous(soil-free) solution with 50% of benzene degrading after 12 hrs and almost complete degradation within 90 hrs. Using a pre-equilibrated soil-water slurry microcosm, benzene did not begin to degrade until 3 days after application and reached 60% degradation after about 12 days(3).

12.3 Bioaccumulative potential

Benzene has BCFs ranging from 1.1-20(1). According to a classification scheme(2), this BCF range suggests the potential for bioconcentration in aquatic organisms is low. The uptake and elimination rate constants for benzene in fathead minnows were studied(3). Fathead minnows were found to have an average uptake rate of 7 L/kg/hr with an average elimination rate of 0.384/hr which corresponds to a BCF of 19(3). In a study of BCF values for various aquatic species, benzene was found to have a BCF value of 3.5 in eels(4), 4.4 in pacific herring(5) and 4.3 in goldfish(6).

12.4 Mobility in soil

An experimentally derived log K_{oc} of 1.93 (K_{oc} = 85) was obtained via reverse phase HPLC (high performance liquid chromatography) with a cyanopropyl column and a non-polar solvent/water(1). According to a classification scheme(2), this estimated K_{oc} value suggests that benzene is expected to have high mobility in soil. The sorption equilibrium for benzene in a soil/water mixture (ratio soil/water 0.12 kg/l) took 72 hrs(3). The K_{oc} for benzene has also been experimentally determined to be 79(4).

12.5 Other adverse effects

no data available

SECTION 13: Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or animal carcasses or waste by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

SECTION 14: Transport information

14.1 UN Number

ADR/RID: UN1114 (For reference only, please check.) IMDG: UN1114 (For reference only, please check.) IATA: UN1114 (For reference only, please check.)

14.2 UN Proper Shipping Name

ADR/RID: BENZENE (For reference only, please check.) IMDG: BENZENE (For reference only, please check.) IATA: BENZENE (For reference only, please check.)

14.3 Transport hazard class(es)

ADR/RID: 3 (For reference only, please check.) IMDG: 3 (For reference only, please check.) IATA: 3 (For reference only, please check.)

14.4 Packing group, if applicable

ADR/RID: II (For reference only, please check.) IMDG: II (For reference only, please check.) IATA: II (For reference only, please check.)

14.5 Environmental hazards

ADR/RID: No IMDG: No IATA: No

14.6 Special precautions for user

no data available

14.7 Transport in bulk according to IMO instruments

no data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC nu
Benzene	Benzene	71-43-2	200-7
European Inventory of Existing Commercial Chemical Substances (EINECS)			List
EC Inventory			List
United States Toxic Substances Control Act (TSCA) Inventory			List
China Catalog of Hazardous chemicals 2015			List
New Zealand Inventory of Chemicals (NZIoC)			List
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			List
Vietnam National Chemical Inventory			List
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			List
Korea Existing Chemicals List (KECL)			List

SECTION 16: Other information

Information on revision

Creation Date	July 15, 2019
Revision Date	July 15, 2019

Abbreviations and acronyms

CAS: Chemical Abstracts Service
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
RID: Regulation concerning the International Carriage of Dangerous Goods by Rail
IMDG: International Maritime Dangerous Goods
IATA: International Air Transportation Association
TWA: Time Weighted Average
STEL: Short term exposure limit
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
EC50: Effective Concentration 50%

References

IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>
HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>
IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>
eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en
CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>
ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>
ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>
Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>
ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

Other Information

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 is exceeded is insufficient. Benzene causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma.

Disclaimer: 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. The supplier shall not be held liable for any damage resulting from handling or from contact with the above product.

Benzene is included in [Hydrocarbons and Derivatives](#) category. See more [Benzene price](#) and marketing trends

[Buy Benzene](#) of different grades for your demands from various manufactures and traders.

Related Products

Benzene	Benzene	Benzene 99% kanbei	Benzene 99.9% Colorless
Pure benzene 99% Liquid Dideu			

Industry News

- What Is Inorganic Benzene? Differences, Si...
- What You Need to Know About Benzene in ...
- Get to know whether benzene is a hydrocar...
- Go Up And Go Up! PET Rose
- Where Is Benzene Found in Everyday Life? ...

More Safety Data Sheets

Dibenzoselenophene 5-oxide SDS	D-Alanine SDS	4-IODOISOQUINOLINE SDS	Methyl 6,11-dihydro-11-oxoc
3-Chloro-6-(1-piperazinyl)pyridazine SDS	6,7-Dihydro-5H-quinolin-8-one SDS	1-BOC-PIPERAZINE SDS	ETC 1002 SDS
EUK 207 SDS	1H-Pyrrole-3-carboxylic acid, 5-formyl-2,4-d...		

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TOP



RFQ

SAFETY DATA SHEET

Version 5.8

Revision Date 02/02/2018

Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzo[a]pyrene

Product Number : 48564
Brand : Supelco
Index-No. : 601-032-00-3

CAS-No. : 50-32-8

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USATelephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)Skin sensitisation (Category 1), H317
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1B), H350
Reproductive toxicity (Category 1B), H360
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

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

Precautionary statement(s)

P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and

P261	understood.
P272	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Contaminated work clothing should not be allowed out of the workplace.
P280	Avoid release to the environment.
	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

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

Formula : C₂₀H₁₂
Molecular weight : 252.31 g/mol
CAS-No. : 50-32-8
EC-No. : 200-028-5
Index-No. : 601-032-00-3

Hazardous components

Component	Classification	Concentration
Benzo[a]pyrene		
	Skin Sens. 1; Muta. 1B; Carc. 1B; Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H317, H340, H350, H360, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Store at room temperature.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low		

		as possible. Suspected human carcinogen		
		Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
Benzo[a]pyrene	50-32-8	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.1 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	0.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	0.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological	Basis
-----------	---------	------------	-------	------------	-------

				specimen	
	-	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|-------------------|
| a) Appearance | Form: solid |
| b) Odour | No data available |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 177 - 180 °C (351 - 356 °F)
f) Initial boiling point and boiling range	495 °C (923 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	1.35 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 5.97
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Subcutaneous - Rat - 50 mg/kg

Skin corrosion/irritation

Skin - Mouse

Result: Mild skin irritation

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

Chronic exposure may cause dermatitis.

Germ cell mutagenicity

May alter genetic material.

In vivo tests showed mutagenic effects

Carcinogenicity

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

Possible human carcinogen

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

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benzo[a]pyrene)

OSHA: OSHA specifically regulated carcinogen (Benzo[a]pyrene)

Reproductive toxicity

May cause congenital malformation in the fetus.

Presumed human reproductive toxicant

May cause reproductive disorders.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 0.25 mg/l - 48 h

Toxicity to algae EC50 - Pseudokirchneriella subcapitata (green algae) - 0.02 mg/l - 72 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 48 h
- 0.0005 mg/l

Bioconcentration factor (BCF): 3,208

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Benzo[a]pyrene)
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[a]pyrene)
Marine pollutant: yes

IATA

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

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

	CAS-No.	Revision Date
Benzo[a]pyrene	50-32-8	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
--	---------	---------------

Benzo[a]pyrene

50-32-8

2007-03-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Benzo[a]pyrene

CAS-No.
50-32-8

Revision Date
1990-01-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H317	May cause an allergic skin reaction.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Muta.	Germ cell mutagenicity

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.8

Revision Date: 02/02/2018

Print Date: 10/19/2018

SAFETY DATA SHEET

Version 6.1
Revision Date 07/17/2018
Print Date 01/21/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzo[**a**]fluoranthene

Product Number : 48490

Brand : Supelco

Index-No. : 601-034-00-4

CAS-No. : 205-99-2

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 3,4-Benzofluoranthene

Formula : C₂₀H₁₂
Molecular weight : 252.31 g/mol
CAS-No. : 205-99-2
EC-No. : 205-911-9
Index-No. : 601-034-00-4

Hazardous components

Component	Classification	Concentration
Benz[e]acephenanthrylene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen
--	---------	--

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benz[e]acephenant hrylene	205-99-2	1- Hydroxypyren e		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 163 - 165 °C (325 - 329 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

TDLo Oral - Mouse - 7.57 mg/kg

Remarks: Liver:Changes in liver weight. Endocrine:Changes in thymus weight.

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[e]acephenanthrylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[e]acephenanthrylene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates Immobilization EC50 - Daphnia magna (Water flea) - > 1.024 mg/l - 24 h(Benz[e]acephenanthrylene)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Benz[e]acephenanthrylene)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

(Benz[e]acephenanthrylene)

Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[e]acephenanthrylene)

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[e]acephenanthrylene	205-99-2	2007-03-01

California Prop. 65 Components

, which is/are known to the State of California to cause cancer.

For more information go to www.P65Warnings.ca.gov.

Benz[e]acephenanthrylene

CAS-No.	Revision Date
205-99-2	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H350

May cause cancer.

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

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.1

Revision Date: 07/17/2018

Print Date: 01/21/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 07/16/2018
Print Date 01/21/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzo[*k*]fluoranthene

Product Number : 48492
Brand : Supelco
Index-No. : 601-036-00-5

CAS-No. : 207-08-9

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₂₀ H ₁₂
Molecular weight	: 252.31 g/mol
CAS-No.	: 207-08-9
EC-No.	: 205-916-6
Index-No.	: 601-036-00-5

Hazardous components

Component	Classification	Concentration
Benzo[k]fluoranthene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzo[k]fluoranthene	207-08-9	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---|---|
| a) Appearance | Form: crystalline
Colour: yellow |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 215 - 217 °C (419 - 423 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |

m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

Carcinogenicity- Rat- Implant

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benzo[k]fluoranthene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benzo[k]fluoranthene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DF6350000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available (Benzo[k]fluoranthene)

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

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

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077

Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)

Reportable Quantity (RQ) : 5000 lbs

no

Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[k]fluoranthene)
Marine pollutant : yes

IATA

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[k]fluoranthene)

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

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.

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[k]fluoranthene	207-08-9	1994-04-01

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov . Benzo[k]fluoranthene	207-08-9	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

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

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 07/16/2018

Print Date: 01/21/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 07/17/2018
Print Date 01/21/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benz[*a*]anthracene

Product Number : 48563
Brand : Supelco
Index-No. : 601-033-00-9

CAS-No. : 56-55-3

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 1,2-Benzanthracene
Tetraphene

Formula : C₁₈H₁₂
Molecular weight : 228.29 g/mol
CAS-No. : 56-55-3
EC-No. : 200-280-6
Index-No. : 601-033-00-9

Hazardous components

Component	Classification	Concentration
Benz[a]anthracene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Store at room temperature.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 157 - 159 °C (315 - 318 °F) |
| f) Initial boiling point and boiling range | 437.6 °C (819.7 °F) |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |

- | | | |
|----|--|-------------------|
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)
NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
NTP: RAHC - Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
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

No data available
No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Benz[a]anthracene)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077

Class: 9

Packing group: III

EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)

Marine pollutant : yes

IATA

UN number: 3077

Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Chronic Health Hazard

Massachusetts Right To Know Components

Benz[a]anthracene

CAS-No.
56-55-3

Revision Date
1993-04-24

Pennsylvania Right To Know Components

Benz[a]anthracene

CAS-No.
56-55-3

Revision Date
1993-04-24

Benz[a]anthracene

CAS-No.
56-55-3

Revision Date
1993-04-24

New Jersey Right To Know Components

Benz[a]anthracene

CAS-No.
56-55-3

Revision Date
1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Benz[a]anthracene

CAS-No.
56-55-3

Revision Date
2007-09-28

WARNING! This product contains a chemical known to the State of California to cause cancer.

Benz[a]anthracene

CAS-No.
56-55-3

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H350

May cause cancer.

H400

Very toxic to aquatic life.

H410

Very toxic to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 07/17/2018

Print Date: 01/21/2019

SAFETY DATA SHEET

Version 4.8

Revision Date 01/11/2018

Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Beryllium

Product Number : 378135

Brand : Aldrich

CAS-No. : 7440-41-7

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Inhalation (Category 2), H330

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitisation (Category 1), H317

Carcinogenicity (Category 1B), H350

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Specific target organ toxicity - repeated exposure (Category 1), H372

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301

Toxic if swallowed.

H315

Causes skin irritation.

H317

May cause an allergic skin reaction.

H319

Causes serious eye irritation.

H330

Fatal if inhaled.

H335

May cause respiratory irritation.

H350

May cause cancer.

H372

Causes damage to organs 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/ vapours/ 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.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Be
Molecular weight	: 9.01 g/mol
CAS-No.	: 7440-41-7
EC-No.	: 231-150-7

Hazardous components

Component	Classification	Concentration
Beryllium foil		
	Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

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

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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Keep in a dry place.

Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Beryllium foil	7440-41-7	TWA	2.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	25.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis)		

		Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		C	0.0005 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.0002 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	0.025 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) Initial boiling point and boiling range | 2,970 °C (5,378 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.85 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Alkali metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Beryllium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg

Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Hamster

Lungs

Result: negative

Carcinogenicity

Carcinogenicity - Rat - Intratracheal

Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)

NTP: Known - Known to be human carcinogen (Beryllium foil)

Known - Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Beryllium foil)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DS1750000

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

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

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER

IATA

UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	2008-10-10

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	3
Reactivity Hazard:	3

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.8

Revision Date: 01/11/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 4.8

Revision Date 01/11/2018

Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Beryllium

Product Number : 378135

Brand : Aldrich

CAS-No. : 7440-41-7

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301

Acute toxicity, Inhalation (Category 2), H330

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitisation (Category 1), H317

Carcinogenicity (Category 1B), H350

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Specific target organ toxicity - repeated exposure (Category 1), H372

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301

Toxic if swallowed.

H315

Causes skin irritation.

H317

May cause an allergic skin reaction.

H319

Causes serious eye irritation.

H330

Fatal if inhaled.

H335

May cause respiratory irritation.

H350

May cause cancer.

H372

Causes damage to organs 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/ vapours/ 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.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Be
Molecular weight	: 9.01 g/mol
CAS-No.	: 7440-41-7
EC-No.	: 231-150-7

Hazardous components

Component	Classification	Concentration
Beryllium foil		
	Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

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

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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Keep in a dry place.

Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Beryllium foil	7440-41-7	TWA	2.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	25.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	2.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000 microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis)		

		Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		C	0.0005 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.0002 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	0.025 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1,278 °C (2,332 °F) - lit. |
| f) Initial boiling point and boiling range | 2,970 °C (5,378 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.85 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Alkali metals

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Beryllium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg

Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Hamster

Lungs

Result: negative

Carcinogenicity

Carcinogenicity - Rat - Intratracheal

Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous

Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)

NTP: Known - Known to be human carcinogen (Beryllium foil)

Known - Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Beryllium foil)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: DS1750000

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

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

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER

IATA

UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Beryllium foil	7440-41-7	2008-10-10

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	3
Reactivity Hazard:	3

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.8

Revision Date: 01/11/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0

Revision Date 05/28/2017

Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Carbon disulfide

Product Number : 335266
Brand : Sigma-Aldrich
Index-No. : 006-003-00-3

CAS-No. : 75-15-0

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATESTelephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225

Acute toxicity, Inhalation (Category 4), H332

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Reproductive toxicity (Category 2), H361

Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372

Acute aquatic toxicity (Category 2), H401

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H315

Causes skin irritation.

H319

Causes serious eye irritation.

H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H401	Toxic to aquatic life.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ 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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: CS<SB>2</>
Molecular weight	: 76.14 g/mol
CAS-No.	: 75-15-0
EC-No.	: 200-843-6
Index-No.	: 006-003-00-3

Hazardous components

Component	Classification	Concentration
Carbon disulphide		
	Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Repr. 2; STOT RE 1; Aquatic Acute 2; H225, H315, H319, H332, H361, H372, H401	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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, Sulphur oxides

Flash back possible over considerable distance., Container explosion may occur under fire conditions., Vapours may form explosive mixture with air., May explode when heated.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Refrigerate before opening.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Carbon disulphide	75-15-0	TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	1.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	20.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		CEIL	30.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		Peak	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		TWA	1.000000 ppm 3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	10.000000 ppm 30.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		See Table Z-2		
		TWA	20 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		CEIL	30 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		
		Peak	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.3-1968		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Carbon disulphide	75-15-0	2-Thiothiazolidine-4-carboxylic acid (TTCA)	0.5000 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls**Appropriate engineering controls**

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

Personal protective equipment**Eye/face protection**

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engine protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---------------|------------------------------------|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | Stench. |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -112 - -111 °C (-170 - -168 °F)
f) Initial boiling point and boiling range	46 °C (115 °F)
g) Flash point	-30 °C (-22 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 50 %(V) Lower explosion limit: 1.3 %(V)
k) Vapour pressure	394.956 hPa at 20 °C (68 °F) 1,342.711 hPa at 55 °C(131 °F)
l) Vapour density	2.63 - (Air = 1.0)
m) Relative density	1.266 g/mL at 25 °C (77 °F)
n) Water solubility	2.9 g/l at 20 °C (68 °F) - OECD Test Guideline 105
o) Partition coefficient: n-octanol/water	log Pow: 2.7 at 25 °C (77 °F)
p) Auto-ignition temperature	97 - 107 °C (207 - 225 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.9 mN/m at 19.5 °C (67.1 °F)
Relative vapour density	2.63 - (Air = 1.0)

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Alkali metals, Zinc, Amines, Azides, Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sulphur oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - female - > 2,000 mg/kg(Carbon disulphide)

(OECD Test Guideline 423)

LC50 Inhalation - Rat - male and female - 4 h - 10.35 mg/l(Carbon disulphide)

(OECD Test Guideline 403)

Dermal: No data available(Carbon disulphide)

No data available(Carbon disulphide)

Skin corrosion/irritation

No data available(Carbon disulphide)

Serious eye damage/eye irritation

No data available(Carbon disulphide)

Respiratory or skin sensitisation

- Mouse(Carbon disulphide)

Result: Does not cause skin sensitisation.

(OECD Test Guideline 429)

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.(Carbon disulphide)

Ames test(Carbon disulphide)

Salmonella typhimurium

Result: negative

Carcinogenicity

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

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

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

Reproductive toxicity

Suspected human reproductive toxicant(Carbon disulphide)

May cause reproductive disorders.(Carbon disulphide)

Specific target organ toxicity - single exposure

No data available(Carbon disulphide)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Carbon disulphide)

Additional Information

RTECS: FF6650000

May cause convulsions.(Carbon disulphide)

Liver - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence(Carbon disulphide)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Poecilia reticulata (guppy) - 4 mg/l - 96 h(Carbon disulphide) (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 2.1 mg/l - 48 h(Carbon disulphide) (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Chlorella pyrenoidosa - 21 mg/l - 96 h(Carbon disulphide) (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d(Carbon disulphide)
Result: > 80 % - Readily biodegradable.
(OECD Test Guideline 301D)

12.3 Bioaccumulative potential

12.4 Mobility in soil

No data available(Carbon disulphide)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1131 Class: 3 (6.1) Packing group: I
Proper shipping name: Carbon disulfide
Reportable Quantity (RQ) : 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1131 Class: 3 (6.1) Packing group: I EMS-No: F-E, S-D
Proper shipping name: CARBON DISULPHIDE

IATA

UN number: 1131 Class: 3 (6.1)
Proper shipping name: Carbon disulphide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

SARA 313 Components

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

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Carbon disulphide	75-15-0	2007-07-01

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Carbon disulphide

CAS-No.	Revision Date
75-15-0	2008-06-17

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 5.11
Revision Date 08/09/2016
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Carbon tetrachloride

Product Number : 571016
Brand : Aldrich
Index-No. : 602-008-00-5

CAS-No. : 56-23-5

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin sensitisation (Sub-category 1B), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Liver, Kidney, H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412
Hazardous to the ozone layer (Category 1), H420

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H301 + H311 + H331
H317
H351
H372

Toxic if swallowed, in contact with skin or if inhaled
May cause an allergic skin reaction.
Suspected of causing cancer.
Causes damage to organs (Liver, Kidney) through prolonged or repeated exposure if inhaled.

H412	Harmful to aquatic life with long lasting effects.
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/ vapours/ 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.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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.
P502	Refer to manufacturer/ supplier for information on recovery/ recycling.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Tetrachloromethane
Formula	: CCl ₄
Molecular weight	: 153.82 g/mol
CAS-No.	: 56-23-5
EC-No.	: 200-262-8
Index-No.	: 602-008-00-5

Hazardous components

Component	Classification	Concentration
Tetrachloromethane		
	Acute Tox. 3; Skin Sens. 1B; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; Ozone 1; H301 + H311 + H331, H317, H351, H372, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrachloromethane	56-23-5	TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		ST	2.000000 ppm 12.600000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	10.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		CEIL	25.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		Peak	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		See Table Z-2		
		TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		ST	2 ppm 12.6 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		Peak	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		TWA	2 ppm 12.6 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	2 ppm 12.6 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

		C	200 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	10 ppm 63 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 240 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--------------------|------------------------------------|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | sweet |
| c) Odour Threshold | No data available |

d) pH	No data available
e) Melting point/freezing point	Melting point/range: -22.99 °C (-9.38 °F)
f) Initial boiling point and boiling range	77 °C (171 °F) at 1,013 hPa (760 mmHg)
g) Flash point	does not flash
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	45 hPa (34 mmHg) at 0.3 °C (32.5 °F) 120 hPa (90 mmHg) at 19.8 °C (67.6 °F) 14,549 hPa (10,913 mmHg) at 24 °C (75 °F)
l) Vapour density	No data available
m) Relative density	1.59 g/cm ³ at 20 °C (68 °F)
n) Water solubility	0.8461 g/l at 20 °C (68 °F)
o) Partition coefficient: n-octanol/water	log Pow: 2.83 at 25 °C (77 °F)
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	26.7 mN/m at 20 °C (68 °F) 19.5 mN/m at 80 °C (176 °F)
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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

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,350 mg/kg

LC50 Inhalation - Rat - 4 h - 8000 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Mild skin irritation - 24 h

(Draize Test)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24 h

(Draize Test)

Respiratory or skin sensitisation

- Mouse

Result: The product is a skin sensitiser, sub-category 1B.

(OECD Test Guideline 429)

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification. Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Tetrachloromethane)

NTP: Reasonably anticipated to be a human carcinogen (Tetrachloromethane)

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Inhalation - Causes damage to organs through prolonged or repeated exposure. - Liver, Kidney

Aspiration hazard

No data available

Additional Information

RTECS: FG4900000

Vomiting, Diarrhoea, Abdominal pain, Nausea, Dizziness, Headache, Damage to the eyes., Liver injury may occur., Kidney injury may occur., Exposure to and/or consumption of alcohol may increase toxic effects., Contact with skin can cause:, Pain, Erythema, hyperemia

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LC50 - Danio rerio (zebra fish) - 24.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 35 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Algae - 20 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 21 d
- 52.3 µg/l

Bioconcentration factor (BCF): 30

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1846 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: CARBON TETRACHLORIDE
Marine pollutant: yes

IATA

UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

Tetrachloromethane	CAS-No. 56-23-5	Revision Date 2007-07-01
--------------------	--------------------	-----------------------------

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Tetrachloromethane

CAS-No.
56-23-5Revision Date
2007-07-01**Pennsylvania Right To Know Components**

Tetrachloromethane

CAS-No.
56-23-5Revision Date
2007-07-01**New Jersey Right To Know Components**

Tetrachloromethane

CAS-No.
56-23-5Revision Date
2007-07-01**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.

Tetrachloromethane

CAS-No.
56-23-5Revision Date
2007-09-28

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H317	May cause an allergic skin reaction.
H331	Toxic if inhaled.
H351	Suspected of causing cancer.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.11

Revision Date: 08/09/2016

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 3.18
Revision Date 08/14/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Chloroform

Product Number : C2432
Brand : Sigma-Aldrich
Index-No. : 602-006-00-4

CAS-No. : 67-66-3

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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 3), H331
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361d
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 1), Liver, Kidney, H372
Acute aquatic toxicity (Category 3), H402

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.

H361d	Suspected of damaging the unborn child.
H372	Causes damage to organs (Liver, Kidney) through prolonged or repeated exposure.
H402	Harmful to aquatic life.
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/ vapours/ 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.
P273	Avoid release to the environment.
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.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Trichloromethane Methyldiyne trichloride
Formula	: CHCl ₃
Molecular weight	: 119.38 g/mol
CAS-No.	: 67-66-3
EC-No.	: 200-663-8
Index-No.	: 602-006-00-4

Hazardous components

Component	Classification	Concentration
Chloroform		
	Acute Tox. 4; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; Repr. 2; STOT SE 3; STOT RE 1; Aquatic Acute 3; H302, H315, H319, H331, H336, H351, H361d, H372, H402	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chloroform	67-66-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Embryo/fetal damage Confirmed animal carcinogen with unknown relevance to humans		
		ST	2 ppm 9.78 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		C	50 ppm 240 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate. Ceiling limit is to be determined from breathing-zone air samples.		
		PEL	2 ppm 9.78 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | sweet |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -63 °C (-81 °F) |
| f) Initial boiling point and boiling range | 60.5 - 61.5 °C (140.9 - 142.7 °F) |
| g) Flash point | - DIN 51755 Part 1 does not flash |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 210 hPa (158 mmHg) at 20 °C (68 °F) |
| l) Vapour density | 4.12 - (Air = 1.0) |
| m) Relative density | 1.492 g/mL at 25 °C (77 °F) |
| n) Water solubility | 8.7 g/l at 23 °C (73 °F) - OECD Test Guideline 105 |
| o) Partition coefficient: n-octanol/water | log Pow: 1.97 at 25 °C (77 °F) - (ECHA), Bioaccumulation is not expected. |
| p) Auto-ignition temperature | > 600 °C (> 1,112 °F) at 1,013 hPa (760 mmHg) - DIN 51794 |
| q) Decomposition temperature | Distillable in an undecomposed state at normal pressure. |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

- | | |
|------------------------------|---|
| Solubility in other solvents | organic solvent at 20 °C (68 °F) - miscible |
| Surface tension | 27.1 mN/m at 20.0 °C (68.0 °F) |
| Relative vapour density | 4.12 - (Air = 1.0) |

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

Contains the following stabiliser(s):

2-Methyl-2-butene (≥ 0.001 - ≤ 0.015 %)

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

various plastics, Rubber

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 908 mg/kg

(OECD Test Guideline 401)

Remarks: Behavioral:Change in motor activity (specific assay). Behavioral:Ataxia. Lungs, Thorax, or

Respiration:Respiratory stimulation.

LOEC Inhalation - Rat - male - 6 h - 500 ppm

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

LD50 Dermal - Rabbit - $> 20,000$ mg/kg

Remarks: (RTECS)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 24 h

Remarks: (ECHA)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irritating to eyes.

Remarks: (ECHA)

Respiratory or skin sensitisation

Sensitisation test: - Guinea pig

Result: negative

(Maximisation Test)

Remarks: (ECHA)

Germ cell mutagenicity

Ames test

Salmonella typhimurium

Result: negative

reverse mutation assay

Escherichia coli

Result: negative

(ECHA)

OECD Test Guideline 474
Rat - male and female - Bone marrow
Result: negative

OECD Test Guideline 486
Rat - male - Other cell types
Result: negative

Carcinogenicity

Carcinogenicity - Rat - Oral
Tumorigenic: Carcinogenic by RTECS criteria. Leukaemia
Suspected of causing cancer.

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

Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - Liver, Kidney

Aspiration hazard

No data available

Additional Information

RTECS: FS9100000

Vomiting, Cough, irritant effects, Shortness of breath, respiratory arrest, narcosis, Dizziness, Nausea, agitation, spasms, inebriation, Headache, Stomach/intestinal disorders, ataxia (impaired locomotor coordination), cardiovascular disorders
Drying-out effect resulting in rough and chapped skin.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Danio rerio (zebra fish) - 121 mg/l - 48 h (OECD Test Guideline 203)
	static test LC50 - Pimephales promelas (fathead minnow) - 103 - 171 mg/l - 96 h Remarks: (ECHA)
	flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 18.2 mg/l - 96 h Remarks: (ECHA)
	flow-through test LC50 - Micropterus dolomieu - 51 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 79 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Chlamydomonas reinhardtii (green algae) - 13.3 mg/l - 72 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 14 d

Result: 0 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation

Cyprinus carpio (Carp) - 42 d
at 25 °C - 0.1 mg/l

Bioconcentration factor (BCF): 4.1 - 13
(OECD Test Guideline 305)

Cyprinus carpio (Carp) - 42 d
at 25 °C - 1 mg/l

Bioconcentration factor (BCF): 1.4 - 4.7
(OECD Test Guideline 305)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1888 Class: 6.1 Packing group: III
Proper shipping name: Chloroform
Reportable Quantity (RQ): 10 lbs Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1888 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: CHLOROFORM

IATA

UN number: 1888 Class: 6.1 Packing group: III
Proper shipping name: Chloroform

15. REGULATORY INFORMATION

SARA 302 Components

Chloroform

CAS-No.
67-66-3

Revision Date
2008-11-03

SARA 313 Components

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

Chloroform

CAS-No.
67-66-3

Revision Date
2008-11-03

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D022 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chloroform	67-66-3	2008-11-03

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chloroform	67-66-3	2008-11-03

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov . Chloroform	67-66-3	2011-09-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H361d	Suspected of damaging the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H402	Harmful to aquatic life.
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.18

Revision Date: 08/14/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 4.9
Revision Date 06/02/2016
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Chloromethane

Product Number : 295507
Brand : Aldrich
Index-No. : 602-001-00-7

CAS-No. : 74-87-3

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Eyes, Nervous system, Testes, H373

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H220 : Extremely flammable gas.
H280 : Contains gas under pressure; may explode if heated.
H351 : Suspected of causing cancer.
H361 : Suspected of damaging fertility or the unborn child.
H373 : May cause damage to organs (Eyes, Nervous system, Testes) through prolonged or repeated exposure if inhaled.

Precautionary statement(s)

P201 : Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Methyl chloride

Formula : CH₃Cl

Molecular weight : 50.49 g/mol

CAS-No. : 74-87-3

EC-No. : 200-817-4

Index-No. : 602-001-00-7

Hazardous components

Component	Classification	Concentration
Chloromethane		
	Flam. Gas 1; Press. Gas Liquefied gas; Carc. 2; Repr. 2; STOT RE 2; H220, H280, H351, H361, H373	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Contents under pressure. Moisture sensitive.

Storage class (TRGS 510): Gases

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chloromethane	74-87-3	TWA	50.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Kidney damage Testicular damage Teratogenic effects Not classifiable as a human carcinogen Danger of cutaneous absorption		

		STEL	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Kidney damage Testicular damage Teratogenic effects Not classifiable as a human carcinogen Danger of cutaneous absorption		
		Potential Occupational Carcinogen See Appendix A		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.18-1969		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.18-1969		
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.18-1969		
		See Table Z-2		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.18-1969		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.18-1969		
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.18-1969		
		STEL	100 ppm 210 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	50 ppm 105 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: compressed liquefied gas |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -97 °C (-143 °F) - lit. |
| f) Initial boiling point and boiling range | -24.2 °C (-11.6 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 17.4 %(V)
Lower explosion limit: 7 %(V) |
| k) Vapour pressure | 5,060.9 hPa (3,796.0 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.915 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | 5.32 g/l at 25 °C (77 °F) - soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 0.91 |

p) Auto-ignition temperature	632.0 °C (1,169.6 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	0.02 mN/m at 20 °C (68 °F)
-----------------	----------------------------

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

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents, Iron

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 1,800 mg/kg

LC50 Inhalation - Rat - male and female - 4 h - > 21,800 mg/m³
(OECD Test Guideline 403)

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat - male

Result: negative

DNA damage DNA repair

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Inhalation - May cause damage to organs through prolonged or repeated exposure. - Central nervous system, Liver, Urogenital tract

Aspiration hazard

No data available

Additional Information

RTECS: PA6300000

Dizziness, Drowsiness, Incoordination., Blurred vision, Headache, Nausea, Vomiting

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Lepomis macrochirus (Bluegill) - 550 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates semi-static test EC50 - Daphnia magna (Water flea) - 200 mg/l - 48 h (OECD Test Guideline 202)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 h
Result: 100 % - Readily biodegradable

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1063 Class: 2.1
Proper shipping name: Methyl chloride
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1063 Class: 2.1
Proper shipping name: METHYL CHLORIDE

EMS-No: F-D, S-U

IATA

UN number: 1063 Class: 2.1
Proper shipping name: Methyl chloride
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Chloromethane	74-87-3	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Sudden Release of Pressure Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chloromethane	74-87-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chloromethane	74-87-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chloromethane	74-87-3	2007-07-01

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

CAS-No.	Revision Date
74-87-3	2009-09-11

Chloromethane

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure if inhaled.
Press. Gas	Gases under pressure
Repr.	Reproductive toxicity
STOT RE	Specific target organ toxicity - repeated exposure

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	3

NFPA Rating

Health hazard:	1
Fire Hazard:	4
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.9

Revision Date: 06/02/2016

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.3
Revision Date 04/05/2019
Print Date 06/28/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Chromium

Product Number : 374849
Brand : Aldrich
CAS-No. : 7440-47-3

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**SECTION 3: Composition/information on ingredients****3.1 Substances**

Formula : Cr
Molecular weight : 52.00 g/mol
CAS-No. : 7440-47-3
EC-No. : 231-157-5

Component	Classification	Concentration
-----------	----------------	---------------

Chromium		
		<= 100 %

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice

Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

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

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

5.2 Special hazards arising from the substance or mixture

Chromium oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Chromium	7440-47-3	PEL	0.5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
	Remarks	see Sections 1532.2, 5206 & 8359		
		TWA	1 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Skin irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Not classifiable as a human carcinogen varies		

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

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).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

- | | |
|--------------------|-----------------------------------|
| a) Appearance | Form: chips
Colour: light grey |
| b) Odour | odourless |
| c) Odour Threshold | No data available |
| d) pH | No data available |

e)	Melting point/freezing point	Melting point/range: 1,857 °C (3,375 °F) - lit.
f)	Initial boiling point and boiling range	2,672 °C 4,842 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	7.14 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 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 acids, Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Chromium oxides

Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GB4200000

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 14.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.07 mg/l - 48 h

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Bioaccumulation Oncorhynchus mykiss (rainbow trout) - 30 d
- 50 µg/l (Chromium)

Bioconcentration factor (BCF): 1.03 - 1.22

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

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. ()
Reportable Quantity (RQ): 5000 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. ()
Marine pollutant : yes

IATA

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

Further information

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

SECTION 15: Regulatory information

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

SARA 311/312 Hazards

Chronic Health Hazard

Reportable Quantity : D007 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

California Prop. 65 Components

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

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 6.3

Revision Date: 04/05/2019

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.5
Revision Date 01/10/2018
Print Date 01/21/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Chrysene

Product Number : 35754
Brand : Sigma-Aldrich
Index-No. : 601-048-00-0

CAS-No. : 218-01-9

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

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

Precautionary statement(s)

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.

P391 Collect spillage.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : C₁₈H₁₂
Molecular weight : 228.29 g/mol
CAS-No. : 218-01-9
EC-No. : 205-923-4
Index-No. : 601-048-00-0

Hazardous components

Component	Classification	Concentration
Chrysene		
	Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

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.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans		
Chrysene	218-01-9	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		

		NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		
		PEL	0.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	1-Hydroxypyrene		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 252 - 254 °C (486 - 489 °F) - lit.
f) Initial boiling point and boiling range	448 °C (838 °F) - lit.
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	insoluble
o) Partition coefficient: n-octanol/water	log Pow: 5.73
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

In vitro tests showed mutagenic effects

Carcinogenicity

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

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chrysene)

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

OSHA: OSHA specifically regulated carcinogen (Chrysene)

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GC0700000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h

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

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

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant: yes

IATA

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

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

SARA 311/312 Hazards

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

Chrysene

CAS-No.
218-01-9

Revision Date
1994-04-01

New Jersey Right To Know Components

Chrysene

CAS-No.
218-01-9

Revision Date
1994-04-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Chrysene

CAS-No.
218-01-9

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5

Revision Date: 01/10/2018

Print Date: 01/21/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 03/12/2019
Print Date 06/22/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Copper

Product Number : 31284
Brand : Aldrich
CAS-No. : 7440-50-8

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none**SECTION 3: Composition/information on ingredients****3.1 Substances**

Formula : Cu
Molecular weight : 63.55 g/mol
CAS-No. : 7440-50-8
EC-No. : 231-159-6

Component	Classification	Concentration
-----------	----------------	---------------

Copper,		
		<= 100 %

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

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

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

5.2 Special hazards arising from the substance or mixture

Copper oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Store under inert gas. Air sensitive.

Storage class (TRGS 510): 13: Non Combustible Solids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Copper,	7440-50-8	TWA	1 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Irritation Gastrointestinal metal fume fever		
		TWA	0.2 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		

		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

General industrial hygiene practice.

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).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: Wire Colour: light red
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 1,083.4 °C (1,982.1 °F)
f) Initial boiling point and boiling range	2,567 °C 4,653 °F
g) Flash point	()No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	8.940 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 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 acids, Strong oxidizing agents, Acid chlorides, Halogens

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Copper oxides

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 3.5 mg/kg

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: GL5325000

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

SECTION 12: Ecological information**12.1 Toxicity**

No data available

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

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

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information**DOT (US)**

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components

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

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.

Pennsylvania Right To Know Components

Copper,	CAS-No. 7440-50-8	Revision Date 1993-02-16
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Copper,	CAS-No. 7440-50-8	Revision Date 1993-02-16
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New Jersey Right To Know Components

Copper,	CAS-No. 7440-50-8	Revision Date 1993-02-16
---------	----------------------	-----------------------------

California Prop. 65 Components

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

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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: 6.1

Revision Date: 03/12/2019

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Cyclohexane

Product Number : 227048
Brand : Sigma-Aldrich
Index-No. : 601-017-00-1

CAS-No. : 110-82-7

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225

Skin irritation (Category 2), H315

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

Aspiration hazard (Category 1), H304

Acute aquatic toxicity (Category 1), H400

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H225 : Highly flammable liquid and vapour.
H304 : May be fatal if swallowed and enters airways.
H315 : Causes skin irritation.
H336 : May cause drowsiness or dizziness.
H400 : Very toxic to aquatic life.

Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	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.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₆ H ₁₂
Molecular weight	: 84.16 g/mol
CAS-No.	: 110-82-7
EC-No.	: 203-806-2
Index-No.	: 601-017-00-1

Hazardous components

Component	Classification	Concentration
Cyclohexane		
	Flam. Liq. 2; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 1; H225, H304, H315, H336, H400	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Cyclohexane	110-82-7	TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment		
		TWA	300.000000 ppm 1,050.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	300.000000 ppm 1,050.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 35 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to enginee protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: liquid Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 4 - 7 °C (39 - 45 °F) - lit.
f) Initial boiling point and boiling range	80.7 °C (177.3 °F) - lit.
g) Flash point	-18.0 °C (-0.4 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 9 %(V) Lower explosion limit: 1 %(V)
k) Vapour pressure	225.0 hPa at 37.7 °C (99.9 °F) 102.7 hPa at 20.0 °C(68.0 °F)
l) Vapour density	No data available
m) Relative density	0.779 g/cm ³ at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 3.44
p) Auto-ignition temperature	260.0 °C (500.0 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 12,705 mg/kg(Cyclohexane)

LC50 Inhalation - Rat - 4 h - 34,000 mg/l(Cyclohexane)

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - > 2,000 mg/kg(Cyclohexane)

No data available(Cyclohexane)

Skin corrosion/irritation

Skin - Rabbit(Cyclohexane)

Result: No skin irritation

Serious eye damage/eye irritation

Eyes - Rabbit(Cyclohexane)

Result: Mild eye irritation

Respiratory or skin sensitisation

No data available(Cyclohexane)

Germ cell mutagenicity

No data available(Cyclohexane)

Carcinogenicity

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

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

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

Reproductive toxicity

No data available(Cyclohexane)

No data available(Cyclohexane)

Specific target organ toxicity - single exposure

No data available(Cyclohexane)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

May be fatal if swallowed and enters airways.(Cyclohexane)

Additional Information

RTECS: GU6300000

Central nervous system depression, Drowsiness, Irritability, Dizziness, Gastrointestinal disturbance, Lung irritation, chest pain, pulmonary edema(Cyclohexane)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 4.53 mg/l - 96 h(Cyclohexane) (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 0.9 mg/l - 48 h(Cyclohexane) (OECD Test Guideline 202)
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 3.4 mg/l - 72 h(Cyclohexane) (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability Result: - Readily biodegradable.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Cyclohexane)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1145 Class: 3 Packing group: II
Proper shipping name: Cyclohexane
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1145 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: CYCLOHEXANE
Marine pollutant : yes

IATA

UN number: 1145 Class: 3 Packing group: II
Proper shipping name: Cyclohexane

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Cyclohexane	110-82-7	2007-07-01

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Cyclohexane	110-82-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cyclohexane	110-82-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Cyclohexane	110-82-7	2007-07-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 07/17/2018
Print Date 01/21/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Dibenz[*a,h*]anthracene

Product Number : 48574

Brand : Supelco

Index-No. : 601-041-00-2

CAS-No. : 53-70-3

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 1B), H350

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H350

May cause cancer.

H410

Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,2:5,6-Dibenzanthracene
Formula	: C ₂₂ H ₁₄
Molecular weight	: 278.35 g/mol
CAS-No.	: 53-70-3
EC-No.	: 200-181-8
Index-No.	: 601-041-00-2

Hazardous components

Component	Classification	Concentration
Dibenz[a,h]anthracene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Store at room temperature.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 262 - 265 °C (504 - 509 °F) - lit. |
| f) Initial boiling point and boiling range | 524 °C (975 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |

- | | | |
|----|--|-------------------|
| n) | Water solubility | No data available |
| o) | Partition coefficient: n-octanol/water | No data available |
| p) | Auto-ignition temperature | No data available |
| q) | Decomposition temperature | No data available |
| r) | Viscosity | No data available |
| s) | Explosive properties | No data available |
| t) | Oxidizing properties | No data available |

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Carcinogenicity

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

Possible human carcinogen

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: HN2625000

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

Lungs -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates

Immobilization EC50 - Daphnia magna (Water flea) - 0.496 mg/l - 24 h(Dibenz[a,h]anthracene)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Dibenz[a,h]anthracene)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

UN number: 3077

Class: 9

Packing group: III

EMS-No: F-A, S-F

Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenz[a,h]anthracene)

Marine pollutant : yes

IATA

UN number: 3077

Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenz[a,h]anthracene)

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dibenz[a,h]anthracene	53-70-3	

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Dibenz[a,h]anthracene	53-70-3	

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

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

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 07/17/2018

Print Date: 01/21/2019

SAFETY DATA SHEET

Version 5.11
Revision Date 05/07/2018
Print Date 07/18/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Dichlorodifluoromethane solution

Product Number : 40346

Brand : Supelco

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225

Acute toxicity, Oral (Category 3), H301

Acute toxicity, Inhalation (Category 3), H331

Acute toxicity, Dermal (Category 3), H311

Specific target organ toxicity - single exposure (Category 1), H370

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

H301 + H311 + H331

H370

Highly flammable liquid and vapour.

Toxic if swallowed, in contact with skin or if inhaled.

Causes damage to organs.

Precautionary statement(s)

P210

P233

P240

P241

P242

P243

P260

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

Keep container tightly closed.

Ground/bond container and receiving equipment.

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

Use only non-sparking tools.

Take precautionary measures against static discharge.

Do not breathe dust/ fume/ gas/ mist/ vapours/ 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/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P311	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician.
P307 + P311	IF exposed: Call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula	: CCl ₂ F ₂
Molecular weight	: 120.91 g/mol

Hazardous components

Component	Classification	Concentration
Methanol		
CAS-No.	67-56-1	90 - 100 %
EC-No.	200-659-6	
Index-No.	603-001-00-X	
Registration number	01-2119433307-44-XXXX	
		Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301 + H311 + H331, H370

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		

		Danger of cutaneous absorption		
		STEL	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		TWA	200 ppm 260 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	250 ppm 325 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	200 ppm 260 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		C	1,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		PEL	200 ppm 260 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	250 ppm 325 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Methanol	15 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 480 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact

Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 30 min
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | -98 °C (-144 °F) |
| f) Initial boiling point and boiling range | 64 - 65 °C (147 - 149 °F) at 1,013 hPa (760 mmHg) |
| g) Flash point | 11 °C (52 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 36 %(V)
Lower explosion limit: 6 %(V) |
| k) Vapour pressure | 130.23 hPa (97.68 mmHg) at 20 °C (68 °F)
547 hPa (410 mmHg) at 50 °C (122 °F) |
| l) Vapour density | 0.791.1 |
| m) Relative density | 0.791 g/cm3 |
| n) Water solubility | completely miscible |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |

- | | |
|-------------------------|-------------------|
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

Relative vapour density	0.79
	1.1

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

acids, Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals, Potassium, Sodium/sodium oxides, Aluminum, Magnesium, Zinc

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's

list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

Methyl alcohol may be fatal or cause blindness if swallowed., Cannot be made non-poisonous., Effects due to ingestion may include:, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Dizziness, Weakness, Confusion., Drowsiness, Unconsciousness, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

Heart - (Dichlorodifluoromethane)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1230 Class: 3 Packing group: II

Proper shipping name: Methanol, solution

Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG

UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D

Proper shipping name: METHANOL, SOLUTION

IATA

UN number: 1230 Class: 3 (6.1)
Proper shipping name: Methanol, solution

Packing group: II

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

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

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01
Dichlorodifluoromethane	75-71-8	2015-11-23

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01
Dichlorodifluoromethane	75-71-8	2015-11-23

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	67-56-1	2012-03-16

Methanol

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H311	Toxic in contact with skin.
H331	Toxic if inhaled.
H370	Causes damage to organs.
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.11

Revision Date: 05/07/2018

Print Date: 07/18/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 03/14/2018
Print Date 07/18/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Dieldrin

Product Number : 33491
Brand : Sigma-Aldrich
Index-No. : 602-049-00-9

CAS-No. : 60-57-1

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 2), H300

Acute toxicity, Dermal (Category 1), H310

Carcinogenicity (Category 2), H351

Specific target organ toxicity - repeated exposure, Oral (Category 1), H372

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word	Danger
Hazard statement(s)	
H300 + H310	Fatal if swallowed or in contact with skin
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.
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/ vapours/ spray.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene
Formula	: C ₁₂ H ₈ Cl ₆ O
Molecular weight	: 380.91 g/mol
CAS-No.	: 60-57-1
EC-No.	: 200-484-5
Index-No.	: 602-049-00-9

Hazardous components

Component	Classification	Concentration
Dieldrin		
	Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable 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, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Dieldrin	60-57-1	TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Reproductive effects Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.250000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.250000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Reproductive effects Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.25 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.25 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.25 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	0.25 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: solid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 143 - 144 °C (289 - 291 °F) - lit. |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |

- | | |
|------------------------------|-------------------|
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 38.3 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: IO1750000

Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence

Blood - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h(Dieldrin)

Toxicity to daphnia and Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h(Dieldrin)
other aquatic
invertebrates

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Dieldrin)

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

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

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 2811 Class: 6.1 Packing group: I

Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)

Reportable Quantity (RQ) : 1 lbs

Marine pollutant: no no
Poison Inhalation Hazard: No

IMDG

UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)
Marine pollutant : yes

IATA

UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)
IATA Passenger: Not permitted for transport
A5

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Dieldrin	60-57-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H300	Fatal if swallowed.
H300 + H310	Fatal if swallowed or in contact with skin
H310	Fatal in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 03/14/2018

Print Date: 07/18/2019

Chemical Safety Data Sheet MSDS / SDS

Ethanol

Revision Date:2023-09-02 Revision Number:1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product identifier

Product name : Ethanol
CBnumber : CB2362508
CAS : 64-17-5
EINECS Number : 200-578-6
Synonyms : ethanol,Ethyl alcohol

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses : For R&D use only. Not for medicinal, household or other use.
Uses advised against : none

Company Identification

Company : Chemicalbook
Address : Building 1, Huihuang International, Shangdi 10th Street, Haidian District, Beijing
Telephone : 400-158-6606

SECTION 2: Hazards identification

GHS Label elements, including precautionary statements

Symbol(GHS)



Signal word

Danger

Precautionary statements

P210 Keep away from heat/sparks/open flames/hot surfaces. — No smoking.

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P303+P361+P353 IF ON SKIN (or hair): Remove/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.

Continuerinsing.

P311 Call a POISON CENTER or doctor/physician.

P337+P313 IF eye irritation persists: Get medical advice/attention.

P370+P378 In case of fire: Use ... for extinction.

P403+P235 Store in a well-ventilated place. Keep cool.

P405 Store locked up.

Hazard statements

H225 Highly Flammable liquid and vapour

H226 Flammable liquid and vapour

H302 Harmful if swallowed

H313 May be harmful in contact with skin

H319 Causes serious eye irritation

H333 May be harmful if inhaled

H370 Causes damage to organs

H371 May cause damage to organs

H402 Harmful to aquatic life

H412 Harmful to aquatic life with long lasting effects

SECTION 3: Composition/information on ingredients

Substance

Product name	: Ethanol
Synonyms	: ethanol, Ethyl alcohol
CAS	: 64-17-5
EC number	: 200-578-6
MF	: C ₂ H ₆ O
MW	: 46.07

SECTION 4: First aid measures

Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

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

Indication of any immediate medical attention and special treatment needed

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing media

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

Special hazards arising from the substance or mixture

Carbon oxides Combustible.

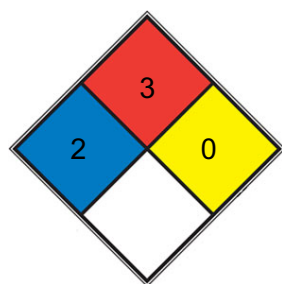
Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

Further information

Use water spray to cool unopened containers.

NFPA 704



HEALTH 2 Intense or continued but not chronic exposure could cause temporary incapacitation or possible residual injury (e.g. [diethyl ether](#), ammonium phosphate, iodine)

FIRE 3 Liquids and solids (including finely divided suspended solids) that can be ignited under almost all ambient temperature conditions. Liquids having a flash point below 22.8 °C (73 °F) and having a boiling point at or above 37.8 °C (100 °F) or having a flash point between 22.8 and 37.8 °C (73 and 100 °F). (e.g. gasoline, [acetone](#))

REACT 0 Normally stable, even under fire exposure conditions, and is not reactive with water (e.g. helium, [N₂](#))

SPEC.

HAZ.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition.

Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

Environmental precautions

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

Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

Hygroscopic.

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

control parameter

Hazard composition and occupational exposure limits

Does not contain substances with occupational exposure limits.

Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it.

Full contact

Material: butyl-rubber

Minimum layer thickness: 0,3 mm Break through time: 480 min

Material tested: Butoject? (KCL 897 / Aldrich Z677647, Size M)

Splash contact Material: Nitrile rubber

Minimum layer thickness: 0,2 mm Break through time: 38 min

Material tested: Dermatril? P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full- face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

Exposure limits

TLV-TWA 1900 mg/m³ (1000 ppm) (ACGIH).

SECTION 9: Physical and chemical properties

Information on basic physicochemical properties

Appearance	Form: liquid Colour: colourless
Odour	pungent
Odour Threshold	0.52ppm
pH	7,0 at 10 g/l at 20 °C
Melting point/freezing point	Melting point/range: -114 °C
Initial boiling point and boiling range	78 °C
Flash point	13 °C - closed cup
Evaporation rate	No data available
Flammability (solid, gas)	No data available
Upper/lower flammability or explosive limits	Upper explosion limit: 13,5 %(V) Lower explosion limit: 2,5 %(V)
Vapour pressure	0,57 hPa at 19,6 °C
Vapour density	1,6
Relative density	0,789 g/mL at 25 °C

Water solubility	1.000 g/l at 20 °C - completely miscible
Partition coefficient: n-octanol/water	log Pow: -0,35 at 24 °C - Bioaccumulation is not expected.
Autoignition temperature	455 °C at 1.013 hPa - DIN 51794
Decomposition temperature	Distillable in an undecomposed state at normal pressure.
Viscosity	No data available
Explosive properties	No data available
Oxidizing properties	No data available
λ_{max}	λ : 240 nm Amax: 0.40 λ : 250 nm Amax: 0.30 λ : 260 nm Amax: 0.30 λ : 270 nm Amax: 0.10 λ : 340 nm Amax: 0.10

Other safety information

Conductivity < 1 $\mu\text{S}/\text{cm}$

Surface tension 72,75 mN/m at 20 °C

Relative vapour density

1,6

SECTION 10: Stability and reactivity

Reactivity

No data available

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

Risk of explosion/exothermic reaction with:hydrogen peroxide, perchlorates, perchloric acid, Nitric acid, mercury(II) nitrate, permanganic acid, Nitriles, peroxi compounds, Strong oxidizing agents, nitrosyl compounds, Peroxides, sodium, Potassium, halogen oxides, calcium hypochlorite, nitrogen dioxide, metallic oxides, uranium hexafluoride, iodides, Chlorine, Alkali metals, Alkaline earth metals, alkali oxides, Ethylene oxidesilver, with, Nitric acidsilver compounds, with, Ammoniapotassium permanganate, with, conc. sulfuric acidRisk of ignition or formation of inflammable gases or vapours with:halogen-halogen compounds, chromium(VI) oxide, chromyl chloride, Fluorine, hydrides, Oxides of phosphorus, platinumNitric acid, with, potassium permanganate

Conditions to avoid

Warming.

Heat, flames and sparks.

Incompatible materials

rubber, various plastics

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides Other decomposition products - No data available

In the event of fire: see section 5

SECTION 11: Toxicological information

Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - 10.470 mg/kg (OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 4 h - 124,7 mg/l (OECD Test Guideline 403)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 24 h (OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Causes serious eye irritation. (OECD Test Guideline 405)

Respiratory or skin sensitisation

(OECD Test Guideline 406)

Remarks: (in analogy to similar products)

Germ cell mutagenicity

Ames test

Salmonella typhimurium Result: negative

In vitro mammalian cell gene mutation test mouse lymphoma cells

Result: negative

OECD Test Guideline 478 Mouse - male

Result: Positive results were obtained in some in vivo tests.

Carcinogenicity

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

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity - Rat - male - Oral - No observed adverse effect level - 1.730 mg/kg

- Lowest observed adverse effect level - 3.200 mg/kg RTECS: KQ6300000

irritant effects, respiratory paralysis, Dizziness, narcosis, inebriation, euphoria, Nausea, Vomiting

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

Toxicity

SECTION 12: Ecological information

Toxicity

Toxicity to fish

flow-through test LC50 - *Pimephales promelas* (fathead minnow) -

15.300 mg/l - 96 h (US-EPA)

Toxicity to daphnia and other aquatic invertebrates

static test LC50 - *Ceriodaphnia dubia* (water flea) - 5.012 mg/l - 48 h

Remarks: (ECHA)

Toxicity to algae

static test ErC50 - *Chlorella vulgaris* (Fresh water algae) - 275 mg/l

- 72 h

(OECD Test Guideline 201)

Toxicity to bacteria

static test IC50 - activated sludge - > 1.000 mg/l - 3 h (OECD Test Guideline 209)

Persistence and degradability

Biodegradability aerobic - Exposure time 15 d

Result: ca.95 % - Readily biodegradable. (OECD Test Guideline 301E)

Biochemical Oxygen Demand (BOD)

Theoretical oxygen demand

930 - 1.670 mg/g Remarks: (Lit.)

2.100 mg/g Remarks: (Lit.)

Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

Mobility in soil

No data available

Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Other adverse effects

Additional ecological information

No data available

SECTION 13: Disposal considerations

Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Waste material must be disposed of in accordance with the Directive on waste 2008/98/EC as well as other national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

Incompatibilities

In acidic conditions, ethanol solutions may react vigorously with oxidizing materials. Mixtures with alkali may darken in color owing to a reaction with residual amounts of aldehyde. Organic salts or acacia may be precipitated from aqueous solutions or dispersions. Ethanol solutions are also incompatible with aluminum containers and may interact with some drugs.

Waste Disposal

Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

UN number

ADR/RID: 1170 IMDG: 1170

UN proper shipping name

ADR/RID: ETHANOL IMDG: ETHANOL IATA: Ethanol

Transport hazard class(es)

ADR/RID: 3 IMDG: 3 IATA: 3

Packaging group

ADR/RID: II IMDG: II IATA: II

Environmental hazards

ADR/RID: no IMDG Marine pollutant: no IATA: no

Special precautions for user

No data available

SECTION 15: Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

Regulations on the Safety Management of Hazardous Chemicals

China Catalog of Hazardous chemicals 2015: Listed. website: <https://www.mem.gov.cn/>

Measures for Environmental Management of New Chemical Substances

Chinese Chemical Inventory of Existing Chemical Substances (China IECSC): Listed. website: <https://www.mee.gov.cn/>

EC Inventory: Listed.

European Inventory of Existing Commercial Chemical Substances (EINECS): Listed. website: <https://echa.europa.eu/>

Korea Existing Chemicals List (KECL): Listed. website: <http://ncis.nier.go.kr>

New Zealand Inventory of Chemicals (NZIoC): Listed. website: <https://www.epa.govt.nz/>

Philippines Inventory of Chemicals and Chemical Substances (PICCS): Listed. website: <https://emb.gov.ph/>

United States Toxic Substances Control Act (TSCA) Inventory: Listed. website: <https://www.epa.gov/>

Vietnam National Chemical Inventory: Listed. website: <https://chemicaldata.gov.vn/>

SECTION 16: Other information

Abbreviations and acronyms

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

CAS: Chemical Abstracts Service

EC50: Effective Concentration 50%

ATA: International Air Transportation Association

IMDG: International Maritime Dangerous Goods

LC50: Lethal Concentration 50%

LD50: Lethal Dose 50%

RID: Regulation concerning the International Carriage of Dangerous Goods by Rail

STEL: Short term exposure limit

TWA: Time Weighted Average

References

【1】CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>

【2】ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>

【3】ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

【4】eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website:

http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en

【5】ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>

【6】Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>

【7】HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>

【8】IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>

【9】IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>

【10】Sigma-Aldrich, website: <https://www.sigmaaldrich.com/>

Other Information

Ethanol consumption during pregnancy may adversely affect the unborn child. Chronic ingestion of ethanol may cause liver cirrhosis and cancer.

Disclaimer:

The information in this MSDS is only applicable to the specified product, unless otherwise specified, it is not applicable to the mixture of this product and other substances. This MSDS only provides information on the safety of the product for those who have received the appropriate professional training for the user of the product. Users of this MSDS must make independent judgments on the applicability of this SDS. The authors of this MSDS will not be held responsible for any harm caused by the use of this MSDS.

SAFETY DATA SHEET

Creation Date 13-Oct-2009

Revision Date 25-Dec-2021

Revision Number 6

1. Identification

Product Name Ethyl acetate

Cat No. : AC326900000; AC326900010; AC326900025; AC326901000;
AC326902500; AC326905000

CAS No 141-78-6
Synonyms Acetic acid ethyl ester

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	

Label Elements**Signal Word**

Danger

Hazard Statements

Highly flammable liquid and vapor
Causes serious eye irritation

May cause drowsiness or dizziness



Precautionary Statements

Prevention

Wash face, hands and any exposed skin thoroughly after handling
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool

Response

Get medical attention/advice 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 (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

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

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

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)

Repeated exposure may cause skin dryness or cracking

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Ethyl acetate	141-78-6	>95

4. First-aid measures

General Advice

If symptoms persist, call a physician.

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 plenty of water for at least 15 minutes. If skin irritation persists,

	call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water.
Most important symptoms and effects	Difficulty in breathing. May cause central nervous system depression: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam.
Unsuitable Extinguishing Media	Water may be ineffective, Do not use a solid water stream as it may scatter and spread fire
Flash Point	-4 °C / 24.8 °F
Method -	CC (closed cup)
Autoignition Temperature	427 °C / 800.6 °F
Explosion Limits	
Upper	11.5 vol %
Lower	2.0 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

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
2

Flammability
3

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Ensure adequate ventilation. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.
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Storage.

Flammables area. Keep away from heat, sparks and flame. Keep container tightly closed in a dry and well-ventilated place. Incompatible Materials. Strong oxidizing agents. Strong acids. Amines. Peroxides.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Ethyl acetate	TWA: 400 ppm	(Vacated) TWA: 400 ppm (Vacated) TWA: 1400 mg/m ³ TWA: 400 ppm TWA: 1400 mg/m ³	IDLH: 2000 ppm TWA: 400 ppm TWA: 1400 mg/m ³	TWA: 400 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Use explosion-proof 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
Odor	sweet
Odor Threshold	50 ppm
pH	No information available
Melting Point/Range	-83.5 °C / -118.3 °F
Boiling Point/Range	75 - 78 °C / 167 - 172.4 °F
Flash Point	-4 °C / 24.8 °F
Method -	CC (closed cup)
Evaporation Rate	6.2
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	11.5 vol %
Lower	2.0 vol %
Vapor Pressure	103 mbar @ 20°C
Vapor Density	3.04
Specific Gravity	0.902
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	427 °C / 800.6 °F
Decomposition Temperature	No information available
Viscosity	0.45 cP @ 20 °C
Molecular Formula	C ₄ H ₈ O ₂

Molecular Weight
Surface tension

88.11
24 mN/m @ 20°C

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong acids, Amines, Peroxides
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethyl acetate	10,200 mg/kg (Rat)	> 20 mL/kg (Rabbit) > 18000 mg/kg (Rabbit)	58 mg/l (rat; 8 h)

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes
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
Ethyl acetate	141-78-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed May cause central nervous system depression: 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 empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ethyl acetate	EC50 = 3300 mg/L/48h	Fathead minnow: LC50: 230 mg/l/ 96h Gold orfe: LC50: 270 mg/L/48h	EC50 = 1180 mg/L 5 min EC50 = 1500 mg/L 15 min EC50 = 5870 mg/L 15 min EC50 = 7400 mg/L 2 h	EC50 = 717 mg/L/48h

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.

Component	log Pow
Ethyl acetate	0.6

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.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Ethyl acetate - 141-78-6	U112	-

14. Transport information

DOT

UN-No UN1173
 Proper Shipping Name ETHYL ACETATE
 Hazard Class 3
 Packing Group II

TDG

UN-No UN1173
 Proper Shipping Name ETHYL ACETATE
 Hazard Class 3
 Packing Group II

IATA

UN-No UN1173
 Proper Shipping Name ETHYL ACETATE
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN1173
 Proper Shipping Name ETHYL ACETATE
 Hazard Class 3
 Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Ethyl acetate	141-78-6	X	ACTIVE	-

Legend:

TSCA US EPA (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/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Ethyl acetate	141-78-6	X	-	205-500-4	X	X	X	X	X	KE-00047

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

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 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
Ethyl acetate	5000 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
Ethyl acetate	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
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 Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Ethyl acetate	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Ethyl acetate	141-78-6	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Ethyl acetate	141-78-6	Not applicable	Not applicable	Not applicable	Annex I - Y42

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 13-Oct-2009

Revision Date 25-Dec-2021

Print Date 25-Dec-2021

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

End of SDS

SAFETY DATA SHEET

Version 5.12
Revision Date 04/20/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Ethylbenzene

Product Number : 296848
Brand : Sigma-Aldrich
Index-No. : 601-023-00-4

CAS-No. : 100-41-4

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H332 Harmful if inhaled.
H351 Suspected of causing cancer.
H373 May cause damage to organs through prolonged or repeated exposure.
H401 Toxic to aquatic life.

Precautionary statement(s)

P201 Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
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.
P331	Do NOT induce vomiting.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₈ H ₁₀
Molecular weight	: 106.17 g/mol
CAS-No.	: 100-41-4
EC-No.	: 202-849-4
Index-No.	: 601-023-00-4

Hazardous components

Component	Classification	Concentration
Ethylbenzene		
	Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H332, H351, H373, H401	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

hygroscopic

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethylbenzene	100-41-4	TWA	20.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	125.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100.000000 ppm 435.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125.000000 ppm 545.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100.000000 ppm 435.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125 ppm 545 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	125 ppm 545 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	30 ppm 130 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	0.7g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Ethylbenzene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Not critical			
		Sum of mandelic acid and phenyl glyoxylic acid	0.15g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: liquid Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -95 °C (-139 °F) - lit.
f) Initial boiling point and boiling range	136 °C (277 °F) - lit.
g) Flash point	15.0 °C (59.0 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 6.7 %(V) Lower explosion limit: 1 %(V)
k) Vapour pressure	13.3 hPa (10.0 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	0.867 g/cm ³ at 25 °C (77 °F)
n) Water solubility	0.2 g/l at 25 °C (77 °F) - slightly soluble
o) Partition coefficient: n-octanol/water	log Pow: 3.6 at 20 °C (68 °F)
p) Auto-ignition temperature	432.0 °C (809.6 °F)
q) Decomposition temperature	No data available
r) Viscosity	0.773 mm ² /s at 20 °C (68 °F) -
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.2 mN/m at 23 °C (73 °F)
-----------------	----------------------------

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - 3,500 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 15,433 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Moderate skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Hamster

ovary

Result: negative

Mouse - male and female

Result: negative

Carcinogenicity

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Ethylbenzene)

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

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

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

May be fatal if swallowed and enters airways.

Additional Information

Repeated dose toxicity Rat - male and female - NOAEL : 75 mg/kg - OECD Test Guideline 407

RTECS: DA0700000

Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h

Toxicity to algae static test EC50 - Skeletonema costatum (marine diatom) - 4.9 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 70 - 80 % - Readily biodegradable.

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1175 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLBENZENE

IATA

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.12

Revision Date: 04/20/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 5.12
Revision Date 07/26/2018
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Heptane

Product Number : 246654
Brand : Sigma-Aldrich
Index-No. : 601-008-00-2

CAS-No. : 142-82-5

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233 Keep container tightly closed.

P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₇ H ₁₆
Molecular weight	: 100.20 g/mol
CAS-No.	: 142-82-5
EC-No.	: 205-563-8
Index-No.	: 601-008-00-2
Registration number	: 01-2119457603-38-XXXX

Hazardous components

Component	Classification	Concentration
Heptane		
	Flam. Liq. 2; Skin Irrit. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 1; Aquatic Chronic 1; H225, H304, H315, H336, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Flash back possible over considerable distance.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Store under inert gas. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Heptane	142-82-5	TWA	85 ppm 350 mg/m ³	USA. NIOSH Recommended Exposure Limits
		C	440 ppm 1,800 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	15 minute ceiling value		
		TWA	500 ppm 2,000 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m ³ is approximate.		
		PEL	400 ppm 1,600 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	500 ppm 2,000 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		
		STEL	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 65 min

Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -91 °C (-132 °F) |
| f) Initial boiling point and boiling range | 98 °C (208 °F) |
| g) Flash point | 22 °C (72 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7 %(V)
Lower explosion limit: 1.1 %(V) |
| k) Vapour pressure | 110.7 hPa (83.0 mmHg) at 37.7 °C (99.9 °F)
53.3 hPa (40.0 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.684 g/mL at 25 °C (77 °F) |
| n) Water solubility | insoluble |
| o) Partition coefficient: n-octanol/water | log Pow: > 3.000 |
| p) Auto-ignition temperature | 223.0 °C (433.4 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

LC50 Inhalation - Rat - 4 h - 103,000 mg/m³

Inhalation: Irritating to respiratory system.

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation

(OECD Test Guideline 405)

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

May be fatal if swallowed and enters airways.

Additional Information

RTECS: MI7700000

Prolonged or repeated exposure to skin causes defatting and dermatitis., Central nervous system depression, narcosis, Damage to the lungs.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Carassius auratus (goldfish) - 4 mg/l - 24.0 h

LC50 - Tilapia mossambica - 375 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 1.50 mg/l - 48 h

12.2 Persistence and degradability

Ratio BOD/ThBOD 3.5 %

12.3 Bioaccumulative potential

Indication of bioaccumulation.

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

Very toxic to aquatic life with long lasting effects.

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

Do not empty into drains. Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1206 Class: 3 Packing group: II

Proper shipping name: Heptanes

Reportable Quantity (RQ): Marine pollutant:yes

Poison Inhalation Hazard: No

IMDG

UN number: 1206 Class: 3 Packing group: II EMS-No: F-E, S-D

Proper shipping name: HEPTANES

Marine pollutant:yes

Marine pollutant: yes

IATA

UN number: 1206

Class: 3

Packing group: II

Proper shipping name: Heptanes

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Heptane	142-82-5	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Heptane	142-82-5	1993-02-16

	CAS-No.	Revision Date
Heptane	142-82-5	1993-02-16

New Jersey Right To Know Components

	CAS-No.	Revision Date
Heptane	142-82-5	1993-02-16

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Skin Irrit.	Skin irritation

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.12

Revision Date: 07/26/2018

Print Date: 11/10/2018

SAFETY DATA SHEET

Version 5.6
Revision Date 12/11/2017
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Indeno[1,2,3-*cd*]pyrene

Product Number : 48499

Brand : Supelco

CAS-No. : 193-39-5

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Carcinogenicity (Category 2), H351

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H351

Suspected of causing cancer.

Precautionary statement(s)

P201

Obtain special instructions before use.

P202

Do not handle until all safety precautions have been read and understood.

P281

Use personal protective equipment as required.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P405

Store locked up.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : C₂₂H₁₂
Molecular weight : 276.33 g/mol
CAS-No. : 193-39-5
EC-No. : 205-893-2

Hazardous components

Component	Classification	Concentration
Indeno[1,2,3-cd]pyrene	Carc. 2; H351	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Store at room temperature.

Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Indeno[1,2,3-cd]pyrene	193-39-5	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the

sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: solid
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	163.6 °C (326.5 °F)
f) Initial boiling point and boiling range	536.0 °C (996.8 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the
State of California to cause cancer.
Indeno[1,2,3-cd]pyrene

CAS-No.
193-39-5

Revision Date
2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
H351	Suspected of causing cancer.

HMIS Rating

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

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6

Revision Date: 12/11/2017

Print Date: 11/10/2018

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 6.0 Revision Date 10.11.2016

Print Date 17.07.2019

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Iron Metal Clinical

Product Number : NIST937

Brand : Sigma-Aldrich

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

2.2 Label elements

2.3 Other hazards - none

SECTION 3: Composition/information on ingredients

SECTION 4: First aid measures

4.1 Description of first aid measures

No data available

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**
No data available
- 5.2 Special hazards arising from the substance or mixture**
No data available
- 5.3 Advice for firefighters**
No data available
- 5.4 Further information**
No data available

SECTION 6: Accidental release measures

- 6.1 Personal precautions, protective equipment and emergency procedures**
For personal protection see section 8.
- 6.2 Environmental precautions**
No data available
- 6.3 Methods and materials for containment and cleaning up**
No data available
- 6.4 Reference to other sections**
For disposal see section 13.

SECTION 7: Handling and storage

- 7.1 Precautions for safe handling**
For precautions see section 2.2.
- 7.2 Conditions for safe storage, including any incompatibilities**
No data available
- 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**
- 8.2 Exposure controls**
No data available

SECTION 9: Physical and chemical properties

- 9.1 Information on basic physical and chemical properties**
 - a) Appearance No data available
 - b) Odour No data available
 - c) Odour Threshold No data available
 - d) pH No data available
 - e) Melting point/freezing point No data available
 - f) Initial boiling point and boiling range No data available
 - g) Flash point No data available
 - h) Evaporation rate No data available
 - i) Flammability (solid, gas) No data available

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

No data available

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

No data available

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

Skin corrosion/irritation

Serious eye damage/eye irritation

Respiratory or skin sensitisation

Germ cell mutagenicity

RTECS: Not available

IN CASE OF TRANSPORTATION EMERGENCY CONTACT:

CHEMTREC:(800) 424-9300

ALL OTHER INQUIRIES:
(770) 904-7042 // www.ciscochem.com
266 Rue Cezzan Lavonia, GA 30553



1. IDENTIFICATION

ISOPROPYL ALCOHOL

SYNONYMS: ISOPROPANOL, IPA

CAS - NO: 67-63-0

EINECS NO: 200-661-7

CHEMICAL FORMULA: C3-H8-O

2. HAZARDS IDENTIFICATION

OSHA/HCS status

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

Classification of the substance or mixture

FLAMMABLE LIQUIDS - Category 2

SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2

SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3

GHS label elements

Signal word: DANGER!

Hazard Statements: Highly flammable liquid and vapor.
May displace oxygen and cause rapid suffocation.
Causes serious eye irritation.
May cause drowsiness and dizziness

Precautionary statements

General: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention:

Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling. Use and store only outdoors or in a well ventilated place.

Response:

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue

Most important symptoms/effects, acute and delayed
Potential acute health effects

EYE CONTACT:	Causes serious eye irritation
INHALATION:	Can cause central nervous system (CNS) depression. May cause drowsiness dizziness
SKIN CONTACT:	No known significant effects or critical hazards
FROSTBITE:	Try to warm up the frozen tissues and seek medical attention
INGESTION:	Can cause central nervous system (CNS) depression. Irritating to mouth, throat and stomach

Over-exposure signs/symptoms

EYE CONTACT:	Adverse symptoms may include the following: pain OR irritation redness watering
INHALATION:	Adverse symptoms may include the following: nausea or vomiting headache drowsiness/fatigue dizziness/vertigo unconsciousness
SKIN CONTACT:	No specific data
INGESTION:	No specific data

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician:	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific Treatments:	No specific treatment
Protection of first-aiders:	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5. FIRE FIGHTING MEASURES

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 399°C (750.2°F)

Flash Points: CLOSED CUP: 11.667°C (53°F) - 12.778 deg. C (55 deg. F) (TAG)

Flammable Limits: LOWER: 2% UPPER: 12.7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Flammable in presence of oxidizing materials. Non- flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

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

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Vapor may travel considerable distance to source of ignition and flash back. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME. Hydrogen peroxide sharply reduces the autoignition temperature of Isopropyl alcohol. After a delay, Isopropyl alcohol ignites on contact with dioxigenyl tetrafluoroborate, chromium trioxide, and potassium tert-butoxide. When heated to decomposition it emits acrid smoke and fumes.

Special Remarks on Explosion Hazards:

Secondary alcohols are readily autooxidized in contact with oxygen or air, forming ketones and hydrogen peroxide. It can become potentially explosive. It reacts with oxygen to form dangerously unstable peroxides which can concentrate and explode during distillation or evaporation. The presence of 2-butanone increases the reaction rate for peroxide formation. Explosive in the form of vapor when exposed to heat or flame. May form explosive mixtures with air. Isopropyl alcohol + phosgene forms isopropyl chloroformate and hydrogen chloride. In the presence of iron salts, thermal decomposition can occur, which in some cases can become explosive. A homogeneous mixture of concentrated peroxides + isopropyl alcohol are capable of detonation by shock or heat. Barium perchlorate + isopropyl alcohol gives the highly explosive alkyl perchlorates. forms explosive mixtures with trinitromethane and hydrogen peroxide. It produces a violent explosive reaction when heated with aluminum isopropoxide + crotonaldehyde. Mixtures of isopropyl alcohol + nitroform are explosive.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders

If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precaution

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill

Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill

Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Protective Measures

Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general :
occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, :
Including any incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls:

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

Personal Protection:

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

Personal Protection in Case of a Large Spill:

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

Exposure Limits:

TWA: 983 STEL: 1230 (mg/m³) [Australia] TWA: 200 STEL: 400 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 980 STEL: 1225 (mg/m³) from NIOSH TWA: 400 STEL: 500 (ppm) from NIOSH TWA: 400 STEL: 500 (ppm) [United Kingdom (UK)] TWA: 999 STEL: 1259 (mg/m³) [United Kingdom (UK)] TWA: 400 STEL: 500 (ppm) from OSHA (PEL) [United States] TWA: 980 STEL: 1225 (mg/m³) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state and appearance: Liquid.

Odor: Pleasant. Odor resembling that of a mixture of ethanol and acetone.

Taste: Bitter. (Slight.)

Molecular Weight: 60.1 g/mole

Color: Colorless.

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

Boiling Point: 82.5°C (180.5°F)

Melting Point: -88.5°C (-127.3°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.78505 (Water = 1)

Vapor Pressure: 4.4 kPa (@ 20°C)

Vapor Density: 2.07 (Air = 1)

Volatility: Not available.

Odor Threshold:

22 ppm (Sittig, 1991) 700 ppm for unadapted panelists (Verschuren, 1983).

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; $\log(\text{oil/water}) = 0.1$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility: Easily soluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone. Insoluble in salt solution. Soluble in benzene. Miscible with most organic solvents including alcohol, ethyl alcohol, chloroform.

10. STABILITY AND REACTIVITY

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, Ignition sources, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts violently with hydrogen + palladium combination, nitroform, oleum, COCl_2 , aluminum triisopropoxide, oxidants

Incompatible with acetaldehyde, chlorine, ethylene oxide, isocyanates, acids, alkaline earth, alkali metals, caustics, amines, crotonaldehyde, phosgene, ammonia. Isopropyl alcohol reacts with metallic aluminum at high temperatures. Isopropyl alcohol attacks some plastics, rubber, and coatings. Vigorous reaction with sodium dichromate + sulfuric acid.

Special Remarks on Corrosivity: May attack some forms of plastic, rubber and coating

Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

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

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3600 mg/kg [Mouse]. Acute dermal toxicity (LD50): 12800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 16000 8 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE]. May cause

damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive/teratogenic effects (fertility, fetotoxicity, developmental abnormalities (development toxin) based on animal studies. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause mild skin irritation, and sensitization. Eyes: Can cause eye irritation. Inhalation: Breathing in small amounts of this material during normal handling is not likely to cause harmful effects. However, breathing large amounts may be harmful and may affect the respiratory system and mucous membranes (irritation), behavior and brain (Central nervous system depression - headache, dizziness, drowsiness, stupor, incoordination, unconsciousness, coma and possible death), peripheral nerve and sensation, blood, urinary system, and liver. Ingestion: Swallowing small amounts during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. Swallowing large amounts may cause gastrointestinal tract irritation with nausea, vomiting and diarrhea, abdominal pain. It also may affect the urinary system, cardiovascular system, sense organs, behavior or central nervous system (somnolence, generally depressed activity, irritability, headache, dizziness, drowsiness), liver, and respiratory system (breathing difficulty). Chronic Potential Health Effects: May cause defatting of the skin and dermatitis and allergic reaction. May cause adverse reproductive effects based on animal data (studies).

12. ECOLOGICAL INFORMATION

Ecotoxicity: Ecotoxicity in water (LC50): 100000 mg/l 96 hours [Fathead Minnow]. 64000 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation:

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

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

Special Remarks on the Products of Biodegradation: Not available.

13. DISPOSAL CONSIDERATIONS

Disposal methods

The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

14. TRANSPORT INFORMATION

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Isopropyl Alcohol UNNA: 1219 PG: II

Special Provisions for Transport: Not available.

PROPER SHIPPING DOCUMENTATION:

UN 1219, ISOPROPYL ALCOHOL,3, PG II FLAMMABLE LIQUID

Special precautions for user

Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not available.

15. REGULATORY INFORMATION

Federal and State Regulations:

Connecticut hazardous material survey.: Isopropyl alcohol Illinois toxic substances disclosure to employee act: Isopropyl alcohol Rhode Island RTK hazardous substances: Isopropyl alcohol Pennsylvania RTK: Isopropyl alcohol Florida: Isopropyl alcohol Minnesota: Isopropyl alcohol Massachusetts RTK: Isopropyl alcohol New Jersey: Isopropyl alcohol New Jersey spill list: Isopropyl alcohol Director's list of Hazardous Substances: Isopropyl alcohol Tennessee: Isopropyl alcohol TSCA 8(b) inventory: Isopropyl alcohol TSCA 4(a) final testing order: Isopropyl alcohol TSCA 8(a) IUR: Isopropyl alcohol TSCA 8(d) Hand S data reporting: Isopropyl alcohol: Effective date: 12/15/86 Sunset Date: 12/15/96 TSCA 12(b) one time export: Isopropyl alcohol SARA 313 toxic chemical notification and release reporting: Isopropyl alcohol

Other Regulations:

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

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable. R36- Irritating to eyes. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3 Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.): Health: 1

Flammability: 3 Reactivity: 0

Specific hazard:

Protective Equipment:

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

16. OTHER INFORMATION

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 CISCO 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 CISCO has been advised of the possibility of such damages.

Date Created: 5/11/2015

Date Updated: 2/4/2016

SAFETY DATA SHEET

Version 4.11

Revision Date 10/12/2018

Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Lead

Product Number : 391352

Brand : Aldrich

CAS-No. : 7439-92-1

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

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

Carcinogenicity (Category 2), H351

Reproductive toxicity (Category 2), H361

Specific target organ toxicity - repeated exposure (Category 2), H373

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H302

Harmful if swallowed.

H351

Suspected of causing cancer.

H361

Suspected of damaging fertility or the unborn child.

H373

May cause damage to organs through prolonged or repeated exposure.

H410

Very toxic to aquatic life with long lasting effects.

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/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
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.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Pb
Molecular weight	: 207.20 g/mol
CAS-No.	: 7439-92-1
EC-No.	: 231-100-4

Hazardous components

Component	Classification	Concentration
Lead		
	Acute Tox. 4; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H302, H351, H372, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Keep in a dry place.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	See 1910.1025		
Lead	7439-92-1	TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Confirmed animal carcinogen with unknown relevance to humans		
		TWA	0.05 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Hematologic effects Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		

		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		See Appendix C		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Lead	200 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Not critical			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|-------------------|
| a) Appearance | Form: powder |
| b) Odour | No data available |

c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 327.4 °C (621.3 °F) - lit.
f) Initial boiling point and boiling range	1,740 °C (3,164 °F) - lit.
g) Flash point	Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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 acids

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Lead oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

Cytogenetic analysis

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Lead)

NTP: RAHC - Reasonably anticipated to be a human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Lead)

OSHA: OSHA specifically regulated carcinogen (Lead)

Reproductive toxicity

Reproductive toxicity - Rat - Inhalation

Effects on Newborn: Biochemical and metabolic.

Reproductive toxicity - Rat - Oral

Effects on Newborn: Behavioral.

Reproductive toxicity - Mouse - Oral

Effects on Fertility: Female fertility index (e.g., # females pregnant per females mated). Effects on Fertility: Pre-implantation mortality (e.g., reduction in numbe corpora lutea).

May damage fertility. May damage the unborn child.

Developmental Toxicity - Rat - Inhalation

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Developmental Toxicity - Rat - Oral

Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow). Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Developmental Toxicity - Rat - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Developmental Toxicity - Mouse - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

RTECS: OF7525000

anemia

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 1.19 mg/l - 96.0 h
	LC50 - Micropterus dolomieu - 2.2 mg/l - 96.0 h
	mortality NOEC - Salvelinus fontinalis - 1.7 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	mortality LOEC - Daphnia (water flea) - 0.17 mg/l - 24 h
	mortality NOEC - Daphnia (water flea) - 0.099 mg/l - 24 h
Toxicity to algae	mortality EC50 - Skeletonema costatum - 7.94 mg/l - 10 d

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus kisutch - 2 Weeks - 150 µg/l
	Bioconcentration factor (BCF): 12

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Lead)
Marine pollutant: yes

IATA

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

Further information

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

New Jersey Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	2015-11-23

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Lead	7439-92-1	2009-02-01

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Lead	7439-92-1	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11

Revision Date: 10/12/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Manganese

Product Number : 463728

Brand : Aldrich

CAS-No. : 7439-96-5

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260

Acute aquatic toxicity (Category 3), H402

Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H260

In contact with water releases flammable gases which may ignite spontaneously.

H412

Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P223

Keep away from any possible contact with water, because of violent reaction and possible flash fire.

P231 + P232

Handle under inert gas. Protect from moisture.

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Mn
Molecular weight	: 54.94 g/mol
CAS-No.	: 7439-96-5
EC-No.	: 231-105-1

Hazardous components

Component	Classification	Concentration
Manganese		
	Water-react. 1; Aquatic Acute 3; Aquatic Chronic 3; H260, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder Carbon dioxide (CO₂)

Unsuitable extinguishing media

Water

5.2 Special hazards arising from the substance or mixture

Manganese/manganese oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

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. Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Never allow product to get in contact with water during storage.

Moisture sensitive. Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Manganese	7439-96-5	TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC)		
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		

		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies		
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Not classifiable as a human carcinogen varies		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Not classifiable as a human carcinogen varies		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 1,244 °C (2,271 °F) - lit. |
| f) Initial boiling point and boiling range | 1,962 °C (3,564 °F) - lit. |
| g) Flash point | ()Not applicable |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 7.3 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

acids, Halogens, Bases, Phosphorus, Sulphur oxides, Peroxides

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Manganese/manganese oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 9,000 mg/kg(Manganese)

Inhalation: No data available(Manganese)

Dermal: No data available(Manganese)

No data available(Manganese)

Skin corrosion/irritation

Skin - Rabbit(Manganese)

Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit(Manganese)

Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation

No data available(Manganese)

Germ cell mutagenicity

No data available(Manganese)

Carcinogenicity

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

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

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

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

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

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

Reproductive toxicity

No data available(Manganese)

May cause reproductive disorders.(Manganese)

Specific target organ toxicity - single exposure

No data available(Manganese)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Manganese)

Additional Information

RTECS: OO9275000

Men exposed to manganese dusts showed a decrease in fertility. Chronic man system. Early symptoms include languor, sleepiness and weakness in the le disturbances such as uncontrollable laughter and a spastic gait with tend cases. High incidence of pneumonia has been found in workers exposed to t(Manganese)

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence(Manganese)

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 40 mg/l - 48 h(Manganese)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Manganese)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 3208

Class: 4.3

Packing group: I

Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)

Poison Inhalation Hazard: No

IMDG

UN number: 3208

Class: 4.3

Packing group: I

EMS-No: F-G, S-N

Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

IATA

UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION**SARA 302 Components**

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

SARA 313 Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards

Reactivity Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

California Prop. 65 Components

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

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

16. OTHER INFORMATION**Full text of H-Statements referred to under sections 2 and 3.**

H260	In contact with water releases flammable gases which may ignite spontaneously.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	2

NFPA Rating

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

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 3.15
Revision Date 03/05/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Mercury

Product Number : 215457

Brand : Sigma-Aldrich

Index-No. : 080-001-00-0

CAS-No. : 7439-97-6

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Inhalation (Category 2), H330

Reproductive toxicity (Category 1B), H360

Specific target organ toxicity - repeated exposure (Category 1), H372

Acute aquatic toxicity (Category 1), H400

Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H330 Fatal if inhaled.

H360 May damage fertility or the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H410 Very toxic to aquatic life with long lasting effects.

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/ vapours/ 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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Hg
Molecular weight	: 200.59 g/mol
CAS-No.	: 7439-97-6
EC-No.	: 231-106-7
Index-No.	: 080-001-00-0

Hazardous components

Component	Classification	Concentration
Mercury		
	Acute Tox. 2; Repr. 1B; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H330, H360, H372, H410	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal. In some instances, a mercury spill kit may be used. Please consult with your site EHS representative to determine the most appropriate clean up method. Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store under inert gas.

Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Mercury	7439-97-6	C	0.1 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	Potential for dermal absorption		
		CEIL	1.0mg/10m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	0.05 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		

		TWA	0.025 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	0.05 mg/m ³	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------|---------------------------------------|
| a) Appearance | Form: liquid
Colour: silver, white |
|---------------|---------------------------------------|

b) Odour	odourless
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -38.87 °C (-37.97 °F) - lit.
f) Initial boiling point and boiling range	356.6 °C (673.9 °F) - lit.
g) Flash point	Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	< 0.01 hPa (< 0.01 mmHg) at 20 °C (68 °F) 1 hPa (1 mmHg) at 126 °C (259 °F)
l) Vapour density	6.93 - (Air = 1.0)
m) Relative density	13.55 g/cm ³ at 25 °C (77 °F)
n) Water solubility	0.00006 g/l at 25 °C (77 °F)
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Relative vapour density 6.93 - (Air = 1.0)

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, Ammonia, Azides, Nitrates, Chlorates, Copper

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Mercury/mercury oxides.

Other decomposition products - No data available

In the event of fire: see section 5

11.1 Information on toxicological effects

No data available

LC50 Inhalation - Rat - male - 2 h - < 27 mg/m3

Dermal: No data available

No data available

No data available

No data available

No data available

No data available

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Presumed human reproductive toxicant

No data available

Causes damage to organs through prolonged or repeated exposure.

No data available

RTECS: OV4550000

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12.1 Toxicity

Toxicity to fish mortality LC50 - *Cyprinus carpio* (Carp) - 0.160 mg/l - 96 h

No data available

Bioaccumulation Carassius auratus (goldfish) - 1,789 d
- 0.25 µg/l

Bioconcentration factor (BCF): 155,986

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2809 Class: 8 (6.1) Packing group: III
Proper shipping name: A. W. Mercury
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG

IATA

UN number: 2809 Class: 8 (6.1) Packing group: III
Proper shipping name: Mercury

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Mercury

CAS-No.
7439-97-6

Revision Date
2015-11-23

Pennsylvania Right To Know Components

Mercury

CAS-No.
7439-97-6

Revision Date
2015-11-23

Mercury

CAS-No.
7439-97-6

Revision Date
2015-11-23

New Jersey Right To Know Components

Mercury

CAS-No.
7439-97-6

Revision Date
2015-11-23

California Prop. 65 Components

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Mercury

CAS-No.
7439-97-6

Revision Date
2013-12-20

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H330	Fatal if inhaled.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Repr.	Reproductive toxicity

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.15

Revision Date: 03/05/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 07/17/2018
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : c1ccc(cc1)C-Xylene

Product Number : 134902
Brand : Aldrich
Index-No. : 601-022-00-9

CAS-No. : 108-38-3

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226

Acute toxicity, Dermal (Category 4), H312

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Aspiration hazard (Category 1), H304

Acute aquatic toxicity (Category 3), H402

Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	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.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,3-Dimethylbenzene
Formula	: C ₈ H ₁₀
Molecular weight	: 106.17 g/mol
CAS-No.	: 108-38-3
EC-No.	: 203-576-3
Index-No.	: 601-022-00-9

Hazardous components

Component	Classification	Concentration
-----------	----------------	---------------

m-Xylene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Asp. Tox. 1; Aquatic Acute 3; Aquatic Chronic 3; H226, H304, H312, H315, H319, H335, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
m-Xylene	108-38-3	TWA	100 ppm 435 mg/m ³	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 655 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m ³ is approximate.		
		TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	150 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
m-Xylene	108-38-3	Methylhippuric acids	1.5g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -48 °C (-54 °F) - lit. |
| f) Initial boiling point and boiling range | 138 - 139 °C (280 - 282 °F) - lit. |
| g) Flash point | 25.0 °C (77.0 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower | Upper explosion limit: 7 %(V) |

	flammability or explosive limits	Lower explosion limit: 1.1 %(V)
k)	Vapour pressure	8.0 hPa at 20.0 °C (68.0 °F) 21.3 hPa at 37.7 °C(99.9 °F)
l)	Vapour density	No data available
m)	Relative density	0.868 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 3.2 at 20 °C (68 °F)
p)	Auto-ignition temperature	465.0 °C (869.0 °F) 528.0 °C (982.4 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety 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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 6,602 mg/kg

(OECD Test Guideline 401)

LC50 Inhalation - Rat - male - 4 h - 6700 ppm

(Directive 67/548/EEC, Annex V, B.2.)

LD50 Dermal - Rabbit - male - 12,126 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Severe eye irritation - 24 h

Respiratory or skin sensitisation

- Mouse

Result: Does not cause skin sensitisation.

(OECD Test Guideline 429)

Germ cell mutagenicity

No data available

Carcinogenicity

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

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (m-Xylene)

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure

Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

May be fatal if swallowed and enters airways.

Additional Information

RTECS: ZE2275000

Liver injury may occur., Kidney injury may occur., Blood disorders, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, narcosis, Lung irritation, chest pain, pulmonary edema, Central nervous system depression, Dermatitis, Gastrointestinal disturbance

Kidney -

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish mortality LC50 - Fish - 11.23 mg/l - 96 h(m-Xylene)
(OECD Test Guideline 203)

Toxicity to daphnia and Remarks: No data available(m-Xylene)
other aquatic
invertebrates

Toxicity to algae Remarks: No data available(m-Xylene)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

12.4 Mobility in soil

No data available(m-Xylene)

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

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

Harmful to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1307 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: XYLENES

IATA

UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
m-Xylene	108-38-3	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
m-Xylene	108-38-3	2007-07-01

Pennsylvania Right To Know Components

m-Xylene	CAS-No. 108-38-3	Revision Date 2007-07-01
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New Jersey Right To Know Components

m-Xylene	CAS-No. 108-38-3	Revision Date 2007-07-01
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California Prop. 65 Components

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

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 07/17/2018

Print Date: 06/22/2019

SAFETY DATA SHEET

Creation Date 26-Oct-2009

Revision Date 25-Dec-2021

Revision Number 5

1. Identification

Product Name n-Hexane

Cat No. : AC326920000; AC326920010; AC326920025; AC326921000;
AC326922500

CAS No 110-54-3
Synonyms Hex

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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	Category 2
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Liver, Heart, Blood, Central nervous system (CNS), Peripheral Nervous System (PNS).	
Aspiration Toxicity	Category 1

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of damaging fertility
Causes damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

If skin irritation occurs: Get medical advice/attention

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing 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 eye irritation persists: Get medical advice/attention

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Do NOT induce vomiting

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store locked up

Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Toxic to aquatic life with long lasting effects

WARNING. Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Hexane	110-54-3	>95

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 plenty of water for at least 15 minutes. Get medical attention.
Inhalation	Remove to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention. Aspiration into lungs can produce severe lung damage.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.
Most important symptoms and effects	Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO ₂ , dry chemical, dry sand, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	Water may be ineffective, This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained
Flash Point	-22 °C / -7.6 °F
Method -	No information available
Autoignition Temperature	223 °C / 433.4 °F
Explosion Limits	
Upper	7.5 vol %
Lower	1.1 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
2Flammability
3Instability
0Physical hazards
N/A**6. Accidental release measures****Personal Precautions**

Use personal protective equipment as required. Ensure adequate ventilation. Evacuate personnel to safe areas. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions

Do not flush into surface water or sanitary sewer system. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up

Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.

7. Handling and storage**Handling**

Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Do not breathe mist/vapors/spray. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use spark-proof tools and explosion-proof equipment. 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 containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Halogens.

8. Exposure controls / personal protection**Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Hexane	TWA: 50 ppm Skin	(Vacated) TWA: 50 ppm (Vacated) TWA: 180 mg/m ³ TWA: 500 ppm TWA: 1800 mg/m ³	IDLH: 1100 ppm TWA: 50 ppm TWA: 180 mg/m ³	TWA: 50 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting equipment.

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

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

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Petroleum distillates
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-95 °C / -139 °F
Boiling Point/Range	69 °C / 156.2 °F @ 760 mmHg
Flash Point	-22 °C / -7.6 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.5 vol %
Lower	1.1 vol %
Vapor Pressure	160 mbar @ 20 °C
Vapor Density	2.97
Specific Gravity	0.659
Solubility	Immiscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	223 °C / 433.4 °F
Decomposition Temperature	No information available
Viscosity	0.31 mPa s at 20 °C
Molecular Formula	C6 H14
Molecular Weight	86.18

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Heat, flames and sparks. Exposure to light. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Halogens
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hexane	LD50 = 25 g/kg (Rat)	LD50 = 3000 mg/kg (Rabbit)	LC50 = 48000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes 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
Hexane	110-54-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects	Mutagenic effects have occurred in experimental animals.
Reproductive Effects	Experiments have shown reproductive toxicity effects on laboratory animals.
Developmental Effects	Developmental effects have occurred in experimental animals.
Teratogenicity	Teratogenic effects have occurred in experimental animals.
STOT - single exposure	Respiratory system Central nervous system (CNS)
STOT - repeated exposure	Liver Heart Blood Central nervous system (CNS) Peripheral Nervous System (PNS)
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Endocrine Disruptor Information	No information available
Other Adverse Effects	Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Toxic 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
Hexane	Not listed	LC50: 2.1 - 2.98 mg/L, 96h flow-through (Pimephales promelas)	Not listed	EC50: 3.87 mg/L/48h

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.

Component	log Pow
Hexane	4.11

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.
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14. Transport information

DOT

UN-No	UN1208
Proper Shipping Name	Hexanes
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1208
Proper Shipping Name	HEXANES
Hazard Class	3
Packing Group	II

IATA

UN-No UN1208
 Proper Shipping Name Hexanes
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN1208
 Proper Shipping Name Hexanes
 Hazard Class 3
 Packing Group II

15. Regulatory information**United States of America Inventory**

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Hexane	110-54-3	X	ACTIVE	-

Legend:

TSCA US EPA (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), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Hexane	110-54-3	X	-	203-777-6	X	X	X	X	X	KE-18626

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations**SARA 313**

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Hexane	110-54-3	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Hexane	X		-

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
Hexane	5000 lb	-

California Proposition 65

This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Hexane	110-54-3	Male Reproductive	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Hexane	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
 DOT Marine Pollutant Y
 DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations**Mexico - Grade**

Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Hexane	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Hexane	110-54-3	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Hexane	110-54-3	Not applicable	Not applicable	Not applicable	Annex I - Y42

16. Other information**Prepared By**

Regulatory Affairs
 Thermo Fisher Scientific
 Email: EMSDS.RA@thermofisher.com

Creation Date

26-Oct-2009

Revision Date

25-Dec-2021

Print Date

25-Dec-2021

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

End of SDS

SAFETY DATA SHEET

Version 6.1
Revision Date 08/07/2018
Print Date 06/29/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : c1ccc(cc1)-c2ccccc2-Xylene

Product Number : 95660
Brand : Sigma-Aldrich
Index-No. : 601-022-00-9

CAS-No. : 95-47-6

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226

Acute toxicity, Inhalation (Category 4), H332

Acute toxicity, Dermal (Category 4), H312

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

Aspiration hazard (Category 1), H304

Acute aquatic toxicity (Category 3), H402

Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H312 + H332	Harmful in contact with skin or if inhaled.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,2-Dimethylbenzene
Formula	: C ₈ H ₁₀
Molecular weight	: 106.17 g/mol
CAS-No.	: 95-47-6
EC-No.	: 202-422-2
Index-No.	: 601-022-00-9

Hazardous components

Component	Classification	Concentration
o-Xylene	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Asp. Tox. 1; Aquatic Acute 3; Aquatic Chronic 3; H226, H304, H312 + H332, H315, H319, H335, H412	<= 100 %

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

4. FIRST AID MEASURES**4.1 Description of first aid measures****General advice**

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
o-Xylene	95-47-6	TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye & Upper Respiratory Tract irritation Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	150.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye & Upper Respiratory Tract irritation Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100.000000 ppm 435.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	100.000000 ppm 435.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150.000000 ppm 655.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100.000000 ppm 435.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	150.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	150 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
o-Xylene	95-47-6	Methylhippuric acids	1,500.000 0 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Methylhippuric acids	1.5g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

- | | |
|---|--|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -26 - -23 °C (-15 - -9 °F) - lit. |
| f) Initial boiling point and boiling range | 143 - 145 °C (289 - 293 °F) - lit. |
| g) Flash point | 31.0 °C (87.8 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 6.7 %(V)
Lower explosion limit: 0.9 %(V) |
| k) Vapour pressure | 21.3 hPa at 37.7 °C (99.9 °F) |

l) Vapour density	No data available
m) Relative density	0.879 g/mL at 20 °C (68 °F)
n) Water solubility	0.1705 g/l at 25 °C (77 °F) - partly soluble
o) Partition coefficient: n-octanol/water	log Pow: 3.12 at 20 °C (68 °F)
p) Auto-ignition temperature	464.0 °C (867.2 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

Surface tension	29.8 mN/m at 25.0 °C (77.0 °F)
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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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

LC50 Inhalation - Rat - male - 6 h - 18,800 mg/m³

Dermal: No data available

LD50 Intraperitoneal - Mouse - 1,364 mg/kg

Skin corrosion/irritation

Skin - Rabbit

Result: Irritating to skin. - 24 h

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

- Mouse

Result: Does not cause skin sensitisation.
(OECD Test Guideline 429)

Germ cell mutagenicity

Ames test

Salmonella typhimurium

Result: negative

Carcinogenicity

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

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

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

May be fatal if swallowed and enters airways.

Additional Information

RTECS: ZE2450000

narcosis, Lung irritation, chest pain, pulmonary edema, Central nervous system depression, Dermatitis, Gastrointestinal disturbance, Liver injury may occur., Kidney injury may occur., Blood disorders

Nerves. -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Lepomis macrochirus (Bluegill) - 16.10 mg/l - 96 h(o-Xylene)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d(o-Xylene)
Result: 69.67 % - Not readily biodegradable.
(OECD Test Guideline 301F)
Remarks: The 10 day time window criterion is not fulfilled.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(o-Xylene)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1307 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: XYLENES

IATA

UN number: 1307 Class: 3 Packing group: III
Proper shipping name: Xylenes

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
o-Xylene	95-47-6	2007-07-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H312 + H332	Harmful in contact with skin or if inhaled.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 08/07/2018

Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.2
Revision Date 07/25/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : **p-Xylene**

Product Number : 296333
Brand : Sigma-Aldrich
Index-No. : 601-022-00-9

CAS-No. : 106-42-3

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226

Acute toxicity, Inhalation (Category 4), H332

Acute toxicity, Dermal (Category 4), H312

Skin irritation (Category 2), H315

Acute aquatic toxicity (Category 2), H401

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)	
H226	Flammable liquid and vapour.
H312 + H332	Harmful in contact with skin or if inhaled.
H315	Causes skin irritation.
H401	Toxic to aquatic life.
Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	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.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,4-Dimethylbenzene
Formula	: C ₈ H ₁₀
Molecular weight	: 106.17 g/mol
CAS-No.	: 106-42-3
EC-No.	: 203-396-5
Index-No.	: 601-022-00-9

Hazardous components

Component	Classification	Concentration
p-Xylene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Aquatic Acute 2; H226, H312 + H332, H315, H401	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable 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

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
p-Xylene	106-42-3	TWA	100 ppm 435 mg/m ³	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 655 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	The value in mg/m ³ is approximate.		
		TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	150 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
p-Xylene	106-42-3	Methylhippuric acids	1.5g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 30 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 12 - 13 °C (54 - 55 °F) - lit. |
| f) Initial boiling point and boiling range | 138 °C (280 °F) - lit. |
| g) Flash point | 25.0 °C (77.0 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7 %(V)
Lower explosion limit: 1.1 %(V) |
| k) Vapour pressure | 21.3 hPa at 37.7 °C (99.9 °F)
12.0 hPa at 20.0 °C(68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.861 g/cm ³ at 20 °C (68 °F) |
| n) Water solubility | 0.2 g/l |
| o) Partition coefficient: n-octanol/water | log Pow: 3.15 |
| p) Auto-ignition temperature | 529.0 °C (984.2 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |

- s) Explosive properties No data available
t) Oxidizing properties No data available

9.2 Other safety information

Surface tension 28.3 mN/m at 20.0 °C (68.0 °F)

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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 5,000 mg/kg

LD50 Oral - Rat - male - 3,523 mg/kg

LC50 Inhalation - Rat - 4 h - 4550 ppm

Remarks: Lungs, Thorax, or Respiration:Chronic pulmonary edema. Liver:Other changes. Blood:Changes in cell count (unspecified).

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Moderate skin irritation - 4 h

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (p-Xylene)

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

May cause reproductive disorders.

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: ZE2625000

narcosis, Lung irritation, chest pain, pulmonary edema, Central nervous system depression, Gastrointestinal disturbance, Liver injury may occur., Kidney injury may occur., Blood disorders

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - 2.60 mg/l - 96 h(p-Xylene)

LC50 - Carassius auratus (goldfish) - 18.00 mg/l - 24 h(p-Xylene)

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 35.50 - 63.10 mg/l - 48 h(p-Xylene)

Toxicity to algae EC50 - Pseudokirchneriella subcapitata (green algae) - 3.20 - 4.40 mg/l - 72 h(p-Xylene)

12.2 Persistence and degradability

Biodegradability Result: 87.8 % - Readily biodegradable.

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(p-Xylene)

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

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

Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1307 Class: 3

Packing group: III

Proper shipping name: Xylenes

Reportable Quantity (RQ) : 100 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1307 Class: 3
Proper shipping name: XYLENES

Packing group: III

EMS-No: F-E, S-D

IATA

UN number: 1307 Class: 3
Proper shipping name: Xylenes

Packing group: III

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
p-Xylene	106-42-3	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H226	Flammable liquid and vapour.
H312	Harmful in contact with skin.
H312 + H332	Harmful in contact with skin or if inhaled.
H315	Causes skin irritation.
H332	Harmful if inhaled.
H401	Toxic to aquatic life.

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.2

Revision Date: 07/25/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Revision Date 26-Dec-2021

Revision Number 4

1. Identification

Product Name Selenium

Cat No. : AC419270000; AC419271000; AC419275000

CAS No 7782-49-2
Synonyms None

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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)

Acute oral toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Specific target organ toxicity - (repeated exposure)	Category 2

Label Elements**Signal Word**

Danger

Hazard Statements

May cause damage to organs through prolonged or repeated exposure
Toxic if swallowed or if inhaled

**Precautionary Statements****Prevention**

Wash face, hands and any exposed skin thoroughly after handling

Do not eat, drink or smoke when using this product

Use only outdoors or in a well-ventilated area

Do not breathe dust/fume/gas/mist/vapors/spray

Response

Get medical attention/advice 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

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Rinse mouth

Storage

Store locked up

Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

May cause long lasting harmful effects to aquatic life

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Selenium	7782-49-2	> 99.5

4. First-aid measures

General Advice

Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation

Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion

Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects

None reasonably foreseeable.

Notes to Physician

Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature Not applicable

Explosion Limits

Upper No data available

Lower No data available

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Dust can form an explosive mixture with air.

Hazardous Combustion Products

None known.

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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
3

Flammability
0

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.

Storage. Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep under nitrogen. Incompatible Materials. Acids. Strong oxidizing agents. Fluorine. oxygen. Metals.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Selenium	TWA: 0.2 mg/m ³	(Vacated) TWA: 0.2 mg/m ³	IDLH: 1 mg/m ³ TWA: 0.2 mg/m ³	TWA: 0.2 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures	Ensure that eyewash stations and safety showers are close to the workstation location.
<u>Personal Protective Equipment</u>	
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	A NIOSH/MSHA approved air purifying dust or mist respirator or European Standard EN 149.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid Granules
Appearance	Dark grey
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	217 - 222 °C / 422.6 - 431.6 °F
Boiling Point/Range	685 °C / 1265 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 345 °C
Vapor Density	Not applicable
Specific Gravity	4.810
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Se
Molecular Weight	78.96

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Acids, Strong oxidizing agents, Fluorine, oxygen, Metals
Hazardous Decomposition Products	None under normal use conditions
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Selenium	LD50 = 6700 mg/kg (Rat)	Not listed	>5.67 mg/l (Rat) 4hr

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

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
Selenium	7782-49-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Selenium	Not listed	LC50: > 100 mg/L, 96h semi-static (Oncorhynchus mykiss)	Not listed	Not listed

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

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 UN3283
Hazard Class 6.1
Packing Group III

TDG

UN-No UN3283
Hazard Class 6.1
Packing Group III

IATA

UN-No UN3283
Proper Shipping Name SELENIUM COMPOUND, SOLID, N.O.S.
Hazard Class 6.1
Packing Group III

IMDG/IMO

UN-No UN3283
Proper Shipping Name SELENIUM COMPOUND, SOLID, N.O.S.
Hazard Class 6.1
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Selenium	7782-49-2	X	ACTIVE	-

Legend:

TSCA US EPA (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/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Selenium	7782-49-2	X	-	231-957-4	X	X		X	X	KE-30924

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations**SARA 313**

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Selenium	7782-49-2	> 99.5	1.0

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
Selenium	-	-	X	X

Clean Air Act

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
Selenium	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
Selenium	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
 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

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Selenium	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Selenium	7782-49-2	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Selenium	7782-49-2	Not applicable	Not applicable	Not applicable	Annex I - Y25

16. Other information

Prepared By

Regulatory Affairs
 Thermo Fisher Scientific
 Email: EMSDS.RA@thermofisher.com

Revision Date

26-Dec-2021

Print Date

26-Dec-2021

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

End of SDS

SAFETY DATA SHEET

Version 6.2
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Sodium

Product Number : 483745

Brand : Aldrich

CAS-No. : 7440-23-5

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260

Skin corrosion (Category 1B), H314

Serious eye damage (Category 1), H318

Carcinogenicity (Category 1A), H350

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H260

In contact with water releases flammable gases which may ignite spontaneously.

H314

Causes severe skin burns and eye damage.

H318

Causes serious eye damage.

H350

May cause cancer.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P260	Do not breathe dust or mist.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P281	Use personal protective equipment as required.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	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/doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Reacts violently with water.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : Na
Molecular weight : 22.99 g/mol

Hazardous components

Hazardous components		
Component	Classification	Concentration
Sodium		
CAS-No. 7440-23-5 EC-No. 231-132-9 Index-No. 011-001-00-0	Water-react. 1; Skin Corr. 1B; Eye Dam. 1; H260, H314	>= 90 - <= 100 %
Paraffin oils		
CAS-No. 8012-95-1 EC-No. 232-384-2	Asp. Tox. 1; H304, H304	>= 90 - <= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sodium oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

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

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustion products. Formation should be taken into consideration before additional processing.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Handle and store under inert gas. Air sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Paraffin oils	8012-95-1	STEL	10.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation 2015 Adoption Not classifiable as a human carcinogen		
		Upper Respiratory Tract irritation 2015 Adoption Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		
		TWA	5.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Upper Respiratory Tract irritation Exposure by all routes should be carefully controlled to levels as low as possible. Suspected human carcinogen		

		TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: Pieces

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 97.8 °C (208.0 °F) - lit.
f) Initial boiling point and boiling range	883 °C (1621 °F) - lit.
g) Flash point	82 °C (180 °F)
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	0.97 g/cm ³
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Reacts violently with water.

10.4 Conditions to avoid

Air Do not allow water to enter container.

Exposure to moisture

10.5 Incompatible materials

Oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sodium oxides

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Aspiration may lead to:, lipid pneumonia, Effects due to ingestion may include:, laxative effect, Gastrointestinal disturbance, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

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

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1428 Class: 4.3 Packing group: I
Proper shipping name: Sodium
Reportable Quantity (RQ) : 10 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1428 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: SODIUM

IATA

UN number: 1428 Class: 4.3 Packing group: I
Proper shipping name: Sodium
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

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

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

Reactivity Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium	7440-23-5	1993-04-24
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

Sodium
Paraffin oils

CAS-No.
7440-23-5
8012-95-1

Revision Date
1993-04-24
2007-03-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Asp. Tox.	Aspiration hazard
Eye Dam.	Serious eye damage
H260	In contact with water releases flammable gases which may ignite spontaneously.
H304	May be fatal if swallowed and enters airways.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H350	May cause cancer.
Skin Corr.	Skin corrosion
Water-react.	Substances and mixtures, which in contact with water, emit flammable gases

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	3
Fire Hazard:	4
Reactivity Hazard:	2
Special hazard.I:	W

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.2

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 06/17/2019
Print Date 06/29/2019

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Styrene

Product Number : S4972

Brand : Sigma-Aldrich

Index-No. : 601-026-00-0

CAS-No. : 100-42-5

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765

Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 3), H226

Acute toxicity, Inhalation (Category 4), H332

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Carcinogenicity (Category 2), H351

Reproductive toxicity (Category 2), H361

Specific target organ toxicity - repeated exposure (Category 1), hearing organs, H372

Short-term (acute) aquatic hazard (Category 2), H401

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word	Danger
Hazard statement(s)	
H226	Flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs (hearing organs) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ 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.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Lachrymator.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : C₈H₈
Molecular weight : 104.15 g/mol
CAS-No. : 100-42-5
EC-No. : 202-851-5
Index-No. : 601-026-00-0

Component	Classification	Concentration
Styrene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; Repr. 2; STOT RE 1; Aquatic Acute 2; H226, H332, H315, H319, H351, H361, H372, H401	<= 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

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Container explosion may occur under fire conditions., Vapours may form explosive mixture with air.

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Light sensitive.

Storage class (TRGS 510): 3: Flammable liquids

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

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Styrene	100-42-5	TWA	50 ppm 215 mg/m ³	USA. NIOSH Recommended Exposure Limits
		ST	100 ppm 425 mg/m ³	USA. NIOSH Recommended Exposure Limits
	Remarks	See Table Z-2		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		Peak	600 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.15-1969		
		C	500 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		PEL	50 ppm 215 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		STEL	100 ppm 425 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral neuropathy Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

		STEL	40 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Peripheral neuropathy Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Styrene	100-42-5	Mandelic acid plus phenylglyoxylic acid	400mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		Styrene	40 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: > 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 32 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This

recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid, clear Colour: colourless
b) Odour	sweet
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -31 °C (-24 °F) - lit.
f) Initial boiling point and boiling range	145 - 146 °C 293 - 295 °F - lit.
g) Flash point	32.0 °C (89.6 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 8.9 %(V) Lower explosion limit: 1.1 %(V)
k) Vapour pressure	6 hPa at 20 °C (68 °F)
l) Vapour density	3.6
m) Relative density	0.906 g/cm ³ at 25 °C (77 °F)
n) Water solubility	0.05 g/l at 25 °C (77 °F) - slightly soluble
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	490.0 °C (914.0 °F) 480.0 °C (896.0 °F)

- | | |
|------------------------------|-------------------|
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

Relative vapour density	3.6
-------------------------	-----

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.
Contains the following stabiliser(s):
4-tert-Butylpyrocatechol (≥ 30 - ≤ 50 ppm)

10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

May polymerize on exposure to light.
Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents, Copper

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 2,650 mg/kg

Remarks: Behavioral:Somnolence (general depressed activity). Liver:Other changes.

LC50 Inhalation - Rat - 4 h - 12,000 mg/m³

LD50 Dermal - Rat - male and female - $> 2,000$ mg/kg
(OECD Test Guideline 402)

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

Respiratory or skin sensitisation

Maximisation Test - Guinea pig

Does not cause skin sensitisation.

(OECD Test Guideline 406)

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Carcinogenicity

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

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Styrene)

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Suspected of damaging the unborn child. Suspected human reproductive toxicant

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Causes damage to organs through prolonged or repeated exposure. - hearing organs

Aspiration hazard

No data available

Additional Information

RTECS: WL3675000

Dermatitis, Central nervous system depression, Nausea, Dizziness, Headache, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Endocrine system. -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 32 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 4.7 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 1.4 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d

Result: > 60 % - Readily biodegradable.

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

Toxic to aquatic life.

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

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

UN number: 2055 Class: 3 Packing group: III

Proper shipping name: Styrene monomer, stabilized

Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2055 Class: 3 Packing group: III EMS-No: F-E, S-D

Proper shipping name: STYRENE MONOMER, STABILIZED

IATA

UN number: 2055 Class: 3 Packing group: III

Proper shipping name: Styrene monomer, stabilized

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

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

Styrene

CAS-No.
100-42-5

Revision Date
2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Styrene

CAS-No.
100-42-5

Revision Date
2007-07-01

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.1

Revision Date: 06/17/2019

Print Date: 06/29/2019

SAFETY DATA SHEET

Creation Date 07-Sep-2010

Revision Date 24-Dec-2021

Revision Number 5

1. Identification

Product Name tert-Butanol

Cat No. : A401-1; A401-500; XXA401200LI; NC2007790

CAS No 75-65-0
Synonyms tert-Butyl alcohol; 2-Methyl-2-propanol; Trimethyl carbinol (Certified)

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 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	Category 2
Acute Inhalation Toxicity - Vapors	Category 4
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor
Causes serious eye irritation
Harmful if inhaled

May cause respiratory irritation
May cause drowsiness or dizziness

**Precautionary Statements****Prevention**

Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Do not breathe 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
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool

Response

Get medical attention/advice 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 (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

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

Fire

In case of fire: Use CO2, dry chemical, or foam for extinction

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 %
tert-Butyl alcohol	75-65-0	>95

4. First-aid measures

General Advice

If symptoms persist, call a physician.

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 plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water.
Most important symptoms and effects	Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	11 °C / 51.8 °F
Method -	No information available
Autoignition Temperature	490 °C / 914 °F
Explosion Limits	
Upper	8.0 vol %
Lower	2.4 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

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
2

Flammability
3

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment.
Methods for Containment and Clean Up	Soak up with inert absorbent material. 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	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.
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Take precautionary measures against static discharges.

Storage.

Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat, sparks and flame. Incompatible Materials. Strong oxidizing agents. Strong acids. Alkali metals.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
tert-Butyl alcohol	TWA: 100 ppm	(Vacated) TWA: 100 ppm (Vacated) TWA: 300 mg/m ³ (Vacated) STEL: 150 ppm (Vacated) STEL: 450 mg/m ³ TWA: 100 ppm TWA: 300 mg/m ³	IDLH: 1600 ppm TWA: 100 ppm TWA: 300 mg/m ³ STEL: 150 ppm STEL: 450 mg/m ³	TWA: 100 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

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	Clear
Odor	Strong
Odor Threshold	No information available
pH	7
Melting Point/Range	25 - 25.5 °C / 77 - 77.9 °F
Boiling Point/Range	83 °C / 181.4 °F @ 760 mmHg
Flash Point	11 °C / 51.8 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	8.0 vol %
Lower	2.4 vol %
Vapor Pressure	36 mbar @ 20 °C
Vapor Density	2.6
Specific Gravity	0.775
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	490 °C / 914 °F

Decomposition Temperature	No information available
Viscosity	6.43 mPa.s (25°C)
Molecular Formula	C4 H10 O
Molecular Weight	74.12

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	May form explosive peroxides.
Conditions to Avoid	Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong acids, Alkali metals
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
tert-Butyl alcohol	>3100 mg/kg (Rat)	>2000 mg/kg (Rabbit)	>31 mg/L/4h (Rat)

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes and respiratory system
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
tert-Butyl alcohol	75-65-0	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed 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 empty into drains. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
tert-Butyl alcohol	EC50 1000 mg/L 72 h	LC50 >961 mg/L/96h (Pimephales promelas)	EC50 > 10000 mg/L 17 h	EC50 933 mg/L 48 h

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.

Component	log Pow
tert-Butyl alcohol	0.35

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 UN1120
 Proper Shipping Name BUTANOLS
 Hazard Class 3
 Packing Group II

TDG

UN-No UN1120
 Proper Shipping Name BUTANOLS
 Hazard Class 3
 Packing Group II

IATA

UN-No UN1120
 Proper Shipping Name BUTANOLS
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN1120
 Proper Shipping Name BUTANOLS
 Hazard Class 3
 Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
tert-Butyl alcohol	75-65-0	X	ACTIVE	-

Legend:

TSCA US EPA (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/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
tert-Butyl alcohol	75-65-0	X	-	200-889-7	X	X	X	X	X	KE-24895

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations**SARA 313**

Component	CAS No	Weight %	SARA 313 - Threshold Values %
tert-Butyl alcohol	75-65-0	>95	1.0

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 Not applicable

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
tert-Butyl alcohol	X	X	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

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
tert-Butyl alcohol	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
tert-Butyl alcohol	75-65-0	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
tert-Butyl alcohol	75-65-0	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By

Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date

07-Sep-2010

Revision Date

24-Dec-2021

Print Date

24-Dec-2021

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

End of SDS

SAFETY DATA SHEET

Version 4.11
Revision Date 06/28/2017
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Tetrachloroethylene

Product Number : 371696

Brand : Sigma-Aldrich

Index-No. : 602-028-00-4

CAS-No. : 127-18-4

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Skin sensitisation (Category 1), H317

Carcinogenicity (Category 2), H351

Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 2), H411

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: Perchloroethylene PCE
Formula	: C ₂ Cl ₄
Molecular weight	: 165.83 g/mol
CAS-No.	: 127-18-4
EC-No.	: 204-825-9
Index-No.	: 602-028-00-4

Hazardous components

Component	Classification	Concentration
Tetrachloroethylene		
	Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H315, H317, H319, H336, H351, H411	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

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

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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrachloroethylene	127-18-4	TWA	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen Minimize workplace exposure concentrations. See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen Minimize workplace exposure concentrations. See Appendix A		
		See Table Z-2		

		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	25 ppm 170 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	100 ppm 685 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	25 ppm 170 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Tetrachloroethylene	127-18-4	Tetrachloroethylene	3ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	3ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	0.5 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.2 mm

Break through time: 49 min

Material tested: Dermatrill® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -22 °C (-8 °F) - lit. |
| f) Initial boiling point and boiling range | 121 °C (250 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 25.3 hPa (19.0 mmHg) at 25.0 °C (77.0 °F)
17.3 hPa (13.0 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.623 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | 0.15 g/l at 25 °C (77 °F) |
| o) Partition coefficient: n-octanol/water | log Pow: 2.53 at 23 °C (73 °F) |
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |

t) Oxidizing properties No data available

9.2 Other safety information

Surface tension 32.1 mN/m at 20 °C (68 °F)

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, Strong bases

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - female - 3,385 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation

- Mouse

Result: May cause sensitisation by skin contact.
(OECD Test Guideline 429)

Germ cell mutagenicity

Hamster

ovary

Result: negative

OECD Test Guideline 474

Mouse - male

Result: negative

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (Tetrachloroethylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Tetrachloroethylene)
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity Mouse - female - Oral - LOEL : 390 mg/kg

RTECS: KX3850000

narcosis, Liver injury may occur., Kidney injury may occur.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 7.50 mg/l - 48 h

Toxicity to algae static test EC50 - Skeletonema costatum - > 16 mg/l - 7 h

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 28 d
Result: 11 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 21 d
- 0.00343 mg/l

Bioconcentration factor (BCF): 49

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene
Reportable Quantity (RQ): 100 lbs Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1897 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TETRACHLOROETHYLENE
Marine pollutant: yes

IATA

UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D039 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Tetrachloroethylene	127-18-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity

Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11

Revision Date: 06/28/2017

Print Date: 06/22/2019

SAFETY DATA SHEET

Creation Date 11-Jun-2009

Revision Date 16-Aug-2023

Revision Number 8

1. Identification

Product Name Tetrahydrofuran

Cat No. : BP1140-1; T424-4

CAS No 109-99-9
Synonyms THF (Sequencing; Spectranalyzed; HPLC; OPTIDRY; OPTIMA)

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 Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 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	Category 2
Acute oral toxicity	Category 4
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	

Label Elements**Signal Word**

Danger

Hazard Statements

Highly flammable liquid and vapor
Harmful if swallowed

Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

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

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Rinse mouth

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store locked up

Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

May form explosive peroxides

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Tetrahydrofuran	109-99-9	>95

4. First-aid measures

General Advice	If symptoms persist, call a physician.
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 plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water.
Most important symptoms and effects	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	Water may be ineffective
Flash Point	-21 °C / -5.8 °F
Method -	No information available
Autoignition Temperature	215 °C / 419 °F
Explosion Limits	
Upper	11.8%
Lower	2.0%
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. May form explosive peroxides.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂). peroxides.

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
2

Flammability
3

Instability
1

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment.
Methods for Containment and Clean	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

Up Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Not suitable for concentration or distillation. May form explosive peroxides on prolonged storage. If peroxide formation is suspected, do not open or move container. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

Storage. Store under an inert atmosphere. Shelf life 12 months (Unopened) or Shelf life: 3 months after opening. Containers should be dated when opened. May form explosive peroxides on prolonged storage. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame. Flammables area. Incompatible Materials. Strong oxidizing agents. Acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Tetrahydrofuran	TWA: 50 ppm STEL: 100 ppm Skin	(Vacated) TWA: 200 ppm (Vacated) TWA: 590 mg/m ³ (Vacated) STEL: 250 ppm (Vacated) STEL: 735 mg/m ³ TWA: 200 ppm TWA: 590 mg/m ³	IDLH: 2000 ppm TWA: 200 ppm TWA: 590 mg/m ³ STEL: 250 ppm STEL: 735 mg/m ³	TWA: 200 ppm TWA: 590 mg/m ³ STEL: 250 ppm STEL: 735 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

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	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Recommended Filter type:	Organic gases and vapours filter. Type A. Brown. conforming to EN14387.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless

Odor	Petroleum distillates
Odor Threshold	No information available
pH	7-8 20% aq. solution
Melting Point/Range	-108.4 °C / -163.1 °F
Boiling Point/Range	66 °C / 150.8 °F
Flash Point	-21 °C / -5.8 °F
Evaporation Rate	> 1
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	11.8%
Lower	2.0%
Vapor Pressure	170 mbar @ 20 °C
Vapor Density	2.5
Specific Gravity	0.880
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	215 °C / 419 °F
Decomposition Temperature	No information available
Viscosity	0.456 mPas @ 20°C Dynamic
Molecular Formula	C ₄ H ₈ O
Molecular Weight	72.11

10. Stability and reactivity

Reactive Hazard	Yes.
Stability	Stable under recommended storage conditions. Reacts with air to form peroxides. May form explosive peroxides on prolonged storage. Hygroscopic.
Conditions to Avoid	Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition. Exposure to moist air or water.
Incompatible Materials	Strong oxidizing agents, Acids
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂), peroxides
Hazardous Polymerization	Hazardous polymerization may occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrahydrofuran	1650 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	180 mg/L (Rat) 1 h 53.9 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes May cause irritation of respiratory tract
Sensitization	No information available
Carcinogenicity	Limited evidence of a carcinogenic effect.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Tetrahydrofuran	109-99-9	Group 2B	Not listed	A3	X	A3

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
 A2 - Suspected Human Carcinogen
 A3 - Animal Carcinogen
 ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects	No information available
Reproductive Effects	No information available.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	Respiratory system Central nervous system (CNS)
STOT - repeated exposure	None known
Aspiration hazard	No information available

Symptoms / effects, both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting:
 Causes central nervous system depression

Endocrine Disruptor Information

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrahydrofuran	Group III Chemical	Not applicable	Not applicable

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Tetrahydrofuran	Not listed	2160 mg/l LC50 = 96 h Pimephales promelas Leuciscus idus: LC50: 2820 mg/L/48h	Not listed	EC50 48 h 3485 mg/l EC50: >10000 mg/L/24h

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.

Component	log Pow
Tetrahydrofuran	0.45

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.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Tetrahydrofuran - 109-99-9	U213	-

14. Transport information

DOT

UN-No UN2056
 Proper Shipping Name TETRAHYDROFURAN
 Hazard Class 3
 Packing Group II

TDG

UN-No UN2056
 Proper Shipping Name TETRAHYDROFURAN
 Hazard Class 3
 Packing Group II

IATA

UN-No UN2056
 Proper Shipping Name TETRAHYDROFURAN
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN2056
 Proper Shipping Name TETRAHYDROFURAN
 Hazard Class 3
 Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Tetrahydrofuran	109-99-9	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT)

Not applicable

TSCA 12(b) - Notices of Export

Component	CAS No	TSCA 12(b) - Notices of Export
Tetrahydrofuran	109-99-9	Section 4, 1 % de minimus concentration

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Tetrahydrofuran	109-99-9	X	-	203-726-8	X	X	X	X	X	KE-33454

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

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 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
Tetrahydrofuran	1000 lb	-

California Proposition 65

This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Tetrahydrofuran	109-99-9	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Tetrahydrofuran	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
 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**

Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Tetrahydrofuran	109-99-9	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Tetrahydrofuran	109-99-9	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Tetrahydrofuran	109-99-9	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information**Prepared By**

Regulatory Affairs
 Thermo Fisher Scientific
 Email: EMSDS.RA@thermofisher.com

Creation Date

11-Jun-2009

Revision Date

16-Aug-2023

Print Date

16-Aug-2023

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

End of SDS

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Thallium

Product Number : 277932
Brand : Aldrich
Index-No. : 081-001-00-3

CAS-No. : 7440-28-0

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

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 2), H300
Acute toxicity, Inhalation (Category 2), H330
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Danger

Hazard statement(s)

H300 + H330

H412

Fatal if swallowed or if inhaled
Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P260

P264

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
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.
P273	Avoid release to the environment.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: TI
Molecular weight	: 204.38 g/mol
CAS-No.	: 7440-28-0
EC-No.	: 231-138-1
Index-No.	: 081-001-00-3

Hazardous components

Component	Classification	Concentration
Thallium		
	Acute Tox. 2; Aquatic Acute 3; Aquatic Chronic 3; H300 + H330, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

thallium oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Thallium	7440-28-0	TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Alopecia Adopted values or notations enclosed are those for which changes are proposed in the NIC 2010 Revision or addition to the notice of intended changes See Notice of Intended Changes (NIC) Danger of cutaneous absorption		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral neuropathy Gastrointestinal damage 2015 Adoption Danger of cutaneous absorption		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral neuropathy Gastrointestinal damage		

		Danger of cutaneous absorption varies		
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Peripheral neuropathy Gastrointestinal damage Danger of cutaneous absorption varies		
		TWA	0.1 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance

Form: granular

	Colour: light grey
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: 303 °C (577 °F) - lit.
f) Initial boiling point and boiling range	1,457 °C (2,655 °F) - lit.
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Air sensitive.

10.5 Incompatible materials

Strong acids, Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - thallium oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data availableThallium
Dermal: No data available(Thallium)
No data available(Thallium)

Skin corrosion/irritation

No data available(Thallium)

Serious eye damage/eye irritation

No data available(Thallium)

Respiratory or skin sensitisation

No data available(Thallium)

Germ cell mutagenicity

No data available(Thallium)

Carcinogenicity

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

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

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

Reproductive toxicity

Possible risk of congenital malformation in the fetus.(Thallium)
No data available(Thallium)

Specific target organ toxicity - single exposure

No data available(Thallium)

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Thallium)

Additional Information

RTECS: XG3425000

The most characteristic symptom of thallium exposure is alopecia (loss of impairment of nail growth often resulting in the appearance of crescent-s Other symptoms in acute poisoning relate chiefly to the gastrointestinal system. Acute poisoning results in swelling of the feet and legs, arthral the hands and feet, mental confusion, polyneuritis with severe pain in th angina-like pains, nephritis, wasting and weakness, and lymphocytosis and peripheral nervous system abnormalities may persist including ataxia, tre disorders, memory loss, and psychoses may develop., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Thallium)

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence(Thallium)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Cyprinodon variegatus (sheepshead minnow) - 21.0 mg/l - 96.0 h(Thallium)

 mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 14.0 mg/l - 96.0 h(Thallium)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available(Thallium)

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 3288 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Thallium)

IATA

UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Thallium)

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Thallium	7440-28-0	2007-07-01

California Prop. 65 Components

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

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H300	Fatal if swallowed.
H300 + H330	Fatal if swallowed or if inhaled
H330	Fatal if inhaled.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1

Revision Date: 05/28/2017

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 09/21/2017
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Toluene

Product Number : 244511
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3

CAS-No. : 108-88-3

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
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.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₇ H ₈
Molecular weight	: 92.14 g/mol
CAS-No.	: 108-88-3
EC-No.	: 203-625-9
Index-No.	: 601-021-00-3
Registration number	: 01-2119471310-51-XXXX

Hazardous components

Component	Classification	Concentration
Toluene		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H315, H336, H361, H373, H401	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. 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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Handle and store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2015 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.0200 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.0300 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3000 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to last shift of workweek			

		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Exposure routes	Health effect	Value
Workers	Inhalation	Acute systemic effects	384 mg/m3
Workers	Inhalation	Acute local effects	384 mg/m3
Workers	Skin contact	Long-term systemic effects	384mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	192 mg/m3
Workers	Inhalation	Long-term local effects	192 mg/m3
Consumers	Inhalation	Acute systemic effects	226 mg/m3
Consumers	Inhalation	Acute local effects	226 mg/m3
Consumers	Skin contact	Long-term systemic effects	226mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	56.5 mg/m3
Consumers	Ingestion	Long-term systemic effects	8.13mg/kg BW/d

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.89 mg/kg
Marine water	0.68 mg/l
Fresh water	0.68 mg/l
Marine sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 mg/l

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--|
| a) Appearance | Form: liquid
Colour: colourless |
| b) Odour | aromatic |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: -93 °C (-135 °F) |
| f) Initial boiling point and boiling range | 110 - 111 °C (230 - 232 °F) |
| g) Flash point | 4.0 °C (39.2 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7 %(V)
Lower explosion limit: 1.2 %(V) |
| k) Vapour pressure | 29.1 hPa (21.8 mmHg) at 20.0 °C (68.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 0.865 g/mL at 25 °C (77 °F) |
| n) Water solubility | 0.5 g/l at 15 °C (59 °F) |
| o) Partition coefficient: n-octanol/water | No data available |
| p) Auto-ignition temperature | 535.0 °C (995.0 °F) |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - > 5,580 mg/kg

LC50 Inhalation - Rat - 4 h - 12,500 - 28,800 mg/m³

LD50 Dermal - Rabbit - 12,196 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation

(OECD Test Guideline 405)

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Rat

Liver

DNA damage

Carcinogenicity

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

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

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

Reproductive toxicity

Damage to fetus possible

Suspected human reproductive toxicant

Reproductive toxicity - Rat - Inhalation

Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count).

Experiments have shown reproductive toxicity effects in male and female laboratory animals.

Developmental Toxicity - Rat - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: XS5250000

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

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 8.00 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h
Toxicity to algae	EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h
	EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h

12.2 Persistence and degradability

Biodegradability Result: - Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d
- 0.05 mg/l

Bioconcentration factor (BCF): 90

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

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

Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE

IATA

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	108-88-3	2009-02-01
Toluene		

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard: 2

Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.0

Revision Date: 09/21/2017

Print Date: 11/10/2018

SAFETY DATA SHEET

Version 4.10
Revision Date 01/04/2018
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Trichloroethylene

Product Number : 251402
Brand : Sigma-Aldrich
Index-No. : 602-027-00-9

CAS-No. : 79-01-6

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H315 Causes skin irritation.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	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.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash 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 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: TCE Trichloroethene
Formula	: C ₂ HCl ₃
Molecular weight	: 131.39 g/mol
CAS-No.	: 79-01-6
EC-No.	: 201-167-4
Index-No.	: 602-027-00-9

Hazardous components

Component	Classification	Concentration
Trichloroethylene	Skin Irrit. 2; Eye Irrit. 2A; Muta. 2; Carc. 1B; STOT SE 3; Aquatic Acute 3; Aquatic Chronic 3; H315, H319, H336, H341, H350, H412	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

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

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

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Light sensitive. Handle and store under inert gas.

Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Trichloroethylene	79-01-6	TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		STEL	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		

		STEL	100 ppm 537 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	25 ppm 135 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Trichloroacetic acid	15.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Trichloroethanol	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

a) Appearance	Form: liquid, clear Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -84.8 °C (-120.6 °F) - lit.
f) Initial boiling point and boiling range	86.7 °C (188.1 °F) - lit.
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 10.5 %(V) Lower explosion limit: 8 %(V)
k) Vapour pressure	81.3 hPa (61.0 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	1.463 g/mL at 25 °C (77 °F)
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	log Pow: 2.29log Pow: 5
p) Auto-ignition temperature	410.0 °C (770.0 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety 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

Oxidizing agents, Strong bases, Magnesium

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION**11.1 Information on toxicological effects****Acute toxicity**

LD50 Oral - Rat - 4,920 mg/kg

LC50 Inhalation - Mouse - 4 h - 8450 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation - 24 h

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

In vitro tests showed mutagenic effects

Carcinogenicity

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

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Trichloroethylene)

NTP: RAHC - Reasonably anticipated to be a human carcinogen (Trichloroethylene)

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

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: KX4550000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., Gastrointestinal disturbance, Kidney injury may occur., narcosis
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 41 mg/l - 96.0 h LOEC - other fish - 11 mg/l - 10.0 d NOEC - Oryzias latipes - 40 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 18.00 mg/l - 48 h
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 175.00 mg/l - 96 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Does not bioaccumulate.

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

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

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1710 Class: 6.1 Packing group: III
Proper shipping name: Trichloroethylene
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1710 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TRICHLOROETHYLENE

IATA

UN number: 1710 Class: 6.1 Packing group: III

Proper shipping name: Trichloroethylene

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2011-09-01

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2011-09-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H402	Harmful to aquatic life.

HMIS Rating

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

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.10

Revision Date: 01/04/2018

Print Date: 06/28/2019

SAFETY DATA SHEET

Version 4.20
Revision Date 09/23/2016
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION**1.1 Product identifiers**

Product name : Trichlorofluoromethane

Product Number : 254991

Brand : Aldrich

CAS-No. : 75-69-4

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

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Acute toxicity, Dermal (Category 4), H312

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word : Warning

Hazard statement(s)
H312

Harmful in contact with skin.

Precautionary statement(s)

P280 : Wear protective gloves/ protective clothing.
P302 + P352 + P312 : IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P363 : Wash contaminated clothing before reuse.
P501 : Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS**3.1 Substances**

Synonyms : Fluorotrichloromethane

Aldrich - 254991

CFC-11

Formula : CCl3F
Molecular weight : 137.37 g/mol
CAS-No. : 75-69-4
EC-No. : 200-892-3

Hazardous components

Component	Classification	Concentration
Trichlorofluoromethane		
	Acute Tox. 4; H312	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. 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

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Recommended storage temperature 2 - 8 °C

Contents under pressure.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Trichlorofluoromethane	75-69-4	C	1,000.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Cardiac sensitization Not classifiable as a human carcinogen		
		C	1,000.000000 ppm 5,600.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000.000000 ppm 5,600.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		C	1,000 ppm 5,600 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 30 min
Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|---|
| a) Appearance | Form: liquid, clear
Colour: colourless |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | -110.99 - -109.99 °C (-167.78 - -165.98 °F) |
| f) Initial boiling point and boiling range | 23.7 °C (74.7 °F) - lit. |
| g) Flash point | No data available |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 885.7 hPa (664.3 mmHg) at 20.0 °C (68.0 °F)
2,701.2 hPa (2,026.1 mmHg) at 55.0 °C (131.0 °F) |
| l) Vapour density | No data available |
| m) Relative density | 1.494 g/cm ³ at 25 °C (77 °F) |
| n) Water solubility | 1 g/l |
| o) Partition coefficient: n-octanol/water | log Pow: 2.53 |
| p) Auto-ignition temperature | No data available |
| q) Decomposition | No data available |

temperature

- r) Viscosity No data available
- s) Explosive properties No data available
- t) Oxidizing properties No data available

9.2 Other safety information

Surface tension 18.0 mN/m at 25.0 °C (77.0 °F)

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, Sodium/sodium oxides, Potassium, Magnesium, Aluminum, Zinc

10.6 Hazardous decomposition products

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

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - > 15,000 mg/kg

LC50 Inhalation - Rat - 0.3 h - 130000 ppm

Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

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

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

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: PB6125000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated., Nausea, Dizziness, Headache, Vomiting, Diarrhoea, Abdominal pain, Weakness, Unconsciousness

Liver -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3082

Class: 9

Packing group: III

Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Trichlorofluoromethane)

Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
H312	Harmful in contact with skin.

HMIS Rating

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

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.20

Revision Date: 09/23/2016

Print Date: 06/22/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Zinc

Product Number : 324930
Brand : Aldrich
Index-No. : 030-001-00-1

CAS-No. : 7440-66-6

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

Company : Sigma-Aldrich Inc.
3050 Spruce Street
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Pyrophoric solids (Category 1), H250
Self-heating substances and mixtures (Category 1), H251
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H250 Catches fire spontaneously if exposed to air.
H251 Self-heating: may catch fire.
H260 In contact with water releases flammable gases which may ignite spontaneously.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)	
P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P222	Do not allow contact with air.
P223	Do not allow contact with water.
P231 + P232	Handle under inert gas. Protect from moisture.
P235 + P410	Keep cool. Protect from sunlight.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P402 + P404	Store in a dry place. Store in a closed container.
P407	Maintain air gap between stacks/ pallets.
P413	Store bulk masses greater than .? kg/ .? lbs at temperatures not exceeding .? °C/ .? °F.
P420	Store away from other materials.
P422	Store contents under inert gas.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: Zn
Molecular weight	: 65.39 g/mol
CAS-No.	: 7440-66-6
EC-No.	: 231-175-3
Index-No.	: 030-001-00-1

Hazardous components

Component	Classification	Concentration
Zinc powder (pyrophoric)		
	Pyr. Sol. 1; Self-heat. 1; Water-react. 1; Aquatic Acute 1; Aquatic Chronic 1; H250, H251, H260, H410	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

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

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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Dry powder

5.2 Special hazards arising from the substance or mixture

Zinc/zinc oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing

Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

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

Never allow product to get in contact with water during storage.

Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

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

Protective gloves against thermal risks

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If th full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|--|---|
| a) Appearance | Form: powder
Colour: grey |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | Melting point/range: 420 °C (788 °F) - lit. |
| f) Initial boiling point and boiling range | 907 °C (1665 °F) - lit. |
| g) Flash point | ()No data available |
| h) Evaporation rate | No data available |

- | | |
|---|---|
| i) Flammability (solid, gas) | May form combustible dust concentrations in air. |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | 1 hPa at 487 °C (909 °F) |
| l) Vapour density | No data available |
| m) Relative density | 7.133 g/mL at 25 °C (77 °F) |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | log Pow: 5 |
| p) Auto-ignition temperature | The substance or mixture is classified as self heating with the category 1.,
The substance or mixture is pyrophoric with the category 1. |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety 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

Reacts violently with water.

10.4 Conditions to avoid

Exposure to moisture

10.5 Incompatible materials

Strong acids and oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Zinc/zinc oxides

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

No data available Zinc powder (pyrophoric)

Inhalation: No data available (Zinc powder (pyrophoric))

Dermal: No data available (Zinc powder (pyrophoric))

No data available (Zinc powder (pyrophoric))

Skin corrosion/irritation

No data available (Zinc powder (pyrophoric))

Serious eye damage/eye irritation

No data available (Zinc powder (pyrophoric))

Respiratory or skin sensitisation

Did not cause sensitisation on laboratory animals.(Zinc powder (pyrophoric))

Germ cell mutagenicity

No data available(Zinc powder (pyrophoric))

Carcinogenicity

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

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

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

Reproductive toxicity

No data available(Zinc powder (pyrophoric))

No data available(Zinc powder (pyrophoric))

Specific target organ toxicity - single exposure

No data available(Zinc powder (pyrophoric))

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available(Zinc powder (pyrophoric))

Additional Information

RTECS: ZG8600000

chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness(Zinc powder (pyrophoric))

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Zinc powder (pyrophoric))

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

Toxicity to fish LC50 - Cyprinus carpio (Carp) - 450.0 µg/l - 96.0 h(Zinc powder (pyrophoric))

Toxicity to daphnia and other aquatic invertebrates LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h(Zinc powder (pyrophoric))

mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d(Zinc powder (pyrophoric))

12.2 Persistence and degradability**12.3 Bioaccumulative potential**

Bioaccumulation Algae - 7 d
at 16 °C - 5 µg/l(Zinc powder (pyrophoric))

Bioconcentration factor (BCF): 466

12.4 Mobility in soil

No data available(Zinc powder (pyrophoric))

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1436 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Zinc powder
Reportable Quantity (RQ) : 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 1436 Class: 4.3 (4.2) Packing group: II EMS-No: F-G, S-O
Proper shipping name: ZINC POWDER
Marine pollutant : yes

IATA

UN number: 1436 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Zinc powder

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

SARA 311/312 Hazards

Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H250	Catches fire spontaneously if exposed to air.
H251	Self-heating: may catch fire.
H260	In contact with water releases flammable gases which may ignite spontaneously.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	1
Special hazard.I:	W

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich 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.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0

Revision Date: 05/28/2017

Print Date: 06/28/2019

Appendix E:
Community Air Monitoring Plan (CAMP)



Geotechnical
Environmental
Site Civil

959 Route 46E, Fl 3, Ste 300
Parsippany, NJ 07054
973.808.9050
www.sesi.org

**Community Air Monitoring Plan
For
157 Irving Avenue
Port Chester, Westchester County, New York**

Prepared for:
Irving Owner LLC
January 2024 (Revised June 2024)

SESI Project No:
12653

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LIST OF ACRONYMS

Acronym	Definition
CAMP	Community Air Monitoring Plan
IRM	Interim Remedial Measure
mcg/m ³	micrograms per cubic meter
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PID	Photoionization Detector
PM-10	Less than 10 micrometers
ppm	Parts Per Million
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This document presents a Community Air Monitoring Plan (CAMP) for the remedial investigation (RI) for the proposed development at 157 Irving Avenue, Port Chester, New York (the “Site”), a 0.38-acre parcel identified as Block 2, Lot 80 on the Westchester County tax map. The Site has been developed with one (1) two-story building that comprises 7,350 square feet (sf) and a residential home comprising 1,450 sf. The Site is bound to the north by a residential property and a gas station, to the west by Palace Place followed by a residential property and a parking lot, to the south by Irving Avenue followed by Westchester Upholstery, and to the east by NY 120-A followed by restaurants/commercial properties.

Most recently, the Site was improved by supermarket, parking lots and a two (2)-story residence. The Site previously contained residences, a garage, gas station and warehouse prior to the current operations. The Site previously consisted of four separate lots (57, 58, 59, 60) which have been consolidated. Specifically, Lot 57 was a residence (circa 1990-1934) and gravel parking lot (circa 1990-present), Lot 58 was a house (circa 1919-present), Lot 59 was a dwelling (circa 1919-1934), garage (circa 1934-1950), warehouse (circa 1950-2006) and grocery store (circa 2006-present), and Lot 60 was vacant (circa 1919-1934), a gas station (circa 1934-1950) and a parking lot (circa 1950-present).

2.0 OBJECTIVES

The objective of the CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases that may arise during all ground intrusive activities, and potentially contaminated soil and material handling and staging. In addition, the CAMP is intended to ensure that dust and contaminants are not leaving the work zone.

3.0 METHODS

The CAMP will include continuous monitoring for particulate matter (e.g. airborne “dust”) and volatile organic compounds (VOCs) during the planned remedial excavation and construction activities. Any CAMP exceedances will be reported to the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) on the same business day and as soon as possible. Notification of the exceedance will be sent

via email along with the reason for the exceedance, the measure(s) taken to address the exceedance, and if the exceedance was resolved.

3.1 CONTINUOUS MONITORING

Continuous air sampling for dust particulates and VOCs will be conducted during any ground intrusive activities at the site.

3.2 PERIODIC MONITORING

Periodic monitoring for VOCs will be conducted 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 consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required 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.

4.0 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

VOCs must be monitored at the downwind perimeter of the immediate work area (i.e. the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photoionization detector (PID) equipped with a 10.6 ev lamp. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

5.0 PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust-suppression techniques must be employed. Work may 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 must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust-suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

6.0 SPECIAL REQUIREMENTS FOR WORK WITHIN 20 FEET OF POTENTIALLY EXPOSED INDIVIDUAL STRUCTURES

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must 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 should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed one (1) ppm, monitoring should 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 should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m³, work activities should 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 should be pre-determined, as necessary, for each site.

Appendix F:

Citizen Participation Plan



Department of
Environmental
Conservation

Brownfield Cleanup Program

Citizen Participation Plan

for

157 Irving Gas Station and Lab Site

June 2024

C360250
157 Irving Avenue
Village of Port Chester
Westchester 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: **Irving Owner LLC (“Applicant”)**
Site Name: **157 Irving Gas Station and Lab Site (“Site”)**
Site Address: **157 Irving Avenue, Port Chester, New York 10573**
Site County: **Westchester County**
Site Number: **C360250**

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:
<http://www.dec.ny.gov/chemical/8450.html> .

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 <http://www.dec.ny.gov/chemical/61092.html> .

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.

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, the significant threat determination for the site had not yet been made.

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
<http://www.dec.ny.gov/regulations/2590.html>

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 style="list-style-type: none"> • Prepare site contact list • Establish document repository(ies) 	At time of preparation of application to participate in the BCP.
<ul style="list-style-type: none"> • Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period 	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):	
<ul style="list-style-type: none"> • 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 Remedial Investigation (RI) Work Plan:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period 	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 Completes Remedial Investigation:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list that describes RI results 	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period 	Before NYSDEC approves RWP. Forty-five 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 Starts Cleanup Action:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list that describes upcoming cleanup action 	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
<ul style="list-style-type: none"> • Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC) 	At the time the cleanup action has been completed. Note: The two fact sheets are combined when possible if there is not a delay in issuing the 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.

There will be areas on the Site where demolition and soil excavation is necessary. Therefore, once the remediation commences, there may be concerns regarding odors, noise or truck traffic coming from the site. However, these impacts will be mitigated through implementation of a Health and Safety Plan and Soil Management Plan approved by NYSDEC, which will be designed to minimize these impacts. A Community Air Monitoring Plan will also be implemented to monitor dust and vapors to ensure the community is not impacted. CAMP implementation involves the placement of air monitoring stations upwind and downwind of where work is occurring to capture both dust and vapor emissions. If dust or emissions exceed a set threshold established by NYSDEC and the New York State Department of Health (NYSDOH), then work must cease, and the cause of the issue must be corrected before work can proceed.

The site is located in an Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.

The site includes a community with a sizable Hispanic-American population, therefore, future fact sheets may be translated into Spanish, if it is deemed necessary.

4. Site Information

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

Site Description

- location – 157 Irving Avenue, County of Westchester, Village of Port Chester, State of New York.
- setting - urban
- site size – 0.38 Acres

- adjacent properties - Commercial and residential properties to the south, east, and west and north of the Site is a gas station and residential property.

History of Site Use, Investigation, and Cleanup

Historic operations at the Site consisted of various mixed-use commercial and residential operations including a grocery store, parking lot, gas station, auto service facility, lab and residential house.

Currently the site is occupied by a two-story building, parking lots and residential house. The first floor of the building is occupied by a grocery store, which also has use of the on-site parking lots. The second floor of the building is vacant. The residential house is also vacant.

Based on the investigations conducted to date, the primary contaminants of concern are SVOCs and metals in soil, SVOCs and metals in groundwater, and VOCs in soil vapor.

Evidence of four underground storage tanks (“USTs”) has been found on one lot of the Site. It appears that two of the USTs have been removed, but the other two remain on the Site. Another UST was located on another lot of the Site, which was abandoned in place in 2002. It is suspected there may be USTs present on the remaining lots of the Site. A trash compactor which utilized hydraulic oils was observed on the Site and may have leaked into a drain located near the trash compactor. An oil burner was observed in the partially flooded basement of the building. The flooding may have washed residual oil into nearby exposed subsurface soil. A loading dock was operated on the Site by the Lab historically present on the Site. Hazardous materials were received by the Lab through the loading dock and spills may have occurred.

Further investigation will occur on the Site, however, the investigations to date have concluded that remedial action will be required to cleanup the contamination concentrations in soil that exceed the restricted residential and commercial cleanup standards, to remediate the contaminants in groundwater that exceeded the ambient water quality standards to the extent feasible and to mitigate the soil vapor concentrations exceeding the NYSDOH screening levels designed to mitigate possible soil vapor intrusion into future on-Site buildings.

The planned use of the property is a mix of residential and commercial use.

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 its Application proposes that the site will be used for unrestricted purposes to the extent feasible to achieve this level of remediation or restricted residential use.

To achieve this goal, the Applicant will conduct investigation and 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.

Investigation

The Applicant has completed a partial site investigation before it entered into the BCP. For the partial investigation, NYSDEC will determine if the data are useable.

The site investigation has several goals:

- 1) define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
- 2) identify the source(s) of the contamination;
- 3) assess the impact of the contamination on public health and the environment; and
- 4) provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submitted a draft "Remedial Investigation Work Plan" to NYSDEC for review and approval. NYSDEC will make the draft plan available to the public review during a 30-day public comment period.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site

poses a significant threat to public health or the environment. If the site is a “significant threat,” it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

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

1. 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

2. 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.

An *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):

Caroline Jalanti
Assistant Engineer
NYSDEC
Division of Environmental Remediation
625 Broadway, Albany, NY 12233-7015
518-402-9650

New York State Department of Health (NYSDOH):

Michele Dolan
Public Health Specialist
NYSDOH
Empire State Plaza – Corning Tower,
Room 1787, Albany, NY 12237
518-402-7860

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Port Chester-Rye Brook Public Library
Attn: Robin Lettieri
1 Haseco Avenue
Port Chester, New York 10573
Phone: (914) 939-6710

<u>Hours:</u>	
Monday	9 AM–9 PM
Tuesday	9 AM–8 PM
Wednesday	9 AM–5 PM
Thursday	9 AM–5 PM
Friday	9 AM–5 PM
Saturday	9 AM–5 PM
Sunday	Closed

Appendix B - Site Contact List

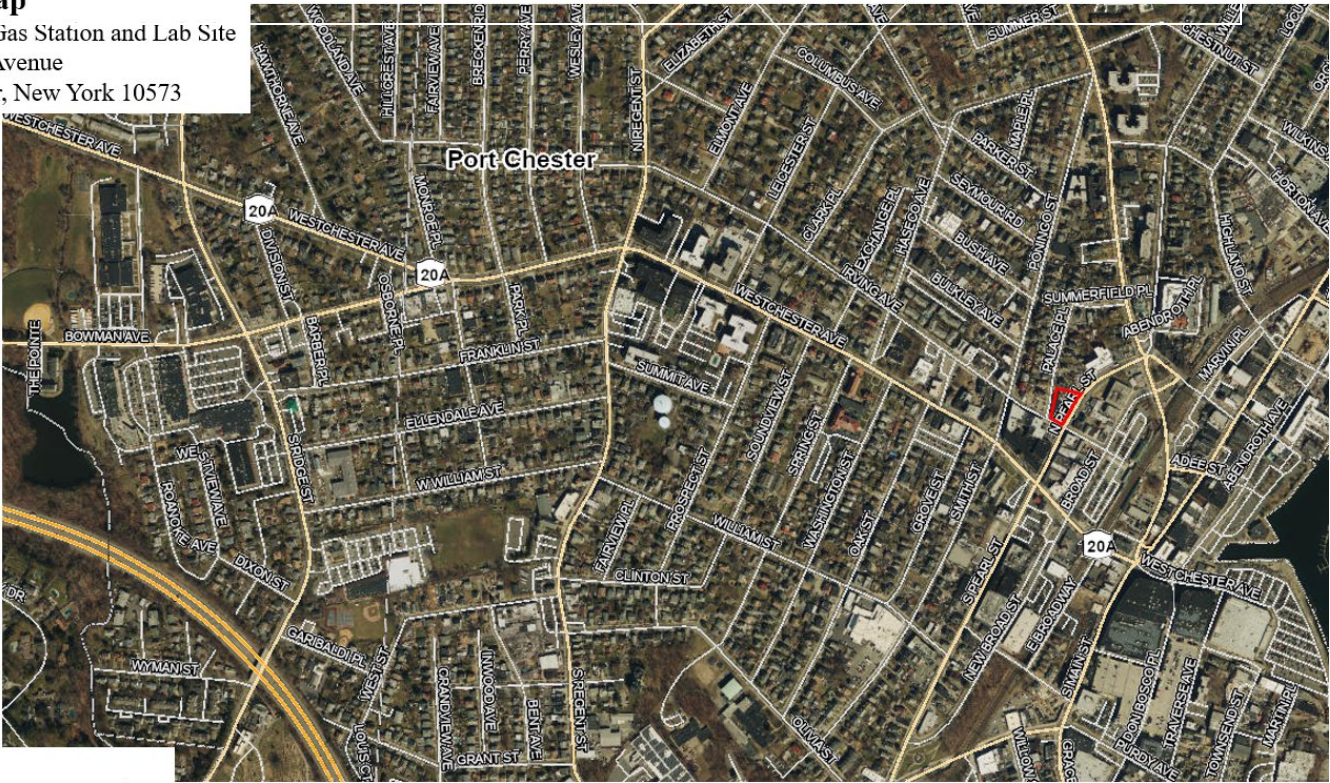
Government/Municipalities		
Charles Schumer US Senator Leo O' Brien Building, 11A Clinton Ave, Room 827 Albany, New York 12207	Kristen Gilibrand US Senator Leo O' Brien Building, 11A Clinton Ave, Room 821 Albany, New York 12207	Jamall Bowman U.S. House of Representatives, 16th District 6 Gramatan Avenue, Suite 205 My. Vernon, New York 10550
Shelley B. Mayer New York State Senator, 37th District Legislative Office Building, Room 509 Albany, New York 12247	George Latimer Westchester County Executive 148 Martine Avenue White Plains, New York 10601	Richard Hyman Westchester County Planning Board, Chair 148 Martine Avenue White Plains, New York 10601
Gary J. Zuckerman Supervisor, Town of Rye 222 Grace Church Street, 3rd Floor Port Chester, New York 10573	Hope Vespia Town of Rye, Town Clerk 222 Grace Church Street, 3rd Floor Port Chester, New York 10573	Luis A. Marino Mayor, Village of Port Chester 222 Grace Church Street Port Chester, New York 10573
Michael Scarola Village of Port Chester Department of Planning and Development 222 Grace Church Street, Suite 202 Port Chester, New York 10573	Janusz Richards Village of Port Chester, Village Clerk 222 Grace Church Street, Suite 120 Port Chester, New York 10573	Stuart L. Rabin Village of Port Chester, Village Manager 222 Grace Church Street Port Chester, New York 10573
Media		
The Journal News 1133 Westchester Avenue, Suite N110 White Plains, New York 10604		
Utilities/Public Water Authorities		
United Water Westchester Rate 2 District 148 Martine Avenue White Plains, New York 10601		
Public Library – Repository		
Port Chester - Rye Brook Public Library 1 Haseco Avenue Port Chester, New York 10573		
Schools/Daycares		
Judy Diaz John F. Kennedy Elementary School, Principal 40 Olivia Street Port Chester NY 10573	Paul Roncagliolo Thomas A. Edison School, Principal 132 Rectory Street Port Chester NY 10573	Deirdre McDermott Corpus Christi-Holy Rosary School - Father Rinaldi Campus, Principal 135 S. Regent Street Port Chester NY 10573
Gloria Guerra Corpus Christi-Holy Rosary School - Laura Vicuna Campus 18 Central Avenue Port Chester NY 10573	Rosa A. Delgado Rossy's Little Angels 43 Soundview Street Port Chester NY 10573	Marcela Arismendi Ladybug Family Preschool 141 William Street Port Chester NY 10573
Flora Tacuri	Yensy Salazar	Paula Belli

Magic Cloud Day Care 18 Parker Street Port Chester NY 10573	My Garden Family Day Care 394 Irving Avenue Port Chester NY 10573	Port Chester Children's Place 400 Westchester Avenue Port Chester NY 10573
Zoila Garzon Happy Corner Day Care Center Inc. 80 S. Regent Street Port Chester NY 10573	Tetyana Palmisano Tots Place 8 Bent Avenue Port Chester NY 10573	
Adjacent Property Owners		
181 Westchester Ave LLC Adjacent Property Owner of N/A Irving Ave and 181 Westchester Place PO Box 1068 Larchmont NY 10538	167 Irving Owners LLC Adjacent Property Owner of 167 Irving Ave 130 Harold Road Woodmere NY 11598	Black Diamond Group LLC Adjacent Property Owner of 8 Palace Place 9 Tashua Parkway Trumbull CT 06611
16 Palace Place Holdings LLC Adjacent Property Owner of 16 Palace Place 16 Palace Place Port Chester NY 10573	Richard and April Gasparino Adjacent Property Owner of 18 Palace Place 16 Palace Place Port Chester NY 10573	Jose and Andrea Garcia Adjacent Property Owner of 17 Palace Place 17 Palace Place Port Chester NY 10573
Iron Ridge Associates LLC Adjacent Property Owner of N/A Palace Place 84 Northfield Street Greenwich CT 06830	110 Pearl Real Estate Corp. Adjacent Property Owner of 110 North Pearl Street 8103 267th Street Floral NY 11004	Verizon New York Inc. Adjacent Property Owner of 50 Broad Street PO Box 2749 Addison TX 75001
Bucci Irrevocable Trust Adjacent Property Owner of 115 North Pearl Street 20 Priscilla Lane Port Chester NY 10573	Broad Street Owners LLC Adjacent Property Owner of 46 Broad St and 147 Irving Ave 147 Irving Avenue Port Chester NY 10573	Belos Broad LLC Adjacent Property Owner of 146- 148 Irving Avenue 144 Langdon Avenue Dobbs Ferry NY 10522
Adjacent Property Operators		
Evermist Lawn Sprinklers Adjacent Property Operator of 16 Palace Place 16 Palace Place Port Chester NY 10573	Sinclair Gas Station Adjacent Property Operator of 110 N Pearl Street 110 North Pearl Street Port Chester NY 10573	JM Electronecanica Adjacent Property Operator of 115 N Pearl Street 115 North Pearl Street Port Chester NY 10573
Ficcinones Media Adjacent Property Operator of 46 Broad Street 46 Broad Street Port Chester NY 10573	Salon Image Adjacent Property Operator of 46 Broad Street 46 Broad Street Port Chester NY 10573	Angelo's Pizza and Pasta Adjacent Property Operator of 147 Irving Avenue 147 Irving Avenue Port Chester NY 10573
Iglesia Evangelica Apostoles Adjacent Property Operator of 146- 148 Irving Avenue 146 Irving Avenue Port Chester NY 10573	Pollo a la Brasa Adjacent Property Operator of 146- 148 Irving Avenue 148 Irving Avenue Port Chester NY 10573	Slavin Studios Adjacent Property Operator of 181 Westchester Avenue 168a Irving Avenue Port Chester NY 10573
The Junkluggers Adjacent Property Operator of 181 Westchester Avenue 168 Irving Avenue, #500f Port Chester NY 10573	Fashion Arts Studio of Westchester Adjacent Property Operator of 181 Westchester Avenue 168a Irving Avenue, Suite 300A Port Chester NY 10573	TPR Enterprises Ltd Adjacent Property Operator of 181 Westchester Avenue 168 Irving Avenue, #303C Port Chester NY 10573
BM Ortho Appliances Inc. Adjacent Property Operator of 181 Westchester Avenue 168a Irving Avenue	The Booth for Business Adjacent Property Operator of 181 Westchester Avenue 168a Irving Avenue, #500G	The Bare Man LLC Adjacent Property Operator of 181 Westchester Avenue 168B Irving Avenue, Suite 203-H

Port Chester NY 10573	Port Chester NY 10573	Port Chester NY 10573
Total by Verizon Adjacent Property Operator of 181 Westchester Avenue 191 Westchester Avenue Port Chester NY 10573	Gentle Touch Lasers Hair Removal Adjacent Property Operator of 181 Westchester Avenue 6 North Pearl Street, #304a Port Chester NY 10573	Heather Tietjen Photography Adjacent Property Operator of 181 Westchester Avenue 6 North Pearl Street, #204-A Port Chester NY 10573
Redemption Community Church Adjacent Property Operator of 181 Westchester Avenue 181 Westchester Avenue Port Chester NY 10573	Panka Peruvian Bistro Adjacent Property Operator of 181 Westchester Avenue 167 Westchester Avenue Port Chester NY 10573	Vellone Promotions Adjacent Property Operator of 181 Westchester Avenue 168 Irving Avenue Port Chester NY 10573

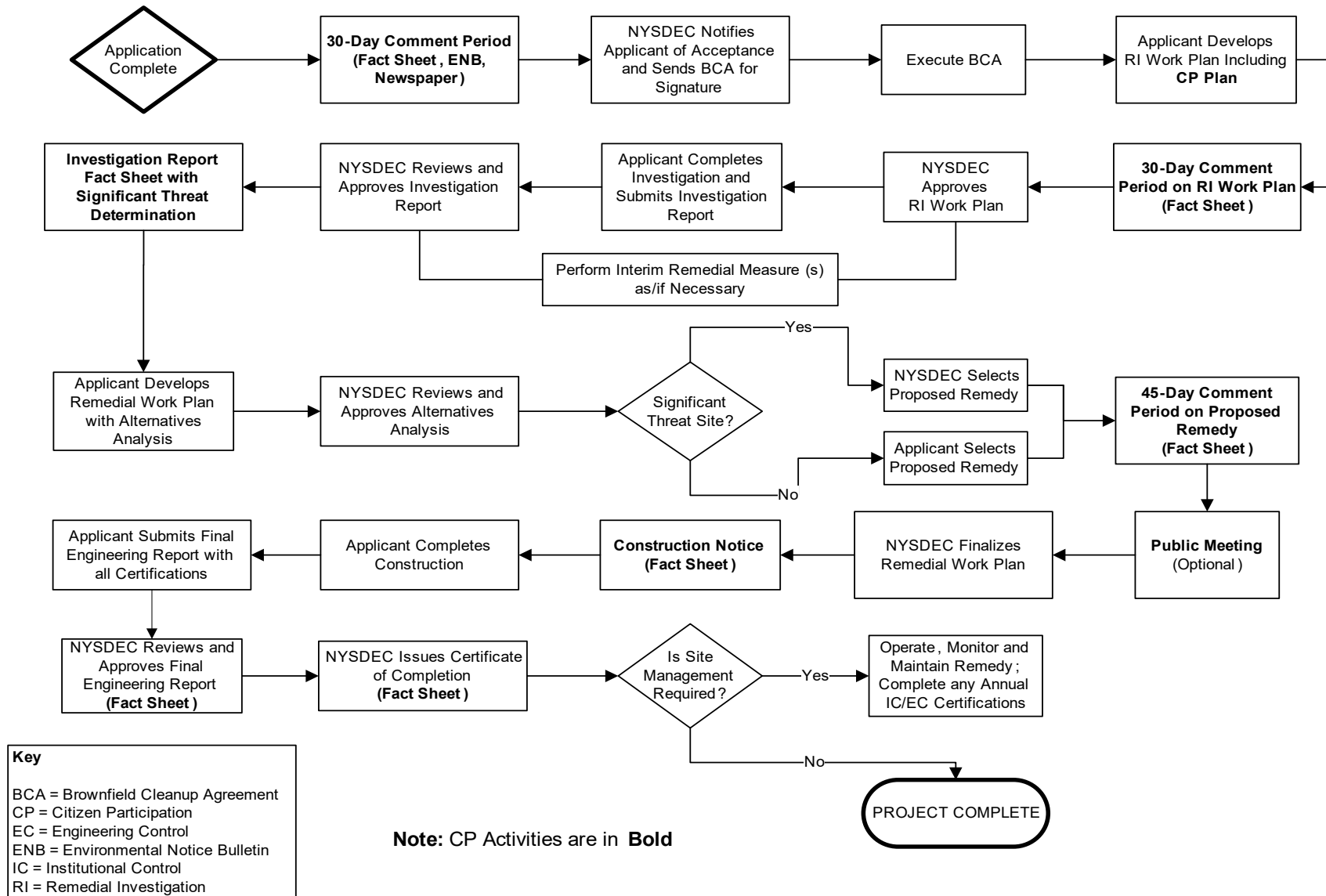
Appendix C - Site Location Map

Street Map
157 Irving Gas Station and Lab Site
157 Irving Avenue
Port Chester, New York 10573



Legend:
— Site Property Boundary

Appendix D– Brownfield Cleanup Program Process





Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: 157 Irving Gas Station and Lab Site ("Site")

Site Number: C360250

Site Address and County: 157 Irving Avenue, Port Chester, New York 10573

Remedial Party(ies): Irving Owner LLC

Note: For Parts 1. – 3. the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**

The issues listed in the CPP are common concerns of all residents near BCP Sites.

How were these issues and/or information needs identified?

Based on experience working on similar sites, these are the issues of concern

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.

None at this time.

How were these information needs identified?

N/A

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.

The Fact Sheets will be the main form of public communication unless additional information or a public hearing is required.

How were these issues and/or information needs identified?

This is the standard CPP process required in the BCP.

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:

☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☐ **Commercial** ☐ **Industrial**

b. Residential type around site:

☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:

☐ **High** ☒ **Medium** ☐ **Low**

d. Water supply of nearby residences:

☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?

☐ **Yes** ☒ **No**

Provide details if appropriate:

[Click here to enter text.](#)

f. Other environmental issues significantly impacted/impacting the affected community?

☐ **Yes** ☒ **No**

Provide details if appropriate:

[Click here to enter text.](#)

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?

☒ **Yes** ☐ **No**

h. Special considerations:

☒ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in h:

High Spanish Population

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in Part 2. of the Citizen Participation Plan under 'Site Contact List'. Are *other* individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☐ **Non-Adjacent Residents/Property Owners:** [Click here to enter text.](#)

☒ **Local Officials:** [Click here to enter text.](#)

☒ **Media:** [Click here to enter text.](#)

☐ **Business/Commercial Interests:** [Click here to enter text.](#)

☐ **Labor Group(s)/Employees:** [Click here to enter text.](#)

☐ **Indian Nation:** [Click here to enter text.](#)

☐ **Citizens/Community Group(s):** [Click here to enter text.](#)

☐ **Environmental Justice Group(s):** [Click here to enter text.](#)

☐ **Environmental Group(s):** [Click here to enter text.](#)

☐ **Civic Group(s):** [Click here to enter text.](#)

☐ **Recreational Group(s):** [Click here to enter text.](#)

☐ **Other(s):** [Click here to enter text.](#)

Prepared/Updated By: Linda R. Shaw, Esq,

Date: 2/6/24

Reviewed/Approved By: [Click here to enter text.](#)

Date: [Click here to enter text.](#)