RCRA Closure Plan

Spill Area
Permanent Parcel Number 116-07-005
Cleveland, Cuyahoga County, Ohio
OHR000219618

September 8, 2022

Prepared by:

HZW Environmental Consultants

6105 Heisley Road ♦ Mentor, Ohio 44060
440-357-1260 ♦ Fax 440-357-1510

H21276-02

1.0 BACKGROUND

This Closure Plan has been prepared by HZW Environmental Consultants, LLC (HZW) on behalf of Fantaco which was a tenant at the Century Plating, Inc. facility located at 17920 Waterloo Road, Cleveland, Ohio located on the Permanent Parcel Number (PPN) 116-07-005, Cleveland, Cuyahoga County, Ohio (the Property). This Plan is prepared in accordance with Ohio Administrative Code (OAC) 3745-55-10 through 3745-55-15 and in accordance with the Ohio Environmental Protection Agency's (EPA's) December 2021 "Closure Plan Review Guidance" (CPRG) document.

This Closure Plan addresses the closure of one (1) hazardous waste management units (HWMUs) at the Property designated the "Spill Area", which is described in greater detail, below.

2.0 DESCRIPTION OF FACILITY

The Property is being leased in part by Fantaco, Inc. (Fantaco). The hazardous waste generator identification number for the property is OHR000219618 with the Property owner as Hawkins Hodgson LTD II. The property owner contact is Gerry Fanta (216-288-5936). Fantaco had been occupying a portion of the building at 17920 Waterloo Road. During an Ohio EPA inspection of adjacent Century Plating facility, Ohio EPA identified a green liquid on the ground close to a dumpster located on the 17920 Waterloo Road site. In response to Ohio EPA's request, Fantaco completed a cleanup of the liquid using a shop vacuum. Approximately 5 to 10 gallons of liquid was cleaned up and put into a container. The exact amount of the released liquid is unknown since it was mixed with rainwater, but it was not more than 10 gallons. Subsequent analysis of the liquid indicated it was hazardous for chromium and cadmium. A copy of the laboratory analysis for the material recovered by the shop vacuum is included as **Appendix A.** A manifest for the off-site disposal of the material is also included as **Appendix A**.

On May 2, 2022, HZW met with a representative of Ohio EPA to determine the location of the Spill Area. The location was determined and established at the "Spill Area" HWMU. The location and outline of the HWMU was mapped using a GPS unit to enable mapping and re-establishment of the location after approval of this Closure Plan. The HWMU extends slightly onto the adjacent property to the east (18006 Waterloo

Road, occupied by Century Plating, Inc.). Fantaco is working with the owners from Century Plating, Inc. to sample and conduct any remediation necessary on their property within the HWMU.

This Closure Plan is being prepared to outline the steps necessary to investigate the extent of contamination and clean up any contamination that may be found.

3.0 MAPS OF THE FACILITY

A topographic map showing the location of the Facility and an aerial photograph showing the general location of the property are included as **Appendix B**. The location of the HWMU on the Property is shown on **Figure 1**, also included in **Appendix B**.

4.0 HAZARDOUS WASTE MANAGEMENT UNITS TO BE CLOSED

The HWMUs to be closed consist of soil in the area of the one (1) HMWU detailed below.

Spill Area

- A release of liquid from a dumpster on site was observed on site. Waste codes associated with containers in the Spill Area include D006 and D007.

There are no other HWMUs to be closed on this Property. Fantaco is no longer a tenant at the Property and has removed all if its equipment and materials, so no activities which may generate hazardous wastes are being conducted.

5.0 CHEMICALS OF CONCERN

In order to define the vertical and horizontal extent of the HWMU, a Sampling and Analysis Plan (SAP) for the site has been developed and included in this Closure Plan. As discussed with the Ohio EPA, the Chemicals of Concern (COCs) for the HWMU are cadmium, chromium, trivalent chromium and hexavalent chromium.

6.0 REGIONAL GEOLOGIC AND HYDROGEOLOGICAL CONDITIONS

According to the 2006 Bedrock Geologic Map of Ohio, published by the Ohio Department of Natural Resources (ODNR), bedrock near the Property consists of buried Upper Devonian Ohio Shale. The ODNR's 1983 (Revised 2002) Bedrock Topography Map (overlaid onto the Cleveland North, Ohio USGS quadrangle map), indicates bedrock beneath the Property is located at approximately 675 feet above the National Geodetic Vertical Datum (NGVD).

The ODNR's 1987 Glacial and Surficial Geology Map depict "Made Land" in the area of the Property. Made Land consists of areas of reclaimed land, cut and fill, and continuous urban cover where concrete, asphalt, buildings, structures or other man-made surfaces cover ninety percent or more of the surface. The 1980 Soil Survey of Cuyahoga County, Ohio, published by the United States Department of Agriculture, designates soils underlying the Property as Urban land. Urban land consists of areas where asphalt, concrete, buildings, or other manmade surfaces are present, and is typically drained by sewer systems, gutters, or subsurface drains, which cover eighty percent of the surface. In the absence of Made Land the Glacial and Surficial Geology Map indicates silt and clay and sand and gravel make up native geologic deposits.

According to ODNR's 1985 Principal Streams and their Drainage Areas Map, the Property is located within the 809 square mile drainage basin of the Cuyahoga River. Based upon topographic conditions on and adjacent to the Property, ground water beneath the Property most likely flows in a northwest direction; however, actual ground water flow direction is often influenced by factors such as underground structures, seasonal fluctuations, soil and bedrock geology, production wells and other factors beyond the scope of this study. According to ODNR's 1992 Ground water Resources Map for Cuyahoga County, Ohio, the Property is underlain by one (1) hydrogeologic unit consisting of impermeable clay deposits overlaying shale or shaley sandstone. No water wells are depicted near the Property.

Therefore, this Closure Plan does not include groundwater sampling at this time, but the Plan will be revised if sampling indicates there may be an impact.

7.0 SOIL SAMPLING AND ANALYSIS PLAN

The primary purpose of the soil sampling is to evaluate the nature and extent of chemicals of concern (COCs) in soil in the HWMU at the Property. The SAP has been prepared in accordance with the Ohio Environmental Protection Agency's (EPA's) December 2021 CPRG.

This SAP presents the methods that will be used during soil sample collection. This SAP has been prepared for use by HZW personnel only. Compliance with this SAP will ensure that representative soil samples are obtained.

7.1 Sampling Locations and Acquisition Methods

Soil sampling at the facility will be conducted using Geoprobe® subsurface sampling techniques. A total of thirty (30) soil samples collected from fifteen (15) locations within the HWMU, to be designated as [Sample Date]-[HWMU ID]-[boring number]-[sample interval] have been located based on a 20-foot sampling grid and on-site discussions with Ohio EPA personnel. A map showing the proposed locations of the soil borings is included as **Figure 2** in **Appendix B**.

The Geoprobe® is a manual or hydraulic "direct push" sampling device that drives a series of 3-foot long, 1-inch outside diameter hollow hardened steel rods into the subsurface. A 2 or 4-foot long sample tube lined with a clean, disposable acetate (plastic) liner of the same length is driven to a predetermined depth to obtain a relatively "undisturbed" core sample of the subsurface material. During boring installation, soil samples will be collected continuously at two or four-foot intervals from the land surface to a terminal depth of four (4) feet. Each sampling interval will be divided to obtain grab samples at the 0-2 feet and 2-4 feet intervals. All samples will be submitted for analysis. The soil samples will not be composited. Field notes, including logs of each boring describing soil type, color, moisture and other physical observations, will be prepared. Poor recovery of probe borings will be address via the installation of a boring that provides sufficient recovery. All borings will be abandoned by filling with hydrated bentonite chips. No investigatory-derived wastes are anticipated to be generated on site.

7.2 Equipment Decontamination

Decontamination of the Geoprobe will follow HZW's Standard Operating Procedure for Field Decontamination. The generalized sequence of routine decontamination procedures for sampling equipment consists of a detergent wash (i.e. Liqui-Nox® detergent), followed by a triple rinsing with distilled water.

Decontamination procedures include:

A. Place a minimum four (4) foot by four (4) foot piece of 6-mil polyethylene sheeting on the ground surface. The ground surface should be level and free of any large stones, sticks or other debris that could puncture or rip the sheeting;

B. Remove all gross materials/debris/contamination from the field equipment;

C. If equipment is muddy, scrub and rinse with distilled water in a separate container prior to washing with a detergent and distilled water solution;

D. Wash and scrub equipment with a detergent and distilled water solution;

E. Triple-rinse equipment with distilled water and allow the equipment to air dry;

F. Transfer all decontamination waters to 55-gallon drums with other wastes generated during field activities;

G. Place the polyethylene sheeting in a 55-gallon drum as investigation-derived waste.

As a part of field quality assurance/quality control, a sample of the final rinse water may be collected and submitted for analysis of the target parameters for the project. The Project Manager will discuss field quality assurance/quality control measures prior to initiating field activities.

7.3 Laboratory Analyses

The soil samples will be submitted to Summit Environmental Technologies, Inc. (SET) for analysis of total concentrations of cadmium, chromium and hexavalent chromium.

SET Certified Laboratories under Ohio's Voluntary Action Program. The laboratory will follow all EPA QA/QC protocol. All QA/QC documentation will be included with the laboratory report associated with this SAP. The analytical data and QA/QC information will support an Ohio EPA Tier 1 data validation, including method blanks and laboratory control samples. The EPA Methods to be used for sample analyses are:

COC	EPA Method
Total Metals	Method 6010/7471
Metals sample extraction	Method 3050
Hexavalent Chromium	Method 3060A/7176A

7.4 Sample Transportation

All samples will be placed in media provided by SET. The table below identifies each parameter, container, preservative, and holding time for specific analyses.

Soil Sampling Media

Matrix	Parameter	Container	Preservative	Hold Time
Soil	Total Metals	1 – 8 oz wide mouth glass	None – Cool 4° C	6 months
Soil	Hexavalent Chromium	1 – 8 oz wide mouth glass	None – Cool 4° C	28 days until sample extraction, 24 hours following extraction

7.5 Health and Safety Plan (HASP)

The site-specific HASP is included as **Appendix C.**

7.6 Data Quality Objectives (DQOs)

The DQO process is a strategic planning approach that is designed to ensure that the type, quantity and quality of environmental data used in decision making processes are appropriate for the intended application. The DQO process is an iterative process requiring reevaluation of objectives as the investigation proceeds. DQOs provide a systematic procedure for defining criteria that a data collection design should satisfy, including when to collect samples, sampling locations, the number of samples to collect and tolerable levels of decision error. Based on the outputs of the DQO process, a specific SAP is developed, and may require revision as data is evaluated.

As stated above, one objective of this SAP is to evaluate the nature of COCs at the HWMU at the Property. The general location of the HWMU is discussed above. The COCs include chromium, hexavalent chromium and cadmium.

Quality Assurance/Quality Control (QA/QC)

The following elements will be included in the sampling methodology and laboratory requirements as part of the QA/QC portion of this plan.

1. Soil sampling at the facility will be conducted using Geoprobe® subsurface sampling techniques. Prior to the start of sampling, field equipment blanks will be collected using de-ionized water. The equipment from which field equipment blanks will be collected will include the Geoprobe acetate liners, and laboratory bottle blanks.
2. During sampling, a decontamination blank will be collected at the frequency of one sample per every 10 borings installed. Distilled water will be placed in contact with the sampling

equipment and will be used to assess the quality of data from field sampling and decontamination procedures.

3. Duplicate soil samples will be collected at a frequency of one (1) duplicate sample for every ten (10 samples collected for a total of three (3) duplicate samples.
4. All sample bottles will be supplied by the laboratory.
5. All sample bottles will be preserved in the field in a laboratory cooler at 4 degrees Celsius.
6. All appropriate Chain of Custody methodology will be used, including documenting sample possession and handing procedures.
7. Samples will be packaged and transported in a manner that maintains the integrity of the sample and permits the analyses to be performed within the prescribed holding time. Prior to transportation, each sample container will be inspected for a label with the proper sample identification label.
8. Matrix spike/matrix spike duplicate sample analysis will be conducted at a frequency of one sample for every 20 samples.

7.7 HZW Personnel

Personnel who will perform project management and soil sampling will be familiar with this SAP. These individuals and their titles are listed below.

Project Manager – Barbara Knecht
QA/QC Officer – Doug Wetzel
HZW Field Personnel – As assigned

7.8 Soil Sampling Schedule

An approximate schedule for the soil sampling activities is outlined below. The Plan approval date is assumed.

Task	Date
Closure Plan/ Soil SAP Approval	September 9, 2022
Conduct Soil Sampling and Analyses	60 days after Plan approval
Review Data	Within 14 days of Plan approval
Confer with Ohio EPA on SAP Data	Upon receipt of results

Ohio EPA will be notified immediately upon any changes in the schedule.

7.9 Comparison of Soil Concentrations to Alternative Metal Standard

Upon analysis of the soil samples, the concentration of the COCs will be compared to the Alternative Metal Standard (AMS) concentrations outlined in the December 2021 CPRG:

Chemical of Concern	AMS (mg/Kg)
Cadmium	1.25
Trivalent Chromium	22.0
Hexavalent Chromium	Not established – use Practical Quantitation Limit (PQL): 1.2

If the concentrations of the metals exceed the AMS or PQL, additional samples will be collected unit the AMS or PQL is met.

If a two (2) to four (4) foot interval soil sample exceeds the AMS or PQL, additional soil samples will be collected at deeper intervals until two (2) consecutive analytical results in the vertical direction are below

the AMS or PQL. Soil sampling activities will be conducted in accordance with the methods outlined in this Plan. Soil sampling will not be conducted below where groundwater is encountered.

8.0 PROPOSED CLOSURE ACTIVITIES

8.1 Regional Screening Levels (RSL) as Remediation Standard

Once all vertical and horizontal extents of the COCs in soil are determined, an appliable remediation standard must be established. In order to determine an applicable standard for comparison to the analytical results from each soil sample that will be collected, the concentration calculator for Regional Screening Levels established by the US EPA (http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) was used. The variables used in the calculation are included as **Appendix D**. The RSLs for certain metals are outlined below:

Chemical of Concern	**RSL Composite Worker (mg/Kg)**
Cadmium	99.7
Trivalent Chromium	1,750,000
Hexavalent Chromium	62.5

If sampling shows detections above RSLs excavation and off-site disposal of the impacted soils will be the presumed remedy. The Property has been designated by the City of Cleveland with an Urban Setting Designation recognizing groundwater is not used for drinking water.

8.2 Determination of Remediation Activities

Based on the history of the HWMU, it is anticipated that the soil sample analytical results will demonstrate there is no exceedance of the RSLs. Therefore, it is anticipated that the soil sampling activities will demonstrate clean closure. If the RSLs are exceeded, a supplement to this Closure Plan will be prepared and submitted for approval addressing any excavation activities that will be needed.

9.0 CLOSURE SCHEDULE

The following schedule is anticipated for completion of closure activities at the Property:

Day 1	Ohio EPA Approval of Closure Plan
Day 2 – 15 (based on personnel availability)	Soil sample collection at HWMU – Professional Engineer to be present
Day 2-15	Provide Ohio EPA 5 days' notice of sampling event
Day 29	Receive results of soil sample analyses
Day 30-45	Additional soil sampling, if necessary - Professional Engineer to be present
Day 30-45	Provide Ohio EPA 5 days' notice of sampling event
Day 59	Receive results of additional soil sample analyses, if necessary.
60 days following completion of sampling and comparison to RSLs	Closure Certification submittal to Ohio EPA

10.0 CERTIFICATION

Within 60 days of completion, this closure will be certified by both the property owner and a qualified, independent registered professional engineer licensed in Ohio. The certifications will be in accordance with OAC 3745-50-42(D). At a minimum, the closure certification document will include a certification statement, a reference to the approved Closure Plan, the results of the sample analysis, all correspondence regarding closure activity after Ohio EPA Closure Plan approval, details of sampling and analysis methods, laboratory records, a narrative describing all activities during closure and the signatures of the owner and qualified, independent, professional engineer registered in the state of Ohio.

11.0 STATUS OF FACILITY AFTER CLOSURE

The closure of the HWMU will be complete after the implementation of the Closure Plan.

12.0 COSTS ASSOCIATED WITH CLOSURE

Below are the estimated costs associated with implementation of this Closure Plan.

Soil sampling activities (assuming three (3) days, labor and equipment	$9,180.00
Soil sample analysis (30 samples)	$2,550.00
Closure Certification Report and PE Certification:	$3,175.00
Total	**$14,905.00**

13.0 FINANCIAL ASSURANCE

Financial Assurance will be addressed in the final Orders.

APPENDIX A

ANALYTICAL RESULTS, SPILL MATERIAL

HAZARDOUS WASTE MANIFEST, SPILL MATERIAL

CWM Environmental Cleveland, LLC.
4450 Johnston Parkway - Unit B
Cleveland, OH 44128
TEL: (216) 663-0808
FAX: (216) 663-0656
Website: www.cwmenvironmental.com

3/22/2022

Matt Knecht
HzW Environmental Consultants, LLC
6105 Heisley Rd
Mentor, OH 44060

RE: Waterloo/E 40th sampled 3/9/22 Order No: 22C0121

Dear Matt Knecht,

CWM Environmental Cleveland, LLC. received sample(s) on 3/10/2022 for the analyses presented in the following report.

There were no problems with the analytical results associated with this report, unless otherwise noted in an attached Case Narrative. Quality Control data is within laboratory defined method(s) and specified acceptance limits, unless otherwise noted within the attached Case Narrative.

Solid Samples are reported in µg/Kg or mg/Kg as received, unless specified in the units section of the report as dry weight, indicated as: µg/Kg-dry or mg/Kg-dry.

If you have any questions regarding these test results, please feel free to call.

Certifications:
1. Varies with analyst - Lab 4041
2. NELAP - FLDOH Laboratory E871150
3. 2020-2021 DMRQA Parameter
VAP - Ohio EPA Voluntary Action Program LabID # CL107

Disclaimer: If no cert appears in the Cert column, no certification should be assumed. Subcontracted analytes ran under the associated laboratory scope of accreditation.

Sincerely,

Rachel S Tonkin

Rachel Tonkin, Customer Service Rep

CWM Environmental Cleveland, LLC.
4450 Johnston Parkway - Unit B
Cleveland, OH 44128
TEL: (216) 663-0808
FAX: (216) 663-0656
Website: www.cwmenvironmental.com

Analytical Report

WO#: 22C0121

Date Reported: 03/22/2022

Client: HzW Environmental Consultants, LLC
Project: Waterloo/E 40th sampled 3/9/22
Sample Number: 22C0121-02
Sample: Poly Tank (Lt Green)

Collection: 03/09/2022 14:58
Matrix: Aqueous

Cert	Analyte	Result	MDL	PQL	Units	DF	Qualifier	Method	Date Analyzed
TCLP Analysis					Prep: **EPA 3010A**			Analyst: **STB**	
	Arsenic	<0.0100	0.00258	0.0100	mg/L	1		EPA 6010C	03/14/2022 19:41
	Barium	0.514	0.000560	0.00200	mg/L	1		EPA 6010C	03/14/2022 19:41
	Cadmium	1.32	0.000470	0.00200	mg/L	1		EPA 6010C	03/14/2022 19:41
	Chromium	11.8	0.000420	0.00200	mg/L	1		EPA 6010C	03/14/2022 19:41
	Lead	2.25	0.000730	0.00200	mg/L	1		EPA 6010C	03/14/2022 19:41
	Selenium	<0.00500	0.00182	0.00500	mg/L	1		EPA 6010C	03/14/2022 19:41
	Silver	<0.00500	0.00165	0.00500	mg/L	1		EPA 6010C	03/14/2022 19:41
Volatile Organics					Prep: **EPA 5030B**			Analyst: **MIM**	
3	1,1,1,2-Tetrachloroethane	<2.00	0.358	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,1,1-Trichloroethane	<2.00	0.524	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,1,2,2-Tetrachloroethane	<2.00	0.379	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,1,2-Trichloroethane	<2.00	0.555	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,1-Dichloroethane	<2.00	0.619	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,1-Dichloroethene	<2.00	0.664	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,1-Dichloropropene	<2.00	0.590	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2,3-Trichlorobenzene	<2.00	0.473	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2,3-Trichloropropane	<2.00	0.334	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2,4-Trichlorobenzene	<2.00	0.576	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2,4-Trimethylbenzene	<2.00	0.378	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2-Dibromo-3-chloropropane	<2.00	0.577	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2-Dibromoethane	<2.00	0.380	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2-Dichlorobenzene	<2.00	0.475	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2-Dichloroethane	<2.00	0.486	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,2-Dichloropropane	<2.00	0.585	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,3,5-Trimethylbenzene	<2.00	0.641	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,3-Dichlorobenzene	<2.00	0.534	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,3-Dichloropropane	<2.00	0.472	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,4-Dichloro-2-butene	<4.00	0.395	4.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1,4-Dichlorobenzene	<2.00	0.457	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	1-Butanol	<5.00	2.16	5.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2,2-Dichloropropane	<2.00	0.464	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2-Butanone	<12.0	2.74	12.0	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2-Chloro-1,3-butadiene	<2.00	0.579	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2-Chlorotoluene	<2.00	0.533	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2-Hexanone	<12.0	2.32	12.0	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2-Methyl-1-Propanol	<2.00		2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	2-Nitropropane	<12.0	0.519	12.0	µg/L	1		EPA 8260B	03/21/2022 17:48
3	4-Chlorotoluene	<2.00	0.666	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	4-Isopropyltoluene	<2.00	0.520	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	4-Methyl-2-pentanone	<12.0	3.69	12.0	µg/L	1		EPA 8260B	03/21/2022 17:48

CWM Environmental Cleveland, LLC.
4450 Johnston Parkway - Unit B
Cleveland, OH 44128
TEL: (216) 663-0808
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Analytical Report

WO#: 22C0121

Date Reported: 03/22/2022

Client: HzW Environmental Consultants, LLC
Project: Waterloo/E 40th sampled 3/9/22
Sample Number: 22C0121-02
Sample: Poly Tank (Lt Green) (Continued)

Collection: 03/09/2022 14:58
Matrix: Aqueous

Cert	Analyte	Result	MDL	PQL	Units	DF	Qualifier	Method	Date Analyzed
Volatile Organics (Continued)				Prep: **EPA 5030B**				Analyst: **MIM**	
3	Acetone	112	5.46	12.0	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Acetonitrile	<2.00	0.940	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Allyl chloride	<2.00	0.593	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Benzene	<2.00	0.556	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Bromobenzene	<2.00	0.594	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Bromochloromethane	<2.00	0.485	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Bromodichloromethane	<2.00	0.694	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Bromoform	<2.00	0.584	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Bromomethane	<2.00	0.474	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Carbon disulfide	<2.00	0.573	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Carbon tetrachloride	<2.00	0.373	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Chlorobenzene	<2.00	0.376	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Chlorodibromomethane	<2.00	0.345	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Chloroethane	<2.00	0.436	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Chloroform	<2.00	0.569	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Chloromethane	<2.00	0.476	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	cis-1,2-Dichloroethene	<2.00	0.439	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	cis-1,3-Dichloropropene	<2.00	0.455	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	cis-1,4-Dichloro-2-butene	<2.00	0.244	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Cumene	<2.00	0.444	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Dibromomethane	<2.00	0.578	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Dichlorodifluoromethane	<2.00	0.917	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Diethyl ether	<2.00	0.640	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Ethyl acetate	<4.00	1.66	4.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Ethyl methacrylate	<2.00	0.433	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Ethylbenzene	<2.00	0.552	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Hexachlorobutadiene	<2.00	0.998	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
	Isopropyl acetate	<5.00		5.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	m,p-Xylene	<4.00	1.93	4.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Methacrylonitrile	<2.00	0.683	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
	Methyl Acetate	<5.00		5.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Methyl methacrylate	<2.00	0.517	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Methylene chloride	<2.00	0.434	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Naphthalene	<2.00	0.419	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
	n-Butyl acetate	<5.00		5.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	n-Butylbenzene	<2.00	0.370	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
	n-Propyl acetate	<5.00		5.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	n-Propylbenzene	<2.00	0.826	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	o-Xylene	<2.00	0.446	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Propionitrile	<4.00	1.15	4.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	sec-Butylbenzene	<2.00	0.583	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48

CWM ENVIRONMENTAL

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Analytical Report

WO#: 22C0121

Date Reported: 03/22/2022

Client: HzW Environmental Consultants, LLC
Project: Waterloo/E 40th sampled 3/9/22
Sample Number: 22C0121-02

Collection: 03/09/2022 14:58

Matrix: Aqueous

Sample: Poly Tank (Lt Green) (Continued)

Cert	Analyte	Result	MDL	PQL	Units	DF	Qualifier	Method	Date Analyzed
Volatile Organics (Continued)					Prep: **EPA 5030B**			Analyst: **MIM**	
3	Styrene	<2.00	0.386	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	tert-Butyl Methyl Ether	<2.00	0.427	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	tert-Butylbenzene	<2.00	0.519	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Tetrachloroethene	<2.00	0.521	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Toluene	<2.00	0.574	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	trans-1,2-Dichloroethene	<2.00	0.733	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	trans-1,3-Dichloropropene	<2.00	0.478	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	trans-1,4-Dichloro-2-butene	<2.00	0.693	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Trichloroethene	<2.00	0.556	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Trichlorofluoromethane	<2.00	0.427	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Trihalomethanes, Total	<2.00	0.476	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Vinyl acetate	<4.00	0.866	4.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Vinyl chloride	<2.00	0.957	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
3	Xylenes, Total	<2.00	0.487	2.00	µg/L	1		EPA 8260B	03/21/2022 17:48
	Surr: Dibromofluoromethane	119%		70-130		1			03/21/2022 17:48
	Surr: Toluene-d8	93.5%		70-130		1			03/21/2022 17:48
	Surr: 4-Bromofluorobenzene	96.3%		70-130		1			03/21/2022 17:48
General Chemistry					Prep: **EPA 7196A**			Analyst: **TIS**	
3	Chromium, Hexavalent	<0.200	0.0202	0.200	mg/L	2		EPA 7196A	03/10/2022 12:35
TCLP Metals (Mercury)					Prep: **EPA 7470A**			Analyst: **STB**	
	Mercury	0.456	0.0379	0.150	µg/L	1		EPA 7470A	03/11/2022 14:13
Semivolatile Organics - Prep EPA 3510C					Prep: **Sep Funnel**			Analyst: **JCL**	
CWM Environmental Kittanning									
	1,2,4-Trichlorobenzene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	1,2-Dichlorobenzene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	1,2-Diphenylhydrazine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	1,3-Dichlorobenzene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	1,4-Dichlorobenzene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,4,5-Trichlorophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,4,6-Trichlorophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,4-Dichlorophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,4-Dimethylphenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,4-Dinitrophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,4-Dinitrotoluene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2,6-Dinitrotoluene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2-Chloronaphthalene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2-Chlorophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2-Methyl-4,6-dinitrophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2-Methylnaphthalene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43

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Analytical Report

WO#: 22C0121

Date Reported: 03/22/2022

Client: HzW Environmental Consultants, LLC
Project: Waterloo/E 40th sampled 3/9/22
Sample Number: 22C0121-02
Sample: Poly Tank (Lt Green) (Continued)

Collection: 03/09/2022 14:58
Matrix: Aqueous

Cert	Analyte	Result	MDL	PQL	Units	DF	Qualifier	Method	Date Analyzed
Semivolatile Organics - Prep EPA 3510C (Continued)					Prep: **Sep Funnel**			Analyst: **JCL**	
	2-Methylphenol (o-Cresol)	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2-Nitroaniline	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	2-Nitrophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	3,3-Dichlorobenzidine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	3+4-Methylphenol	0.00279	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	3-Nitroaniline	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	4- Nitroaniline	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	4-Bromophenyl-phenylether	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	4-Chloro-3-methylphenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	4-Chlorophenyl-phenylether	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	4-Nitrophenol	0.00287	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Acenaphthene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Acenaphthylene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	alpha-terpineol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Aniline	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Anthracene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzidine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzo(a)anthracene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzo(a)pyrene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzo(b)fluoranthene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzo(g,h,i)perylene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzo(k)fluoranthene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzoic Acid	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Benzyl Alcohol	0.00668	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	bis(2-Chloroethoxy)methane	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	bis(2-Chloroethyl) ether	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	bis(2-Chloroisopropyl)ether	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	bis(2-Ethylhexyl) phthalate	0.00185	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Butyl benzyl phthalate	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Chrysene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Dibenzo(a,h)anthracene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Dibenzofuran	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Diethylphthalate	0.00425	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Dimethylphthalate	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Di-n-Butylphthalate	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Di-n-Octylphthalate	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Fluoranthene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Fluorene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Hexachlorobenzene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Hexachlorobutadiene	<0.000500	0.000500	0.000500	mg/L	1		EPA 8270C	03/17/2022 21:43
	Hexachlorocyclopentadiene	<0.00100	0.00100	0.00100	mg/L	1	I2, R2	EPA 8270C	03/17/2022 21:43

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Analytical Report

WO#: 22C0121

Date Reported: 03/22/2022

Client: HzW Environmental Consultants, LLC
Project: Waterloo/E 40th sampled 3/9/22
Sample Number: 22C0121-02
Sample: Poly Tank (Lt Green) (Continued)

Collection: 03/09/2022 14:58
Matrix: Aqueous

Cert	Analyte	Result	MDL	PQL	Units	DF	Qualifier	Method	Date Analyzed
Semivolatile Organics - Prep EPA 3510C (Continued)					Prep: **Sep Funnel**			Analyst: **JCL**	
	Hexachloroethane	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Indeno(1,2,3-cd)pyrene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Isophorone	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Naphthalene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Nitrobenzene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	n-Nitrosodimethylamine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	n-Nitroso-di-n-propylamine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	n-Nitrosodiphenylamine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Pentachlorophenol	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Phenanthrene	0.00145	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Phenol	0.00362	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Pyrene	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
	Pyridine	<0.00100	0.00100	0.00100	mg/L	1		EPA 8270C	03/17/2022 21:43
General Chemistry					Prep: **SM 4500-CN- C**			Analyst: **TIS**	
3	Cyanide, Total	0.752	0.00509	0.0200	mg/L	1		SM 4500-CN- E	03/14/2022 10:30

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Analytical Report

WO#: 22C0121

Date Reported: 03/22/2022

Qualifications and analytical notes

I2 A Laboratory Control Sample (LCS) was outside the established control limits failing low.

R2 Continuing Calibration Verification (CCV) was outside established control limits failing low

DEFINITIONS:

DF: Dilution factor; the dilution factor applied to the prepared sample.

DUP: Duplicate; aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently, used to calculate Precision (%RPD).

LCS: Laboratory Control Sample; prepared by adding a known amount of target analytes to a specified amount of clean matrix and prepared with the batch of samples, used to calculate Accuracy (%REC).

LCSD: A duplicate LCS sample, used to calculate both Accuracy (%REC) and Precision (%RPD).

MB: Method Blank; a sample of similar matrix that does not contain target analytes or interference that may impact the analytical results and is processed simultaneously with, and under the same conditions, as samples through all steps of the analytical procedure, used to assess and verify that the analytical process is free of contamination.

MDL: Method Detection Limit; The lowest concentration of an analyte that can be detected by the method in the applicable matrix.

MS: Matrix Spike; prepared by adding a known amount of target analytes to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available, used to calculate Accuracy (%REC).

MSD: A duplicate MS sample, used to calculate both Accuracy (%REC) and Precision (%RPD).

%REC: Percent Recovery of a known spike (SPK); a measure of accuracy expressed as a percentage of a measured (recovered) concentration compared to the known concentration (SPK) added to the sample. This is compared to the Low acceptable and High Limits.

%RPD: Relative Percent Difference; a measure of precision expressed as a percentage of the difference between two duplicates relative to the average concentration. This is compared to the RPD Limit.

PL: Permit limit:; Not included on all reports. Used primarily for NPDES wastewater and POTW discharge permits.

PQL: Practical Quantitation Limit; The lowest verified limit to which data is quantified without qualifications. Analyte concentrations below PQL are reported either as ND or as a number with a "J"qualifier.Also known as the Reporting Limit (RL).

Qual: Qualifier that applies to the analyte reported.

SPK: Spike; used in the QC section for both SPK Value and SPK Ref Val.

ND: Not detected at the Reporting Limit.

CWM ENVIRONMENTAL

4450 Johnston Parkway, Unit B · Cleveland, OH 44128
(216) 663 0808 · FAX (216) 663 0656

22C0121

☑ Check if s

COMPANY NAME: HzW Environmental	CONTACT: Barb Knecht	INVOICE TO	
ADDRESS: 6105 Heisley Rd.		ADDRESS	
CITY: Mentor	STATE: Oh ZIP: 44060	CITY / STATE / ZIP	
PHONE No. 440 357-1260	FAX No. 440 357-1510	Phone No.	FAX No.
EMAIL: bknecht@hzwenv.com	PROJECT ID: Waterloo / E 40th	PO No.	QUOTE No.

TAT ☐10 Day (STD) *RUSH: ☐1 Day ☐2 Day ☐5 Day Auth. Signature _____

*RUSH REQUESTS MAY INCUR SURCHARGES

ANALYSIS REQUESTED

Special Instructions & QC Requirements

TEMP °C 3.2

VIS. ICE YES / NO

Sample Disposal ☐ Return to Client ☐ Disposal by Lab ☐ Archive for ____ Mos.

No.	SAMPLE IDENTIFICATION	DATE	TIME	CMP	GRAB	No. CONT	MATRIX	Total VOCs	Total SVOCs	TCLP metals	CN	Hexavalent Chromium										PH @	
1	Fiberglass tank (DK Green)		2:37		X	9		X	X	X	X	X										6.57	
2	Poly tank (Lt Green)		2:58		X	9		X	X	X	X	X										7.21	
3	Drum (DK Green)		3:45		X	2				X		X										Ø	
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							

SAMPLERS	RELINQUISHED BY	DATE 3-10-22	TIME 0835	RECEIVED BY	RELINQUISHED BY	DATE 3/10/22	TIME 0945
RECEIVED BY	RELINQUISHED BY	DATE	TIME	RECEIVED IN LABORATORY BY		DATE 3/10/22	TIME 0945

CWM ENVIRONMENTAL

Sample Receipt Checklist

Form 244
Rev#: 1
5/21/10

Work Order No. 22C0121

RUSH: ☐ Yes ☑ No ☐ NA

Date & Time Received: 3/10/22 0945 Checklist By: RG

Date & Time Logged In: 3/10/22 1207 Logged In By: RG

Date & Time Reviewed: 3.10.22 1325 Reviewed By: SB

Carrier Name: ☒ CWM ☐ UPS ☐ FedEx ☐ Client ☐ Other/Tracking #

Samples Analyzed In House? ☒ Yes ☐ No Subbed To

Is Chain Of Custody Present?	☑ Yes	☐ No		
Is Chain Of Custody Properly Filled Out?	☒ Yes	☐ No		
Does Chain Of Custody Match Sample Labels?	☒ Yes	☐ No		
Are Samples Past Hold Time?	☐ Yes	☑ No	☐ NA	
Are Samples In Proper Containers?	☒ Yes	☐ No	Intact? ☒ Yes	☐ No

No. Of Containers? 20 ☒ Glass ☒ Plastic ☐ Baggie ☐ VOA ☐ Micro ☐ Tedlar ☐ Other

When Applicable, Is Headspace Present? ☐ Yes ☒ No MSDS Provided ☐ Yes ☒ No

Matrix: ☒ Aqueous ☐ Liquid ☐ Sludge ☐ Solid ☐ Oil ☐ Drinking Water ☐ Soil ☐ Gas ☐ Other

On Ice? 3.2 °C	☒ Yes	☐ No	☐ NA
Are Samples Preserved?	☒ Yes	☐ No	☐ NA
Chlorine detected? (for EPA 608/625 only):	☐ Yes	☐ No	

Final pH Results:

Metals____ Hardness____ ☐ HN03 CN____ ☐ NaOH

COD____ NH3____ Phenol____ TOC____ TKN/TON____ Phos____ No2No3____ Total Nitrogen____ ☐ H2S04

Sulfide____ ☐ NaOH & ZnAcetate Other

Field Data: ☐ pH ☐ Temp ☐ Flow ☐ TRC ☐ TRC Low ☐ Color ☐ Odor ☐ Turbidity ☐ Other

Explanation of Comments & Problems:

IR #1 ☒

IR #2 ☐

Legionella Containers lot #

Based on client knowledge and in coordination with Listed Waste (Lists: F, K, P and U per CFR 40) sample determination:

☐ to be

☒ not to be from Listed Source

Please print or type.

FOR LEAK, FIRE OR MEDICAL EMERGENCY, CALL INFOTRAC AT 1-800-535-5053 AND REFERENCE CONTRACT #104831

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
OHR000219818	1	(800) 535-5053	024218053 JJK

GENERATOR

5. Generator's Name and Mailing Address
HAWKINS HODGSON LTD II
3858 SUPERIOR AVE, CLEVELAND, OH 44103
Generator's Phone: (216) 268-5936 ATTN: GERRY FANTA

Generator's Site Address (if different than mailing address)
HAWKINS HODGSON LTD II
17920 S WATERLOO RD, CLEVELAND, OH 44119

6. Transporter 1 Company Name
ENVIROSERVE INC
(216) 642-1311
U.S. EPA ID Number
OH0000333336

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
CHEMICAL SOLVENTS
1010 OLD DENISON AVE, CLEVELAND, OH 44109
Facility's Phone: (216) 741-8310
U.S. EPA ID Number
OHD980897656

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes		
X	1. RQ, NA3082, HAZARDOUS WASTE, LIQUID, N.O.S., 9, PGIII (CADMIUM, CHROMIUM), ERG 171 APPR # 30111	001	TP	500	P	D006	D007	
	2.							
	3.							
	4.							

14. Special Handling Instructions and Additional Information
ENVSRV PO#
0093231

15. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Gerry Fanta — Signature — Month: 05 Day: 19 Year: 22

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: GARY GREENAWALT — Signature — Month: 05 Day: 19 Year: 22

Transporter 2 Printed/Typed Name — Signature — Month — Day — Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month — Day — Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name — Signature — Month: 5 Day: 24 Year: 22

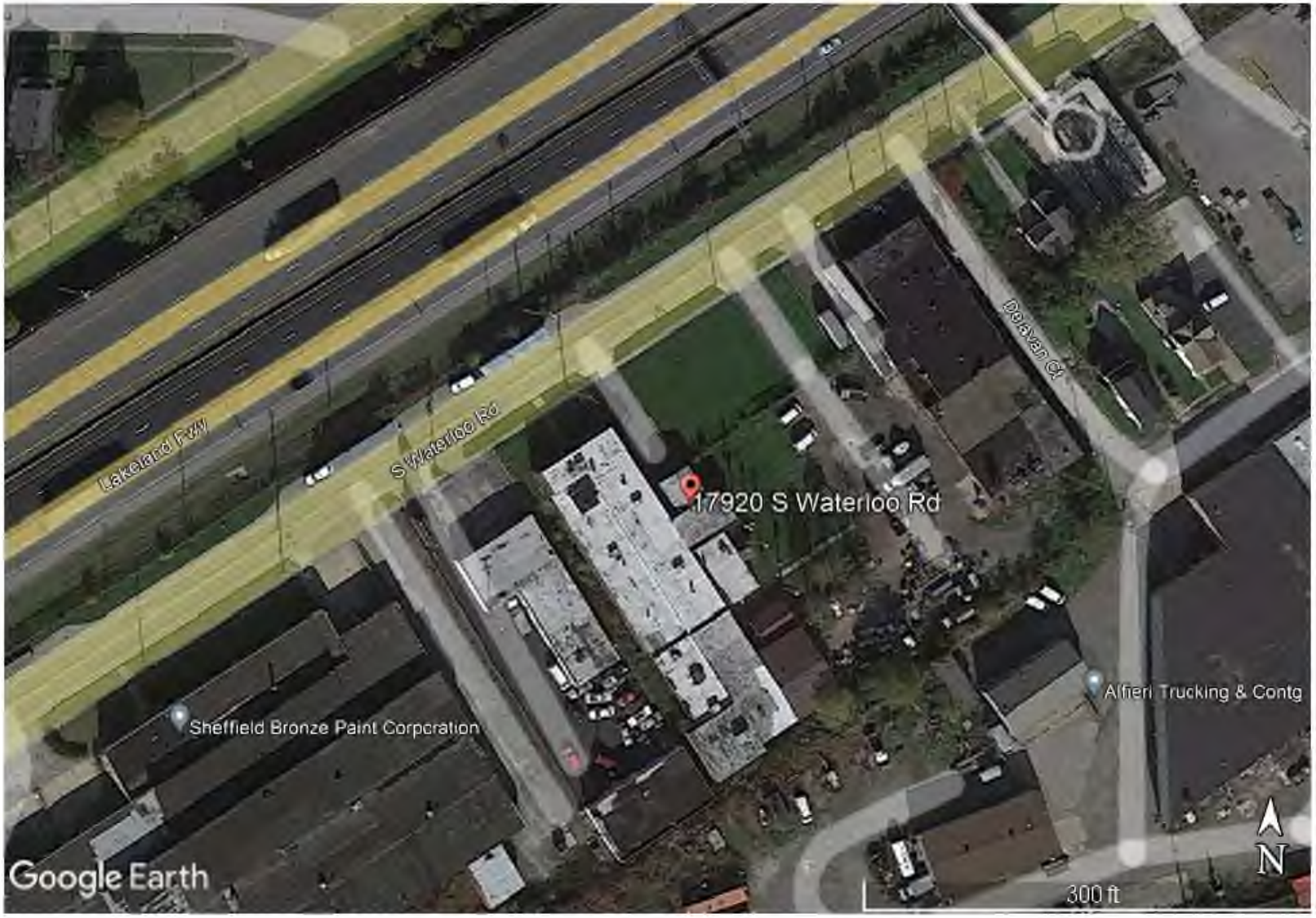
EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete.

TRANSPORTER COPY

APPENDIX B

FIGURES

Site Location Map
17920 Waterloo Road, Cleveland OH



Aerial photograph
17920 Waterloo Road, Cleveland OH

HZW Environmental Consultants

I:\2021\H21276-02\CADDWGS\H21276-02_Waterloo Base Map.dwg

HZW Environmental Consultants

FIGURE 1

SPILL AREA HWMU
17920 SOUTH WATERLOO ROAD
CLEVELAND, CUYAHOGA COUNTY, OHIO

I:\2021\H21276-02\CADDWGS\H21276-02_Waterloo Base Map.dwg

HZW Environmental Consultants

FIGURE 2

SAMPLING LOCATIONS
17920 SOUTH WATERLOO ROAD
CLEVELAND, CUYAHOGA COUNTY, OHIO

APPENDIX C

HEALTH AND SAFETY PLAN

SITE SPECIFIC HEALTH AND SAFETY PLAN

18006 Waterloo Road

Cleveland, OH

August 2022

Prepared by:

HZW Environmental Consultants

6105 Heisley Road ♦ Mentor, Ohio 44060
440-357-1260 ♦ Fax 440-357-1510

H21276-02

EMPLOYEE ACKNOWLEDGEMENT FORM

I have read this site-specific health and safety plan, understand the material presented, have been given an opportunity to ask questions and will abide by the provisions stated in this site-specific plan under which this project is to be implemented.

Site Manager:
(Optional) _____

HZW Project Manager: _____

Contractor's Site Supervisor:
(Optional) _____

Field Technician: _____

Field Technician: _____

Field Technician: _____

Field Technician: _____

Professional Engineer:
_____

TABLE OF CONTENTS

APPENDICES

HEALTH AND SAFETY PLAN

1.0 OBJECTIVE

The objective of this Health and Safety Plan (HASP) is to identify, evaluate, and control safety and health hazards, and provide for emergency response to hazardous materials which may be encountered in the course of these field activities. This HASP has been prepared as a proactive and precautionary measure to deal with unanticipated health and safety concerns encountered during field activities. This HASP is applicable to HZW personnel and the Professional Engineer subcontracted by HZW and will remain at the project site for the duration of the project.

2.0 RESPONSIBILITIES

All HZW personnel are responsible for continuous adherence to the health and safety procedures, covered in this HASP, during the performance of their work. No person may work in any manner that conflicts with the intent or the inherent safety and environmental precautions expressed in these procedures.

2.1 Project Manager

The Project Manager or his/her designee is ultimately responsible for ensuring that all project activities are completed in compliance with requirements set forth in this plan.

The Project Manager or his/her designee in conjunction with HZW's Health and Safety Department will be responsible for developing, modifying, amending, and/or deleting the site-specific provisions of this HASP. The HASP will be revised if warranted by changing site conditions.

The Project Manager or his/her designee and/or HZW's Health and Safety Department are the contacts for regulatory agencies on matters of health and safety.

The Project Manager or his/her designee responsibilities include:

- General health and safety program administration in the field;
- Updating equipment or procedures based on information obtained during field operations;
- Establishing sampling and analysis parameters based on expected contaminants;

- Stopping work as required to ensure the health and safety of personnel;
- Developing site-specific and project specific employee response plans as required, based on expected hazards; and
- Distributing copies of the HASP to the appropriate persons, and ensuring that all distributed copies are promptly updated to include modifications, amendments, and/or deletions.

2.2 HZW's Health and Safety Department

HZW's Health and Safety Department in conjunction with the Project Manager will assist in developing, modifying, amending, and/or deleting the site-specific provisions of this HASP. The HASP will be revised if warranted by changing site conditions.

HZW's Health and Safety Department and/or the Project Manager or his/her designee is the contact for regulatory agencies on matters of health and safety.

HZW's Health and Safety Department responsibilities include:

- Determining initial and subsequent personnel protection requirements;
- Reviewing significant accidents and illnesses related to possible environmental causes, and implementing corrective actions; and
- Developing site-specific and project specific employee response plans as required based on expected hazards.

2.3 Field Technicians

All field technicians working at the project site are required to comply with the provision of this HASP and all applicable federal, state, and local regulations. All field technicians will read and sign off on the Employee Acknowledgement Form included at the beginning of this HASP prior to arriving at the project site. A Field Technician's responsibilities include:

- Ensuring his/her own health and safety by completing tasks in a safe manner, and reporting any unsafe acts or conditions to their Project Manager or their designee;
- Monitoring themselves and their fellow employees for signs and symptoms of heat or cold stress and chemical exposure;
- Maintaining the operation and calibration of monitoring equipment; and
- Assuring that adequate first aid is present on site.

Key HASP personnel for this project are listed in Appendix A.

3.0 SITE DESCRIPTION AND SCOPE OF WORK

The Property is located at 18006 Waterloo Road, Cleveland, Ohio, formerly occupied by Century Plating, Inc. The "Tote" Hazardous Waste Management Unit (HWMU) being assessed is a 4-feet by 4-feet area outside of the building were a plastic tote containing a hazardous waste liquid was stored. Soil sampling, and, if necessary, soil excavation will be conducted in this area.

4.0 SITE CHARACTERIZATION AND CHEMICAL HAZARD ASSESSMENT

Based on the analytical results of the material in the tote, the chemicals of concern for this HWMU include cadmium, total chromium, hexavalent chromium and trivalent chromium. As a result, the potential exists for field personnel, while performing activities at the Property, to be exposed to these hazardous substances. A list of the most likely chemicals to be encountered and worst-case scenario chemicals is presented in Appendix B.

5.0 GENERAL WORK PRACTICES

- No food, beverages or tobacco products will be present, consumed, or used in areas where project activities are being conducted.
- Before eating, drinking or smoking, employees must wash their hands and remove any outer protective garments.
- First aid kits must be readily accessible at the project site.
- Fire extinguishers must be readily accessible at the project site. Where there is fire potential, fire extinguishers will be located in the adjacent area.
- Should there be any contaminated protective equipment, such as respirators, hoses, boots, etc., said equipment shall not be removed from the project site until such equipment has been cleaned, or properly packaged and labeled.
- Legible and understandable precautionary labels which comply with hazard communication requirements must be affixed prominently to containers of contaminated waste, debris and/or clothing.
- Where work is being performed at or near roadways, safety vests must be worn.
- Removal of any contaminated soil from protective clothing or equipment by blowing, shaking, or any other means that disperse contaminants into the air is prohibited.
- All areas that have been determined as contaminated at the project site must be clearly marked as such. No personnel, equipment, etc., must be removed from the site until they have been properly decontaminated, according to applicable state and federal regulations.

6.0 PERSONAL PROTECTIVE EQUIPMENT

This section is provided as a proactive measure should unanticipated hazardous materials or wastes be encountered during the project. The items in this section are presented to give a broad spectrum of alternative personal protective equipment (PPE) options to address a worst case scenario. It is not likely that the more comprehensive of these options will need to be implemented.

This section outlines maintenance and storage of PPE, decontamination, donning and doffing procedures, inspection and monitoring effectiveness and limitation.

6.1 Respiratory Protection

- Only employees who have been trained to wear and maintain respirators properly shall be allowed to enter areas requiring respiratory protection.
- Only properly cleaned, maintained, National Institute of Occupational Safety and Health (NIOSH) approved respirators shall be used on site.
- Selection of respirators, as well as any decision regarding upgrading or downgrading of respiratory protection, will be made by HZW's Health and Safety Department.
- Used air-purifying cartridges shall be replaced at the end of each shift or when breakthrough is suspected.
- Positive and negative pressure tests shall be performed each time the respiratory is donned.
- Only employees who have been both fit tested and have had a medical surveillance examination within the last 12 months will be allowed to work in atmospheres where respirators are required. Contractors hired by HZW shall provide certificates of respirator fit testing completed within the last 12 months for each employee on site.
- Respirator users shall be instructed in the proper use and limitation of respirators.
- If an employee has difficulty in breathing during the fit test or during use, he/she shall be evaluated medically to determine if he/she can wear a respirator safely while performing assigned tasks.
- No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent medical surveillance examination, a physician determines that the health or safety of the employee will be impaired by respirator use.
- Contact lenses shall not be worn while using any type of respiratory protection.
- Respirators shall be cleaned and sanitized daily after use.

- Respirators shall be inspected during cleaning. Worn or deteriorated parts shall be replaced.
- Facial hair that might interfere with a good face-piece seal or proper operation of the respirator is prohibited.
- The Project Manager in conjunction with HZW's Health and Safety Department will review the respiratory protection program daily to ensure employees are properly wearing and maintaining their respirators and that the selected respiratory protection is adequately protecting the employees.

6.2 Levels of Protection

The following sections outline four (4) basic levels of PPE based on guidelines issued by NIOSH, the Occupational Safety and Health Administration (OSHA) and the United States Environmental Protection Agency (U.S. EPA). Selection of PPE is typically based upon the location and nature of the project, past use at the project site, the likelihood of encountering hazardous materials or waste, and any additional information gathered from previous sampling and analysis performed or sampling and analysis performed as part of this HASP's Scope of Work. The PPE selected for this project site is outlined in Appendix C.

Specific levels of protection will be changed whenever additional information is obtained and/or site conditions and activities so dictate. Levels of protection can either be increased to the next higher level, or decreased to the next lower level. The decision to change levels of protection will be made by the Project Manager in conjunction with HZW's Health and Safety Department. If the need arises to protect health and safety, the Project Manager can upgrade protection levels without input from HZW's Health and Safety Department. However, the Project Manager must then discuss the decision with the Health and Safety Department as soon as feasible. Levels of protection will not be downgraded without prior approval from HZW's Health and Safety Department.

6.2.1 Level A Protection

Level A protection would be used when the greatest level of skin, respiratory and eye protection is required. This level of protection is typically required for firefighting activities, oxygen deficient environments or immediately dangerous to life and health (IDLH) atmospheres. Level A Protection is not anticipated at this time for HZW personnel at the project site. The following equipment will be used for Level A protection:

- Full-face pressure demand SCBA (self-contained breathing apparatus) or a pressure demand (positive pressure) air line respirator with an escape bottle for IDLH atmospheres. (Assigned Protection Factor approximately 10,000 and 2000, respectively)
- Fully encapsulated chemical protective suit.
- Gloves: inner and outer chemically resistant.
- Chemical resistant, safety-toe boots.
- Booties/disposable boot covers.
- Hard hat (under suit).

6.2.2 Level B Protection

Level B respiratory protection is the same as Level A respiratory protection. However, the protective clothing is different. Level B Protection is not anticipated at this time for HZW personnel at the project site. The following equipment will be used for Level B protection:

- Full-face, positive pressure SCBA or a pressure demand (positive pressure) airline respirator with an escape bottle for IDLH atmospheres.
- Coated Tyvek (or other chemical resistant) coveralls with hood.
- Inner and outer chemical resistant gloves.
- Chemical resistant safety toe boots.
- Booties/disposable boot covers.
- Hard Hat.

6.2.3 Level C Protection

Level C Protection is mandatory for any personnel entering an area where the airborne contaminants exceed or may exceed OSHA PELs. Level C Protection is not anticipated at this time for HZW personnel at the project site. A full-face air-purifying respirator may only be utilized if:

- The chemical compounds have adequate warning properties;
- The personnel have passed qualitative fits tests for the particular mask as previous required in the HASP;
- The appropriate filter cartridges are used and their service limitation are not exceeded; and
- The project's operations will not encounter unknown compounds or excessive concentrations of known compounds.

Half-face respirators will be used only when approved by the Project Manager in conjunction with HZW's Health and Safety Department.

The following equipment will be used for Level C protection:

- Full-faced, air purifying canister-equipped respirator;
- Coated Tyvek® (or other chemical resistant) coverall with hood;
- Chemical resistant, safety-toe boots;
- Booties/disposable boot covers;
- Inner and outer chemical resistant gloves;
- Hard had (with goggles if half-face respirator is used);
- Respirator cartridges will be changed daily, and also upon the detection of any chemical odor by the worker.

6.2.4 Level D Protection

Level D protection is the minimum level of protection required at the site. Level D protection is anticipated at this time for HZW personnel the project site. The following equipment will be used for Level D protection:

- Half-face air-purifying respirators, as necessary;
- Protective coveralls, as necessary;
- Safety glasses;
- Safety-toe boots or shoes;
- Gloves of an appropriate material;
- Hard hat, as necessary; and
- Hearing protection, as necessary.

6.3 Using Personal Protective Equipment

All personnel at the project site will comply with the required PPE, according to established procedures in this HASP to minimize exposure potential. When leaving the project site, personal protective equipment will be removed according to these established procedures to minimize the potential for the spread of contamination.

6.3.1 Donning Procedure – Level D

- Put on protective coveralls, if needed;
- Put on boots;
- Put on gloves;
- If hearing protection is required, put in earplugs;
- Put on hardhat, if necessary; and

- Put on safety glasses or goggles.

6.3.2 Doffing Procedure – Level D

- Remove excess soil and/or other material from outer clothing and boots while at work area;
- Before leaving the project site, remove coveralls, boots, gloves, safety goggles and hard hat;
- If disposable coveralls are used, place them in the appropriate refuse container; and
- If coveralls require laundering, place in appropriate laundry receptacle.

6.3.3 Donning Procedures – Levels C and B

- Remove street clothes and store in a clean location;
- Put on protective coveralls;
- Put on boots and boot covers and tape the coveralls;
- Don respirator and check for secure fit;
- Put on gloves;
- Tape the cuff of the gloves over the coveralls at the wrist;
- If hearing protection is required, put in earplugs;
- Put hood or head covering over the respirator;
- Put on hard hat, if necessary, over the hood and respirator (Tape to secure from falling off); and
- Put on any remaining protective equipment such as safety glasses or goggles.

6.3.4 Doffing Procedures – Levels C and B

At the discretion of HZW's Health and Safety Department and depending on the activities, one person may remain outside the project site to assist in decontamination of personnel leaving the site. Whenever a person requires decontamination, the following sequence of stations will be used:

Station 1. Exiting personnel will remove excess soil and/or other materials from their outer clothing and boots.

Station 2. Required equipment at Station 2 shall include the following:

- Plastic lined receptacle
- Chair

- Clean, damp cloths
- Paper towels
- Plastic bags

At Station 2, personnel will wipe their respirators (if used), hard hats, and boots with clean, damp cloths and then remove those items. If the inner gloves are contaminated or appear to be dirty, they must be removed and replaced prior to wiping off equipment. All items removed are then hand-carried to the next station.

Station 3. Required equipment at Station 3 shall include the following:

- Wash basin with soap and water
- Respirator sanitation station

At this Station, personnel will thoroughly wash their hands and face. Respirators will be sanitized and then placed in a clean, plastic re-sealable bag. Lined waste receptacles containing disposable equipment, garments and PPE will be removed and disposed in accordance with RCRA regulations.

6.4 Personal Protective Equipment Selection

The level of PPE can be based on measurements of the work environment when such measurements can be made in real-time. When the assessment of the work environment depends on laboratory analysis of samples collected or past land use, then the selection of PPE will be made on the professional judgment of possible or expected exposures.

7.0 SITE MONITORING

If determined necessary by field personnel, HZW's Project Manager or HZW's Health and Safety Department, monitoring of atmospheric and/or breathing zone atmospheric conditions will be performed during on-site activities using real-time instrumentation, a photoionization detector (PID) and a lower explosive limit (LEL) meter, to determine total organic contaminant concentrations and/or the percentage of explosive gas vapors. Site monitoring of atmospheric conditions will be conducted by HZW while performing work at the site during on-site activities if conditions warrant. As necessary, monitoring of the breathing zone will be

conducted prior to initiation of on-site activities and continue during activities. Site monitoring will be performed at the point of highest expected concentration with the sample media located at the ground surface and within the breathing zone at 4 to 6 feet above the ground surface.

The work area air monitoring program addressed in this section has been developed to aid in the selection of PPE and to document exposures to on-site personnel. Prior to commencement of project activities, PID scans will be utilized as a preliminary indication of site conditions. PID and LEL readings will also be taken in the breathing zone and over excavated soil as sampling activities proceed. PID and LEL reading times will be recorded on an air monitoring log. Monitoring may be decreased if the results prove to be negative or uniform below ½ of PEL for the chemicals of concern. Based on known site conditions, the monitoring program will take into account the following factors:

- Determining when peak concentrations may be encountered; and
- Determining when and where unusual contaminants may be present.

8.0 PERSONAL EXPOSURE AIR MONITORING

The personal exposure air monitoring program addressed in this section has been developed to aid in the selection of PPE and to document exposures to on-site personnel. Personal exposure air monitoring is not anticipated at this time. However, information pertaining to personal exposure air monitoring is presented below should personal exposure air monitoring be deemed necessary at the project site by the Project Manager and/or HZW's Health and Safety Department.

The frequency and duration of personnel monitoring will be at the discretion of HZW's Health and Safety Department. In situations where personnel exposure is being evaluated, the personnel sample will be collected in the breathing zone of the employee.

When applicable, site personnel will be notified of air sampling results as soon as they are available. Where samples require laboratory analysis, the results will be made known to site personnel the day following receipt of results.

The personal exposure air monitoring program may include real-time instrumentation (direct reading instruments) and/or integrated air sampling (personal sampling pump methods). Appropriate NIOSH or OSHA sampling and analytical procedures will be utilized for time-weighted average monitoring. All air monitoring equipment will be maintained and operated in accordance with manufacturers' recommendations. Real time instrument maintenance and

calibration data will be recorded in the air-monitoring log. When applicable, calibration of sampling pumps will also be documented in the daily field notes.

8.1 Real-Time Sampling Methods

Real-time air monitoring will not be conducted at the project site.

8.2 Integrated Air Monitoring

Integrated air monitoring will not be conducted at the project site.

8.3 Noise Monitoring

Noise monitoring will not be conducted at the project site.

8.4 Equipment Tampering

On-site personnel must wear monitoring equipment and the required personal protective equipment. Refusal to wear appropriate equipment and/or intentional tampering with sampling apparatus will lead to disciplinary action and immediate dismissal from the project site.

8.5 Monitoring Record

The Project Manager will be responsible for establishing and maintaining records of all required monitoring as described below:

- Employee name and social security number;
- Date, time, pertinent task information and exposure information;
- Type of PPE worn; and
- Engineering controls used to reduce exposure.

8.6 Notification

Employees will be notified of exposure in excess of the permissible exposure limit and will be provided with follow-up medical monitoring when required.

9.0 MEDICAL SURVEILLANCE EXAMINATION

All HZW field personnel will have successfully completed an initial and annual physical examination. The examination is designed to meet the requirements of 29

CFR 1920.120 for possible exposure to hazardous materials or waste. The medical surveillance examination consists of the following:

- Medical and occupational medical history and physical examination;
- Visual test
- Urinalysis
- Audiogram
- Spirometry
- EKG (Age 40 and over)
- dt Tetanus
- Chest X-ray
- CBC with differential
- 13 Blood Chemistry Tests
- Blood Lead and Zinc Protoporphrin
- Cholinesterase
- PCBs
- Mercury
- Cadmium

The following information is provided to the examining physician:

- Description of employee's duties;
- Anticipated chemical exposures and levels;
- Description of PPE to be used; and
- Information from previous medical examinations.

Exit medical surveillance examinations are provided to HZW field personnel upon termination of employment.

A copy of the medical examination report is provided at the employee's request. The employee will be informed of any medical conditions that would result in work restriction.

10.0 FIRST AID AND MEDICAL TREATMENT

All field personnel must report any near-miss incident, accident, injury, or illness to HZW's Health and Safety Department as well as their Project Manager. First aid will be rendered expeditiously by a person qualified to do so. The employee's Project Manager will complete an accident/injury report and conduct an investigation of the incident as soon as emergency conditions (if any) no longer exist and medical or first-aid treatment has been rendered. The investigation should follow completion of the accident/injury report. HZW's Health and Safety Department

shall promptly receive for review a copy of the accident/injury report, and the results of the incident investigation.

11.0 MEDICAL RESTRICTION

When the examining physician determines a need to restrict a field employee from their job activities, that determination will be communicated to the employee's Project Manager as well as the Health and Safety Department. The Project Manager will ensure that the employee complies with the work restriction(s).

12.0 MEDICAL RECORDS

Medical and exposure monitoring records will be maintained according to the requirements of 29 CFR 1910.120, and retained for a minimum of 30 years. Confidentiality of these records shall be maintained through retention.

13.0 EMERGENCY PROCEDURES

Should the need for outside medical attention arise, the Cleveland Clinic Euclid Hospital will be used. In addition, a map, as well as directions from the site to Euclid Hospital is included as Appendix D. The City of Cleveland Police Department will be called to handle any security incidents at the project site.

The Project Manager will establish evacuation routes and assembly areas for the project site. All personnel entering the site will be informed of these routes and assembly areas.

Unusual events, activities, odors, and conditions will be reported to the Project Manager and subsequently HZW's Health and Safety Department. Emergency telephone numbers will be available in each motor vehicle at the project site, along with a map and directions to the nearest hospital. A list of emergency telephone numbers is included as Appendix E.

All incidents will be dealt with in a manner which minimizes health risks to project site workers, the environment and the local community. In the case of a medical emergency, paramedics will be summoned without delay.

14.0 TRAINING

All field personnel shall have taken a 40-hour HAZWOPER training course with annual refreshers as well as first aid and CPR training. In addition, training shall cover Hazard Communication and Respiratory Protection.

All training shall be documented by a certificate signed by the instructor. A copy of each and every training certificate shall be maintained by HZW's Health and Safety Department. Subcontractors must provide to HZW's Health and Safety Department copies of certificates of training for all subcontractors personnel at the project site.

15.0 SAFETY MEETINGS

The Project Manager shall conduct a safety meeting at the beginning of each shift, or whenever new employees arrive at the project site once the project commences. Topics to be discussed at these meetings include health and safety considerations for the day's activities, necessary protective equipment (as applicable), problems encountered, and new operations. Attendance records and meeting notes shall be maintained by the Project Manager.

16.0 SAFETY DATA SHEETS

This HASP includes Safety Data Sheets (SDSs) for the chemicals listed in Appendix C. The SDSs shall be maintained on site as part of this HASP, and shall be accessible to all employees. A copy of each chemical's SDS is also included in Appendix C.

APPENDIX A

KEY HASP PERSONNEL

The following is a list of potential personnel having responsibilities under this HASP:

Barbara Knecht:	Project Manager
Joan Sablar:	Health and Safety Representative
Steve Sablar:	Senior Field Technician
Bradley Loney:	Field Technician
Nick Hillborn:	Field Technician

APPENDIX B

LIST OF POTENTIAL CHEMICAL CONTAMINANTS AT THE PROJECT AREA

POTENTIAL CHEMICAL CONTAMINANTS
AT THE PROJECT SITE

Areas of the Property will be evaluated for cadmium, total chromium, hexavalent chromium and trivalent chromium.

A copy of each of these chemicals SDS is included for review.

ThermoFisher SCIENTIFIC

SAFETY DATA SHEET

Revision Date 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Cadmium**

Cat No. : **C3-500**

CAS No 7440-43-9
Synonyms No information available

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 solids	Category 2
Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	
Combustible dust	Yes

Label Elements

Signal Word

Danger

Hazard Statements
Flammable solid
May form combustible dust concentrations in air
Fatal if inhaled
Harmful if swallowed
Harmful in contact with skin
May cause respiratory irritation
Suspected of causing genetic defects
May cause cancer
Suspected of damaging fertility. Suspected of damaging the unborn child
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
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
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
Immediately call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Wash contaminated clothing before reuse
Call a POISON CENTER or doctor/physician if you feel unwell
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
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
WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Cadmium	7440-43-9	100

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 None reasonably foreseeable. . Kidney disorders: May cause harm to the unborn child: Blood disorders

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 No information available

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
Thermal decomposition can lead to release of irritating gases and vapors. Fine dust dispersed in air may ignite. Dust can form an explosive mixture with air. Pyrophoric properties of solids and liquids. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products
Toxic fumes.
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	Flammability	Instability	Physical hazards
4	1	0	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 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 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 containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere. Incompatible Materials. Strong oxidizing agents. Strong acids. Sulfur oxides.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cadmium	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³	Ceiling: 0.3 mg/m³ Ceiling: 0.6 mg/m³ (Vacated) STEL: 0.3 ppm TWA: 0.1 mg/m³ TWA: 0.2 mg/m³ TWA: 5 µg/m³	IDLH: 9 mg/m³	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³

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 only under a chemical fume hood. 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 When using do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes or clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Physical State Solid

Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	321 °C / 609.8 °F
Boiling Point/Range	765 °C / 1409 °F @ 760 mmHg
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	No information available
Vapor Density	Not applicable
Specific Gravity	8.64 @ 25°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cd
Molecular Weight	112.40

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions. Moisture sensitive. Air sensitive.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Exposure to air or moisture over prolonged periods.

Incompatible Materials Strong oxidizing agents, Strong acids, Sulfur oxides

Hazardous Decomposition Products Toxic fumes

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
Cadmium	LD50 = 2330 mg/kg (Rat)	Not listed	LC50 = 25 mg/m³ (Rat) 30 min

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
Cadmium	7440-43-9	Group 1	Known	A2	X	A2

IARC (International Agency for Research on Cancer)	*IARC (International Agency for Research on Cancer)* *Group 1 - Carcinogenic to Humans* *Group 2A - Probably Carcinogenic to Humans* *Group 2B - Possibly Carcinogenic to Humans*
NTP: (National Toxicity Program)	*NTP: (National Toxicity Program)* *Known - Known Carcinogen* *Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*
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 Possible risk of irreversible effects

Reproductive Effects Possible risk of impaired fertility. May cause harm to the unborn child.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Kidney disorders: May cause harm to the unborn child: Blood disorders

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cadmium	Not listed	LC50: 0.0004 - 0.003 mg/L, 96h (Pimephales promelas) LC50: = 0.016 mg/L, 96h (Oryzias latipes) LC50: = 21.1 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h static (Cyprinus carpio) LC50: = 4.26 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 0.002 mg/L, 96h	Not listed	EC50: = 0.0244 mg/L, 48h Static (Daphnia magna)

		(Cyprinus carpio) LC50: = 0.006 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 0.003 mg/L, 96h flow-through (Oncorhynchus mykiss)		

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

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	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Technical Name	Cadmium
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

TDG

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IATA

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IMDG/IMO

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Cadmium	7440-43-9	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
Cadmium	7440-43-9	X	-	231-152-8	X	X		X	X	KE-04397

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 %
Cadmium	7440-43-9	100	0.1

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
Cadmium	-	-	X	X

Clean Air Act

OSHA - Occupational Safety and Health Administration: Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Cadmium	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

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
Cadmium	10 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Cadmium	7440-43-9	Carcinogen Developmental Male Reproductive	0.05 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cadmium	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)
Cadmium	-	Use restricted. See item 72. (see link for restriction details) Use restricted. See item 23. (see link for restriction details) Use restricted. See item 28. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	SVHC Candidate list - 231-152-8 - Carcinogenic, Article 57a;Specific target organ toxicity after repeated exposure, Article 57(f) - human health

After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

https://echa.europa.eu/authorisation-list
https://echa.europa.eu/substances-restricted-under-reach
https://echa.europa.eu/candidate-list-table

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)
Cadmium	7440-43-9	Listed	Not applicable	Not applicable	0.01% (Max. Conc.)

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)
Cadmium	7440-43-9	Not applicable	Not applicable	Not applicable	Annex I - Y26

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

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

Revision Date 24-Feb-2020 **Revision Number** 2

1. Identification

Product Name **Hexavalent Chromium, standard solution, Specpure®, Cr(+6) 1000µg/ml**

Cat No. : **42234**

Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1B

Label Elements

Signal Word
Danger

Hazard Statements
May cause genetic defects
May cause cancer
May damage fertility or the unborn child

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
Response
IF exposed or concerned: Get medical attention/advice
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified
WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Water	7732-18-5	99.76
Ammonium bichromate	7789-09-5	0.24

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 None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Not combustible.

Unsuitable Extinguishing Media No information available

Flash Point No information available

Method -	No information available
Autoignition Temperature	No information available
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
None reasonably foreseeable.

Hazardous Combustion Products
Nitrogen oxides (NOx). Ammonia. Chromium oxide.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
0	0	0	-

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information. Do not allow material to contaminate ground water system. Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

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.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Ammonium bichromate	TWA: 0.0002 mg/m³ STEL: 0.0005 mg/m³ Skin	(Vacated) Ceiling: 0.1 mg/m³ Ceiling: 0.1 mg/m³	IDLH: 15 mg/m³ TWA: 0.0002 mg/m³	TWA: 0.05 mg/m³

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.

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	Yellow
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	No data available
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	<=1100 hPa @ 50 °C
Vapor Density	No information available
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	(NH4)2 Cr2 O7 in H2 O

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Nitrogen oxides (NOx), Ammonia, Chromium oxide

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information	
Oral LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.
Component Information	

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Ammonium bichromate	LD50 = 48 mg/kg (Rat)	LD50 = 1860 mg/kg (Rabbit)	LC50 = 0.2 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 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
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Ammonium bichromate	7789-09-5	Group 1	Known	A1	X	A1

IARC (International Agency for Research on Cancer)
IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

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)

Mexico - Occupational Exposure Limits - Carcinogens
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects California Proposition 65. Reproductive toxicity.

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
May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ammonium bichromate	Not listed	LC50: = 136 mg/L, 96h	Not listed	Not listed

		(Gambusia affinis)		

Persistence and Degradability based on information available. May persist

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its 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 Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Water	7732-18-5	X	ACTIVE	-
Ammonium bichromate	7789-09-5	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export

Component	CAS-No	**TSCA 12(b)** - Notices of Export
Ammonium bichromate	7789-09-5	Section 6

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Water	7732-18-5	X	-	231-791-2	X	X	X	X	KE-35400
Ammonium bichromate	7789-09-5	X	-	232-143-1	X	X	X	X	KE-01653

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Ammonium bichromate	7789-09-5	0.24	0.1 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
Ammonium bichromate	X	10 lb	X	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Ammonium bichromate	X		-

OSHA - Occupational Safety and Health Administration: Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Ammonium bichromate	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

CERCLA: Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Ammonium bichromate	10 lb	-

California Proposition 65: This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Ammonium bichromate	7789-09-5	Carcinogen Developmental Female Reproductive Male Reproductive	0.001 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Ammonium bichromate	X	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

16. Other information

Prepared By: Health, Safety and Environmental Department
Email: tech@alfa.com
www.alfa.com

Revision Date: 24-Feb-2020
Print Date: 24-Feb-2020
Revision Summary: SDS authoring systems update, replaces ChemGes SDS No. 2,327.

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

1. IDENTIFICATION

Product identifier
Product Name Chromium, Trivalent Standard Solution 50 ± 0.5 mg/L as Cr^{+3}

Other means of identification
Product Code(s) 1415142

Safety data sheet number M00715

Recommended use of the chemical and restrictions on use
Recommended Use Laboratory reagent. Standard solution.
Uses advised against None.
Restrictions on use None.

Details of the supplier of the safety data sheet

Manufacturer Address
Hach Company, P.O.Box 389, Loveland, CO 80539, USA, +1(970) 669-3050

Emergency telephone number
+1(303) 623-5716 - 24 Hour Service

2. HAZARDS IDENTIFICATION

Classification

Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1

Hazards not otherwise classified (HNOC)
Not applicable

Label elements

Signal word
Danger

Hazard statements
H314 - Causes severe skin burns and eye damage

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves, protective clothing, eye protection, and face protection
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 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P363 - Wash contaminated clothing before reuse
P405 - Store locked up
P501 - Dispose of contents/ container to an approved waste disposal plant

Other Hazards Known
None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance
Not applicable

Mixture

Percent ranges are used where confidential product information is applicable.

Chemical name	CAS No	Percent Range	HMRIC #
Sulfuric acid	7664-93-9	<1%	-
Sulfuric acid, chromium potassium salt	10279-63-7	<0.1%	-

4. FIRST AID MEASURES

Description of first aid measures

General advice
Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Inhalation
Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately. 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. If breathing is difficult, (trained personnel should) give oxygen. Delayed pulmonary edema may occur. Get immediate medical advice/attention.

Eye contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Do not rub affected area. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

Skin contact
Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get immediate medical advice/attention.

Ingestion
Do NOT induce vomiting. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Get immediate medical advice/attention.

Self-protection of the first aider Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid contact with skin, eyes or clothing. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation.

Most important symptoms and effects, both acute and delayed

Symptoms Burning sensation.

Indication of any immediate medical attention and special treatment needed

Note to physicians Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical The product causes burns of eyes, skin and mucous membranes. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous combustion products This material will not burn.

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

U.S. Notice Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance. Outside of the US, only persons properly qualified according to state or local regulations should respond to a spill involving chemicals.

Personal precautions, protective equipment and emergency procedures

Personal precautions Attention! Corrosive material. Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

Other Information Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions Prevent further leakage or spillage if safe to do so. Should not be released into the environment. Do not allow to enter into soil/subsoil. Prevent product from entering drains.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Take up mechanically, placing in appropriate containers for disposal.

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

Reference to other sections See section 8 for more information. See section 13 for more information.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. In case of insufficient ventilation, wear suitable respiratory equipment. Handle product only in closed system or provide appropriate exhaust ventilation. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture. Store locked up. Keep out of the reach of children. Store away from other materials.

Flammability class Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
Sulfuric acid CAS#: 7664-93-9	TWA: 0.2 mg/m^3 thoracic particulate matter	TWA: 1 mg/m^3 (vacated) TWA: 1 mg/m^3	IDLH: 15 mg/m^3 TWA: 1 mg/m^3
Sulfuric acid, chromium potassium salt CAS#: 10279-63-7	NDF	TWA: 0.5 mg/m^3 (vacated) TWA: 0.5 mg/m^3	IDLH: 250 mg/m^3 Cr(II) TWA: 0.5 mg/m^3 Cr

Appropriate engineering controls

Engineering Controls
Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Hand Protection Wear suitable gloves. Impervious gloves. Barrier creams may help to protect the exposed areas of skin. Gloves must be inspected prior to use. The selected protective gloves have to satisfy the specifications of EU Directive 2016/425 and the standard EN 374 derived from it. Chemical resistant gloves made of butyl rubber or nitrile rubber category III according to EN 374-1:2016.

Eye/face protection Face protection shield.

Skin and body protection Wear suitable protective clothing. Long sleeved clothing. Chemical resistant apron. Avoid contact with eyes, skin and clothing.

General Hygiene Considerations Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Contaminated work clothing should not be allowed out of the workplace. Regular cleaning of equipment, work area and clothing is recommended. Wash hands before breaks and immediately after handling the product.

Environmental exposure controls Local authorities should be advised if significant spillages cannot be contained. Do not allow into any sewer, on the ground or into any body of water.

Thermal hazards None under normal processing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Liquid		
Appearance	aqueous solution	**Color**	colorless
Odor	Odorless	**Odor threshold**	No data available

Property	Values	Remarks • Method
Molecular weight	No data available	
pH	1.0	@ 20 °C
Melting point/freezing point	~ -1 °C / 30.2 °F	
Boiling point / boiling range	~ 100 °C / 212 °F	
Evaporation rate	1 (water = 1)	
Vapor pressure	23.777 mm Hg / 3.17 kPa at 25 °C / 77 °F	
Relative vapor density	0.62	
Specific gravity (water = 1 / air = 1)	0.993	
Partition Coefficient (n-octanol/water)	Not applicable	
Soil Organic Carbon-Water Partition Coefficient	Not applicable	
Autoignition temperature	No data available	
Decomposition temperature	No data available	
Dynamic viscosity	No data available	
Kinematic viscosity	No data available	

Solubility(ies)

Water solubility

Water solubility classification	Water solubility	Water Solubility Temperature
Soluble	> 1000 mg/L	25 °C / 77 °F

Solubility in other solvents

Chemical Name	Solubility classification	Solubility	Solubility Temperature
Acid	Soluble	> 1000 mg/L	25 °C / 77 °F

Other information

Metal Corrosivity

Steel Corrosion Rate 5.41 mm/yr / 0.21 in/yr
Aluminum Corrosion Rate

Volatile Organic Compounds (VOC) Content

Chemical name	CAS No	Volatile organic compounds (VOC) content	CAA (Clean Air Act)
Sulfuric acid	7664-93-9	No data available	-
Sulfuric acid, chromium potassium salt	10279-63-7	No data available	-

Explosive properties

Upper explosion limit No data available
Lower explosion limit No data available

Flammable properties

Flash point No data available

Flammability Limit in Air
Upper flammability limit: No data available
Lower flammability limit: No data available

Oxidizing properties No data available.

Bulk density No data available

10. STABILITY AND REACTIVITY

Reactivity
Not applicable.

Chemical stability
Stable under normal conditions.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Possibility of hazardous reactions
None under normal processing.

Hazardous polymerization
None under normal processing.

Conditions to avoid

Exposure to air or moisture over prolonged periods.

Incompatible materials
Acids. Bases. Oxidizing agent.

Hazardous decomposition products
Thermal decomposition can lead to release of irritating and toxic gases and vapors.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Inhalation	Corrosive by inhalation. Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Inhaled corrosive substances can lead to a toxic edema of the lungs. Pulmonary edema can be fatal.
Eye contact	Causes burns. Corrosive to the eyes and may cause severe damage including blindness. Causes serious eye damage. May cause irreversible damage to eyes.
Skin contact	Corrosive. Causes severe burns. Avoid contact with skin and clothing.
Ingestion	Causes burns. Ingestion causes burns of the upper digestive and respiratory tracts. May cause severe burning pain in the mouth and stomach with vomiting and diarrhea of dark blood. Blood pressure may decrease. Brownish or yellowish stains may be seen around the mouth. Swelling of the throat may cause shortness of breath and choking. May cause lung damage if swallowed. May be fatal if swallowed and enters airways.
Symptoms	Redness. Burning. May cause blindness. Coughing and/ or wheezing.

Acute toxicity
Based on available data, the classification criteria are not met

Product Acute Toxicity Data
No data available.

Ingredient Acute Toxicity Data
Test data reported below.

Oral Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid, chromium potassium salt (<0.1%) CAS#: 10279-63-7	Rat LD_{50}	3530 mg/kg	None reported	None reported	Vendor SDS

Unknown Acute Toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity.

Acute Toxicity Estimations (ATE)

ATEmix (oral)	No information available

ATEmix (dermal)	No information available
ATEmix (inhalation-dust/mist)	No information available
ATEmix (inhalation-vapor)	No information available
ATEmix (inhalation-gas)	No information available

Skin corrosion/irritation
Causes severe burns.

Product Skin Corrosion/Irritation Data
No data available.

Ingredient Skin Corrosion/Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (<1%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to skin	HSDB (Hazardous Substances Data Bank)

Serious eye damage/irritation
Classification based on data available for ingredients. Causes burns. Risk of serious damage to eyes.

Product Serious Eye Damage/Eye Irritation Data
No data available.

Ingredient Eye Damage/Eye Irritation Data
Test data reported below.

Chemical name	Test method	Species	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (<1%) CAS#: 7664-93-9	Existing human experience	Human	None reported	None reported	Corrosive to eyes	HSDB (Hazardous Substances Data Bank)

Respiratory or skin sensitization
Based on available data, the classification criteria are not met.

Product Sensitization Data
No data available.

Ingredient Sensitization Data
No data available.

STOT - single exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Single Exposure Data
No data available.

Ingredient Specific Target Organ Toxicity Single Exposure Data
Test data reported below.

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data

Sulfuric acid (<1%) CAS#: 7664-93-9	Human TD_{Lo}	0.144 mg/L	5 minutes	**Lungs, Thorax, or Respiration** Dyspnea	RTECS (Registry of Toxic Effects of Chemical Substances)

STOT - repeated exposure
Based on available data, the classification criteria are not met.

Product Specific Target Organ Toxicity Repeat Dose Data
No data available.

Ingredient Specific Target Organ Toxicity Repeat Exposure Data
Test data reported below.

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (<1%) CAS#: 7664-93-9	Human TC_{Lo}	0.003 mg/L	168 days	**Musculoskeletal** Changes in teeth and supporting structures	RTECS (Registry of Toxic Effects of Chemical Substances)

Carcinogenicity
Based on available data, the classification criteria are not met.

Product Carcinogenicity Data
No data available.

Ingredient Carcinogenicity Data
No data available.

Chemical name	CAS No	ACGIH	IARC	NTP	OSHA
Sulfuric acid	7664-93-9	A2	Group 1	Known	X
Sulfuric acid, chromium potassium salt	10279-63-7	-	-	-	-

Legend

ACGIH (American Conference of Governmental Industrial Hygienists)	A2 - Suspected Human Carcinogen
IARC (International Agency for Research on Cancer)	Group 1 - Carcinogenic to Humans
NTP (National Toxicology Program)	Known - Known Carcinogen
OSHA (Occupational Safety and Health Administration of the US Department of Labor)	X - Present

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Product Germ Cell Mutagenicity *invitro* Data
No data available.

Ingredient Germ Cell Mutagenicity *invitro* Data
Test data reported below.

Chemical name	Test	Cell Strain	Reported dose	Exposure time	Results	Key literature references and sources for data
Sulfuric acid (<1%) CAS#: 7664-93-9	Cytogenetic analysis	Hamster ovary	4 mmol/L	None reported	Positive test result for mutagenicity	No information available

Product Germ Cell Mutagenicity *invivo* Data
No data available.

Ingredient Germ Cell Mutagenicity *invivo* Data
No data available.

Reproductive toxicity
Based on available data, the classification criteria are not met.

Product Reproductive Toxicity Data
No data available.

Ingredient Reproductive Toxicity Data
Test data reported below.

Inhalation (Vapor) Exposure Route

Chemical name	Endpoint type	Reported dose	Exposure time	Toxicological effects	Key literature references and sources for data
Sulfuric acid (<1%) CAS#: 7664-93-9	Rabbit TC_{Lo}	0.02 mg/L	7 hours	**Specific Developmental Abnormalities** Musculoskeletal system	RTECS (Registry of Toxic Effects of Chemical Substances)

Aspiration hazard
Based on available data, the classification criteria are not met.

12. ECOLOGICAL INFORMATION

Ecotoxicity Based on available data, the classification criteria are not met.

Unknown aquatic toxicity 0 % of the mixture consists of component(s) of unknown hazards to the aquatic environment.

Product Ecological Data

Aquatic Acute Toxicity
No data available.

Aquatic Chronic Toxicity
No data available.

Ingredient Ecological Data

Aquatic Acute Toxicity
Test data reported below.

Fish

Chemical name	Exposure time	Species	Endpoint type	Reported dose	Key literature references and sources for data
Sulfuric acid, chromium potassium salt (<0.1%) CAS#: 10279-63-7	96 hours	None reported	LC_{50}	27 mg/L	GESTIS (Information System on Hazardous Substances of the German Social Accident Insurance)

Aquatic Chronic Toxicity
No data available.

Persistence and degradability

Product Biodegradability Data
No data available.

Bioaccumulation
MATERIAL DOES NOT BIOACCUMULATE
Product Bioaccumulation Data
No data available.

Partition Coefficient (n-octanol/water) Not applicable

Mobility

Soil Organic Carbon-Water Partition Coefficient Not applicable

Other adverse effects
No information available

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

US EPA Waste Number D002

Special instructions for disposal Dispose of material in an E.P.A. approved hazardous waste facility.

14. TRANSPORT INFORMATION

DOT Not regulated

TDG Not regulated

IATA Not regulated

IMDG Not regulated

Additional information
There is a possibility that this product could be contained in a reagent set or kit composed of various compatible dangerous goods.
If the item is not in a reagent set or kit, the classification given above applies.
If the item is part of a reagent set or kit the classification would change to the following:
UN3316 Chemical Kit, Hazard Class 9, Packing Group II or III.
If the item is not regulated, the Chemical Kit classification does not apply.

15. REGULATORY INFORMATION

National Inventories
TSCA Complies
DSL/NDSL Complies

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

International Inventories

EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Complies
KECL - Existing substances	Complies
PICCS	Complies
TCSI	Complies
AICS	Complies
NZIoC	Complies

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
TCSI - Taiwan Chemical Substances Inventory
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Sulfuric acid (CAS #: 7664-93-9)	1.0

SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Sulfuric acid 7664-93-9	1000 lb	-	-	X
Sulfuric acid, chromium potassium salt 10279-63-7	-	X	-	-

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Sulfuric acid 7664-93-9	1000 lb	1000 lb	RQ 1000 lb final RQ RQ 454 kg final RQ

U.S. - DEA (Drug Enforcement Administration) List I & List II

Chemical name	U.S. - DEA (Drug Enforcement Administration) - List I or Precursor Chemicals	U.S. - DEA (Drug Enforcement Administration) - List II or Essential Chemicals
Sulfuric acid (<1%) CAS#: 7664-93-9	Not Listed	50 gallon Export Volume (exports, transshipments and international transactions to designated countries given in 1310.08(b))

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Sulfuric acid (CAS #: 7664-93-9)	Carcinogen

WARNING: This product can expose you to chemicals including Sulfuric acid, which is known to the State of California to cause cancer.
For more information, go to http://www.P65Warnings.ca.gov

U.S. State Right-to-Know Regulations

This product may contain substances regulated by state right-to-know regulations.

Chemical name	New Jersey	Massachusetts	Pennsylvania
Sulfuric acid 7664-93-9	X	X	X
Sulfuric acid, chromium potassium salt 10279-63-7	X	-	X

U.S. EPA Label Information

Chemical name	FIFRA	FDA
Sulfuric acid	180.0910	21 CFR 184.1095

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

Special Comments

None

Additional information

Global Automotive Declarable Substance List (GADSL)
Not applicable

NFPA and HMIS Classifications

NFPA	**Health hazards** - 3	**Flammability** - 0	**Instability** - 0	**Physical and chemical properties** -
HMIS	**Health hazards** - 3	**Flammability** - 0	**Physical hazards** - 0	**Personal protection** - X - I

Key or legend to abbreviations and acronyms used in the safety data sheet

NIOSH IDLH	*Immediately Dangerous to Life or Health*
ACGIH	ACGIH (American Conference of Governmental Industrial Hygienists)
NDF	*no data*

Legend - Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
MAC	Maximum Allowable Concentration	Ceiling	Ceiling Limit Value
X	Listed	Vacated	These values have no official status. The only binding levels of contaminants are those listed in the final OSHA PEL. These lists are for reference purposes only. Please note that some reference state regulations of these "liberated" exposure limits in their state regulations.
SKN*	Skin designation	SKN+	Skin sensitization
RSP+	Respiratory sensitization	**	Hazard Designation
C	Carcinogen	R	Reproductive toxicant
M	mutagen		

Prepared By	Hach Product Compliance Department
Issue Date	04-Jun-2020
Revision Date	23-Nov-2021
Revision Note	None

Disclaimer

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

End of Safety Data Sheet

ThermoFisher SCIENTIFIC

SAFETY DATA SHEET

Creation Date 22-Sep-2009 **Revision Date** 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Chromium, Reference Standard Solution, 1000ppm (Certified)**

Cat No. : **SC192-100; SC192-500**

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

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)

Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1B

Label Elements

Signal Word
Danger

Hazard Statements
May cause genetic defects
May cause cancer
May damage fertility or the unborn child

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
Response
IF exposed or concerned: Get medical attention/advice
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified
WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Water	7732-18-5	99.8
Potassium dichromate	7778-50-9	0.2

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 None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point Not applicable

Method -	No information available
Autoignition Temperature	No information available
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
Non-combustible. None reasonably foreseeable.

Hazardous Combustion Products
None known based on information supplied.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions	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	Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid ingestion and inhalation. Do not get in eyes, on skin, or on clothing.
Storage.	Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. None known.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Potassium dichromate	TWA: 0.0002 mg/m³ STEL: 0.0005 mg/m³ Skin	(Vacated) Ceiling: 0.1 mg/m³ Ceiling: 0.1 mg/m³	IDLH: 15 mg/m³ TWA: 0.0002 mg/m³	TWA: 0.05 mg/m³

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.

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	Orange
Odor	Odorless
Odor Threshold	No information available
pH	~ 7
Melting Point/Range	0 °C / 32 °F
Boiling Point/Range	100 °C / 212 °F
Flash Point	Not applicable
Evaporation Rate	> 1 (ether = 1)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	14 mmHg @ 20 °C
Vapor Density	0.7
Specific Gravity	1.0
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	None known.
Incompatible Materials	None known
Hazardous Decomposition Products	None known based on information supplied
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information	No acute toxicity information is available for this product
Oral LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.
Component Information	

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Potassium dichromate	130 mg/kg (Rat)	1150 mg/kg (Rabbit)	0.09 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 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
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Potassium dichromate	7778-50-9	Group 1	Known	A1	X	A1

IARC (International Agency for Research on Cancer)
IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

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)

Mexico - Occupational Exposure Limits - Carcinogens
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects Mutagenic effects have occurred in experimental animals. Genetic mutations observed in bacterial and mammalian test systems

Reproductive Effects Contains material that may cause adverse reproductive effects.

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
Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Potassium dichromate	Not listed	LC50: 14 - 20.9 mg/L, 96h	Not listed	EC50: 1.4 mg/L 24h

		static (Pimephales promelas) LC50: 24.81 - 34.55 mg/L, 96h semi-static (Poecilia reticulata) LC50: 23 - 41.2 mg/L, 96h static (Poecilia reticulata) LC50: 15.41 - 30.36 mg/L, 96h flow-through (Pimephales promelas) LC50: > 139 mg/L, 96h static (Cyprinus carpio) LC50: 113.6 - 155.7 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 320 mg/L, 96h (Lepomis macrochirus) LC50: 65.6 - 137.6 mg/L, 96h static (Lepomis macrochirus) LC50: = 12.3 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: 21.209 - 30.046 mg/L, 96h semi-static (Oryzias latipes)		

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its 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 Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Water	7732-18-5	X	ACTIVE	-
Potassium dichromate	7778-50-9	X	ACTIVE	R

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

TSCA 12(b) - Notices of Export

Component	CAS No	**TSCA 12(b)** - Notices of Export

Potassium dichromate	7778-50-9	Section 6

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
Water	7732-18-5	X	-	231-791-2	X	X		X	X	KE-35400
Potassium dichromate	7778-50-9	X	-	231-906-6	X	X	X	X	X	KE-29094

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 %
Potassium dichromate	7778-50-9	0.2	0.1

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
Potassium dichromate	X	10 lb	X	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Potassium dichromate	X		-

OSHA - Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Potassium dichromate	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

CERCLA

Component	Hazardous Substances RQs	CERCLA EHS RQs
Potassium dichromate	10 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Potassium dichromate	7778-50-9	Carcinogen Developmental Female Reproductive Male Reproductive	0.001 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Potassium dichromate	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)
Potassium dichromate	Carcinogenic Category 1B, Mutagenic Category 1B, Toxic for reproduction Category 1B Article 57 Application date: March 21, 2016 Sunset date: September 21, 2017 Exemption - None	Use restricted. See item 72. (see link for restriction details) Use restricted. See item 28. (see link for restriction details) Use restricted. See item 29. (see link for restriction details) Use restricted. See item 30. (see link for restriction details) Use restricted. See item 75. (see link for restriction details) Use restricted. See item 47. (see link for restriction details)	SVHC Candidate list - 231-906-6 - Carcinogenic, Article 57a; Mutagenic, Article 57b; Toxic for reproduction, Article 57c

After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

https://echa.europa.eu/authorisation-list
https://echa.europa.eu/substances-restricted-under-reach
https://echa.europa.eu/candidate-list-table

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)
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable
Potassium dichromate	7778-50-9	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)
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable
Potassium dichromate	7778-50-9	Not applicable	Not applicable	Not applicable	Annex I - Y21

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
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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

APPENDIX C

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

PERSONAL PROTECTION EQUIPMENT

The personal protective equipment requirements for HZW personnel for on-site activities were selected and based on previous land use and previous investigations. Therefore, unless more information is obtained regarding employee exposure at this specific site, such as personal or area air monitoring data or data from the PID indicates that a higher level of PPE is required, then the following PPE, at a minimum is required to be worn:

Respirator:	As necessary
Protective Clothing:	Protective Coveralls/As necessary
Gloves:	Nitrile
Boots:	Safety-toe boots or shoes
Hard Hat:	As necessary
Safety Glasses:	Required

***ANY PPE REQUIREMENTS OF ANY FACILITY SHALL SUPERSEDE THOSE PRESENTED IN THIS HASP**.*

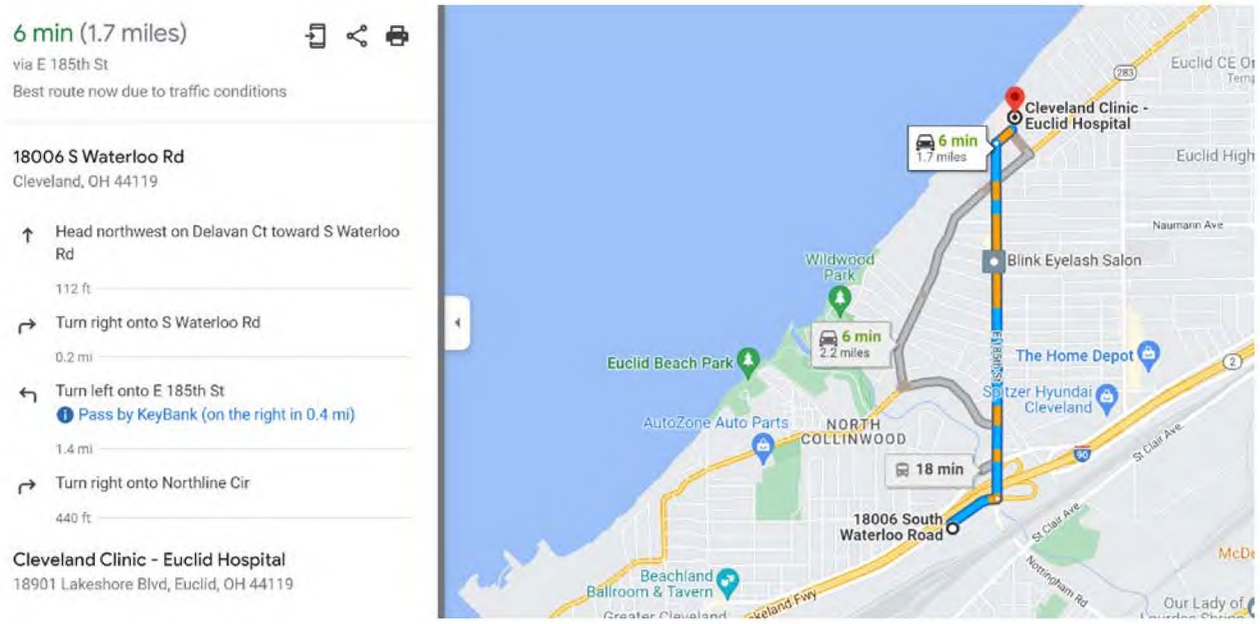
APPENDIX D

LOCATION, MAP AND DIRECTIONS TO NEAREST HOSPITAL

Cleveland Clinic Euclid Hospital
18901 Lakeshore Boulevard
Euclid, OH

Directions:

1.	From the site, turn right on Waterloo Road	0.2 mi.
2.	Turn Left onto E 185th Street	1.4 mi.



APPENDIX E

EMERGENCY INFORMATION AND PHONE NUMBERS

EMERGENCY INFORMATION AND PHONE NUMBERS

OHIO EPA

- NORTHEAST DISTRICT OFFICE (TWINSBURG) 1-330-963-1200
- OFFICE OF EMERGENCY RESPONSE 1-800-282-9378

UNITED STATES EPA

- CERCLA/RCRA HOTLINE 1-800-424-9346
- NATIONAL RESPONSE CENTER.....1-800-424-8802
- EPCRA HOTLINE 1-800-535-0202

HAZMAT

- EMERGENCY 911

CITY OF CLEVELAND FIRE DEPARTMENT.....911

CITY OF CLEVELAND POLICE DEPARTMENT.....911

OHIO UTILITY PROTECTION SERVICE (OUPS) 1-800-362-2764
OUPS Reference #: Multiple Numbers to be Assigned Upon Contacting

APPENDIX D

RSL CALCULATIONS

Site-specific
Composite Worker Soil Inputs

Variable	Composite Worker Soil Default Value	Site-Specific Value
A (PEF Dispersion Constant)	16.2302	12.8612
A (VF Dispersion Constant)	11.911	12.8612
A (VF Dispersion Constant - mass limit)	11.911	12.8612
B (PEF Dispersion Constant)	18.7762	20.5164
B (VF Dispersion Constant)	18.4385	20.5164
B (VF Dispersion Constant - mass limit)	18.4385	20.5164
City (PEF Climate Zone) Selection	Default	Cleveland, OH (
City (VF Climate Zone) Selection	Default	Cleveland, OH (
C (PEF Dispersion Constant)	216.108	237.2798
C (VF Dispersion Constant)	209.7845	237.2798
C (VF Dispersion Constant - mass limit)	209.7845	237.2798
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.232
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
ρ_b (dry soil bulk density) g/cm ^{3}	1.5	1.5
ρ_b (dry soil bulk density - mass limit) g/cm ^{3}	1.5	1.5
PEF (particulate emission factor) m ^{3}/kg	1359344438	950330991.29529
ρ_s (soil particle density) g/cm ^{3}	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	85.631784252497
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	85.631784252497
Q/C_{vol} (g/m^2-s per kg/m^3 - mass limit)	68.18	85.631784252497
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_w (skin adherence factor - composite worker) mg/cm ^{2}	0.12	0.12
AT_w (averaging time - composite worker)	365	365
BW_w (body weight - composite worker)	80	80
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8

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Site-specific
Composite Worker Soil Inputs

Variable	Composite Worker Soil Default Value	Site-Specific Value
THQ (target hazard quotient) unitless	0.1	1
IRS_w (soil ingestion rate - composite worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_w (surface area - composite worker) cm^2/day	3527	3527
TR (target risk) unitless	1.0E-06	1.0E-05
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	4.83
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5
VF_{ml} (volitization factor - mass limit) m^3/kg	.	0

Site-specific

Composite Worker Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF_o $(mg/kg\text{-}day)^{-1}$	SF_o Ref	IUR $(ug/m^3)^{-1}$	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m^3)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)
Cadmium (Diet)	7440-43-9	No	No	Inorganics	-		1.80E-03	I	1.00E-04	A	1.00E-05	A	0.025	0.001	1	-
Chromium(III), Insoluble Salts	16065-83-1	No	No	Inorganics	-		-		1.50E+00	I	-		0.013	-	1	-
Chromium(VI)	18540-29-9	Yes	No	Inorganics	5.00E-01	C	8.40E-02	G	3.00E-03	I	1.00E-04	I	0.025	-	1	-
Chromium, Total	7440-47-3	No	No	Inorganics	-		-		-		-		0.013	-	1	-

Site-specific

Composite Worker Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

S (mg/L)	K_{oc} \ (cm^3/g)	K_d \ (cm^3/g)	HLC (atm-m^3/mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T_c \ (K)	T_c \ Ref	Chemical Type	D_{la} \ (cm^2/s)	D_{lw} \ (cm^2/s)	D_A \ (cm^2/s)	Particulate Emission Factor (m^3/kg)
-	-	7.50E+01	-	-		1038.15	PHYSPROP	2291	YAWS	INORGANIC	-	-	-	9.50E+08
-	-	1.80E+06	-	-		-		-		INORGANIC	-	-	-	9.50E+08
1.69E+06	-	1.90E+01	-	-		-		-		INORGANIC	-	-	-	9.50E+08
-	-	1.80E+06	-	-		2915.15	PHYSPROP	8560.93	YAWS	INORGANIC	-	-	-	9.50E+08

Site-specific

Composite Worker Regional Screening Levels (RSL) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Volatilization Factor Unlimited Reservoir (m^3/kg)	Volatilization Factor Mass Limit (m^3/kg)	Volatilization Factor Selected (m^3/kg)	Ingestion SL TR=1E-05 (mg/kg)	Dermal SL TR=1E-05 (mg/kg)	Inhalation SL TR=1E-05 (mg/kg)	Carcinogenic SL TR=1E-05 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
-	-	-	-	-	6.47E+04	6.47E+04	1.17E+02	6.90E+02	4.16E+04	9.97E+01	9.97E+01 nc
-	-	-	-	-	-	-	1.75E+06	-	-	1.75E+06	1.75E+06 nc max
-	-	-	6.54E+01	-	1.39E+03	6.25E+01	3.50E+03	-	4.16E+05	3.47E+03	6.25E+01 ca*
-	-	-	-	-	-	-	-	-	-	-	