Industrial and Sanitary Outfalls
2019 NPDES Permit Re-Application
Outfall 051 Fact Sheet

TA-55 Facility Operations
TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF)

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Table of Contents

List of Tables

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INDUSTRIAL AND SANITARY OUTFALLS
2019 NPDES PERMIT RE-APPLICATION
OUTFALL 051 FACT SHEET

1.0 OUTFALL LOCATION [Section I]

Outfall ID No.:	051	**Outfall Location:**	TA-50
Category:	Radioactive Liquid Waste Discharge	**Originating Structure for the Discharge:**	TA-50-1
Flow Type:	Intermittent (batch)	**Receiving Stream:**	Effluent Canyon, Tributary to Mortandad Canyon, Water Quality Segment 20.6.4.128 NMAC
Longitude:	106° 17' 54" W	**Latitude:**	35° 51' 54" N

2.0 FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES [Section II]

Outfall 051 is located at TA-50 and discharges to Effluent Canyon which is a tributary to Mortandad Canyon in Water Quality Segment 20.6.4.128 NMAC. The outfall discharges treated radioactive liquid waste effluent from that originates at TA-50-1. Attachment A provides a location map. The discharge is comprised of treated effluent from the Radioactive Liquid Waste Treatment Facility (RLWTF). Table 1 identifies the discharge source, the source location, and source composition.

Table 1
Sources for Discharges to Outfall 051

TA	Buildings	Types	Transportation Mode (Piping, Truck etc.)	Discharge Source Description	Source Composition
50	1, 66, 230, 248, 250, 257, 261	Process Cooling Storm Water	Piping, Truck	Radioactive Liquid Waste Treatment Facility (RLWTF)	Treated effluent from the RLWTF.
52	181, 183				

2.1 Process Schematic and Water Balance [II.A]

A process schematic line drawing that shows the route taken by water from intake to the discharge at Outfall 051 is provided in Attachment B. This drawing includes all operations that contribute process water to the discharge at the outfall. A water balance is also provided on the process schematic with average flows. The water balance is based upon actual data collected from operations personnel.

2.2 Water Treatment Processes [II.B]

The RLWTF receives and treats radioactive liquid waste (RLW) process, cooling, and/or storm water from various generator facilities located throughout the Los Alamos National Laboratory (LANL). All wastewater that is discharged to the facility must comply with the facility's Waste Acceptance Criteria and must have a completed and approved Waste Stream Profile Form prior to its discharge. The RLWTF consists of (a) an underground collection system (double walled piping and vaults) that conveys water to Technical Area (TA) 50 from generators at LANL; (b) structures located at TA-50 that house treatment operations and the mechanical evaporator system (MES) located at TA-50-257; and (c) Solar Evaporation Tanks (SET) located at TA-52-181 and 183. The RLWTF treatment operations are centralized at TA-50-1, which houses the treatment equipment, process tanks, analytical laboratories, and offices. Structures adjacent to TA-50-1 provide low level waste (LLW) influent and emergency storage (TA-50-250), transuranic (TRU) influent storage (TA-50-66), secondary waste storage (TA-50-248), and mechanical evaporation (TA-50-257). The treatment operations are divided into the following:

- **Main LLW Treatment Process:** Consists of LLW influent collection, LLW influent storage, LLW treatment, and discharge of treated effluent water to the environment. The treatment process includes the addition of chemicals to the influent in reaction tanks, filtration, ion exchange, and reverse osmosis (RO). Treated effluent may be discharged to the NPDES Outfall 051, the SET located at TA-52, or the mechanical evaporation system (MES) located at TA-50-257. The main LLW treatment process generates solids/sludge and RO concentrate that is routed to the secondary treatment process.

- **TRU Treatment Process:** Consists of influent collection, influent storage, TRU treatment, and sludge concentration, and sludge solidification. The treated effluent water from the TRU treatment process is not

discharged to the environment. Treated effluent water either receives additional treatment in the Secondary RO or it is sent to the bottoms storage tanks located at TA-50-248. Sludge from the TRU treatment process is concentrated, solidified with cement in a drum tumbler, and shipped to the Waste Isolation Pilot Plant as a solid TRU waste for disposal.

- **Secondary Treatment Process**: Consists of a rotary vacuum filter to treat sludge from the main LLW treatment process, a secondary RO to treat RO concentration from the main LLW treatment process and/or effluent from the TRU treatment process, and bottoms storage tanks located at TA-50-248 for RO concentrate. Treated water is either stored as bottoms or routed back to the main LLW reaction tanks. Sludge from the rotary vacuum filter is drummed and shipped offsite for disposal as LLW radioactive solid waste. Bottoms from the storage tanks are shipped offsite in tanker trucks for disposal as LLW radioactive solid waste.

Table 2 identifies the wastewater treatment codes associated with the RLWTF. Attachment B provides a schematic of the buildings and vaults associated with the influent collection system. The vaults are monitored by radio signal and/or process logic controller at the facility to ensure that there are no leaks into the double walled piping. Photographs are provided in Attachment C.

Table 2
Wastewater Treatment Codes Assigned to Outfall 051

Treatment Code	Description	Justification
1F	Evaporation	Mechanical Evaporator (MES) and Solar Evaporation Tanks (SET)
1O	Mixing	Various Storage and Reaction Tanks
1S	Reverse Osmosis (RO) (Hyperfiltration)	Primary RO Unit
1U	Sedimentation (Settling)	Sludge
2C	Chemical Precipitation	Chemical precipitation of radionuclides in reaction tanks.
2J	Ion Exchange	Removal of Perchlorate using ion exchange.
2K	Neutralization	Influent and Room 60 Neutralization
5Q	Landfill	Drums of TRU Waste
5R	Pressure Filtration	Pressure Filter
5U	Vacuum Filtration	Rotary Vacuum filter for low level waste sludge

The water treatment processes identified in Table 2 utilize chemicals to promote precipitation, adjust pH, clean membranes, and/or otherwise treat the radioactive liquid wastewater. Table 3 provides a list of the chemicals used at the RLWTF.

Table 3
List of Treatment Chemicals used in the Operations that Contribute to Outfall 051

Source	Chemical Name	Reason for Use	Toxic Pollutant and/or Hazardous Substances Table 2C-3 or 2C-4	
Radioactive Liquid Waste Treatment Facility	EDTA	Membrane Cleaning	EDTA	2C-4
	Ferric Sulfate	Promote Precipitation/Flocculation	Ferric Sulfate Sulfuric Acid	2C-4
	Hydrochloric Acid	Membrane Cleaning	Hydrochloric acid	2C-4
	Magnesium Hydroxide	Promote Precipitation/Flocculation	NA	NA
	Magnesium Sulfate	Precipitation/Flocculation	NA	NA
	SIR-110	Ion Exchange Resin	NA	NA
	Sodium Bisulfite	Membrane Cleaning	Sodium Bisulfite	2C-4
	Sodium Hydroxide 25%	Raising pH, Promote Precipitation, Flocculation, and Membrane Cleaning	Sodium Hydroxide	2C-4
	Sulfuric Acid	pH Adjustment	Sulfuric acid	2C-4
	WEST W-126	Ionic Co-polymer used as a Flocculent	2-propanoic acid	2C-4
	Bright Dyes FLT Yellow-Green Liquid	Water Line and Drain Tracing Dye	NA	NA

Table 3 List of Treatment Chemicals used in the Operations that Contribute to Outfall 051				
Source	**Chemical Name**	**Reason for Use**	**Toxic Pollutant and/or Hazardous Substances Table 2C-3 or 2C-4**	
	Bright Dyes FLT Yellow-Green Tablet	Water Line and Drain Tracing Dye	NA	NA

EDTA = Ethylene Diamine Tetraacetic Acid

2.3 Discharge Rate and Frequency [II.C]

The discharge rates and frequencies for Outfall 051 are provided in Table 4.

Table 4 Discharge Rates and Frequencies for Outfall 051							
Source [a]	**Frequency**		**Flow Rates and Volumes**				
	Days/Week	**Months**	**Average (MGD)**	**Maximum (MGD)**	**Average Volume (GPD)**	**Maximum Volume (GPD)**	**Duration (days)**
Radioactive Liquid Waste Treatment Facility	4	12	0.020	0.040	20,000	39,840	208

a. Estimated based on the operating parameters of the Effluent Storage Tanks.

GPD = gallons per day; MGD = million gallons per day

3.0 PRODUCTION [Section III]

Section III is not applicable to Outfall 051.

4.0 IMPROVEMENTS [Section IV]

Future improvements to the treatment processes at the RLWTF includes the startup of a newly constructed main low-level waste treatment facility located at TA-50-230 and 261. The new facility utilizes the same treatment/process technologies as the existing facility described in Section 2.2 (e.g., neutralization, reverse osmosis) and is expected to complete startup testing in 2019 with an estimated operational start date in2023. A Notice of Change will be submitted for this change prior to the start of operations and impact to the outfall. The startup of the new facility is not expected to impact the outfall location, flowrates, and discharge frequency provided in Table 4. A red lined schematic and a process flow diagram for the new facility are provided in Attachment D.

5.0 INTAKE AND EFFLUENT CHARACTERISTICS [Section V]

5.1 Analytical Data [V.A, B, and C]

The analytical results provided for the Outfall 051 Permit Reapplication on the Form 2C were provided from the following sources:

- Samples collected on September 26, 2018 and shipped to an independent laboratory for analysis.
- Field samples collected and analyzed on August 26, 2018 for temperature, residual chlorine, and pH.
- Field samples collected and analyzed on February 5, 2019 for sulfite.
- Hardness = 17.3 mg/L ($CaCO_3$)

A discharge monitoring report summary is not provided for Outfall 051 because the effluent form the RLWTF was not discharged to Effluent Canyon between October 2014 and September 2018. Effluent from the RLWTF was routed to the MES.

5.2 Potential Pollutants [V.D]

The treatment chemicals associated with the RLWTF and the content of the wastewaters treated by the RLWTF constitute the pollutant load of the discharge to Outfall 051. Table 5 identifies the Table 2C-3 and 2C-4 pollutants by discharge source.

It also identifies those pollutants (if any) that were detected in the analytical results from the samples collected for the 2019 Permit Application.

Table 5
Potential Pollutants by Source for Outfall 051

Source Description	POTENTIAL Toxic Pollutant and/or Hazardous Substances Table 2C-3 or 2C-4		Analytical Data Results from Operational Samples Collected for Outfall 051 [a]
Effluent from the Radioactive Liquid Waste Treatment Facility (RLWTF) - Chemicals used during treatment at the RLWTF.	EDTA	2C-4	pH = 6.1 – 8.9 S.U.
	Ferric Sulfate	2C-4	Iron = 49.3 ug/L, Sulfate = 51.0 mg/L
	Sulfuric Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Hydrochloric Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Sodium Bisulfite	2C-4	Sulfite = 0.9 mg/L
	Sodium Hydroxide	2C-4	pH = 6.1 – 8.9 S.U.
	2-Propanoic Acid	2C-4	pH = 6.1 – 8.9 S.U.
Effluent from the RLWTF - Chemicals identified on the waste stream profile forms associated with the wastewaters discharged to the RLWTF for treatment.	1,4-Dichlorobenzene	2C-4	Not detected.
	Acetic Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Acetone [b]	2C-4	Not analyzed. [c]
	Acrolein	2C-4	Not detected.
	Acrylonitrile	2C-4	Not detected.
	Ammonia	2C-4	Ammonia = 0.393 mg/L
	Ammonium Acetate	2C-4	Ammonia = 0.393 mg/L
	Ammonium Bicarbonate	2C-4	Ammonia = 0.393 mg/L
	Ammonium Biflouride	2C-4	Ammonia = 0.393 mg/L Fluoride = 0.201 mg/L
	Ammonium Carbonate	2C-4	Ammonia = 0.393 mg/L
	Ammonium Chloride	2C-4	Ammonia = 0.393 mg/L Residual Chlorine = 0.4 mg/L
	Ammonium Fluoride	2C-4	Ammonia = 0.393 mg/L Fluoride = 0.201 mg/L
	Ammonium Hydroxide	2C-4	Ammonia = 0.393 mg/L
	Ammonium Thiocyanate	2C-4	Ammonia = 0.393 mg/L
	Benzene [b]	2C-4	Not detected.
	Benzoic Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Beryllium Chloride	2C-4	Beryllium was not detected. Residual Chlorine = 0.4 mg/L
	Calcium Chloride	2C-4	Residual Chlorine = 0.4 mg/L
	Carbon Disulfide [b]	2C-3 & 2C-4	Not analyzed. [c]
	Carbon Tetrachloride [b]	2C-4	Not detected.
	Chlorine	2C-4	Residual Chlorine = 0.4 mg/L
	Chlorobenzene [b]	2C-4	Not detected.
	Chloroform	2C-4	1.5 mg/L
	Cresol [b]	2C-3 & 2C-4	Not analyzed. [c]
	Cupric Chloride	2C-4	Residual Chlorine = 0.4 mg/L Copper = 7.35 ug/L
	Dichlorobenzene	2C-4	Not detected.
	Dichloropropane	2C-4	Not detected.
	Dichloropropene	2C-4	Not detected.
	EDTA	2C-4	pH = 6.1 – 8.9 S.U.
	Ethylbenzene	2C-4	Not detected.
	Ferric Chloride	2C-4	Residual Chlorine = 0.4 mg/L
	Ferrous Ammonium Sulfate	2C-4	Iron = 49.3 ug/L, Ammonia = 0.393 mg/L, Sulfate = 51.0 mg/L
	Formic Acid	2C-4	pH = 6.1 – 8.9 S.U.

Table 5
Potential Pollutants by Source for Outfall 051

Source Description	POTENTIAL Toxic Pollutant and/or Hazardous Substances Table 2C-3 or 2C-4		Analytical Data Results from Operational Samples Collected for Outfall 051 [a]
	Hydrochloric Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Hydrofluoric Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Lead Nitrate	2C-4	Nitrate = 5.3 mg/L. Lead was not detected.
	Naphthalene	2C-4	Not detected
	Nitric Acid	2C-4	pH = 6.1 – 8.9 S.U. Nitrate = 5.3 mg/L
	Pentachlorophenol	2C-4	Not detected.
	Phosphoric Acid	2C-4	pH = 6.1 – 8.9 S.U. Total Phosphorus = 0.0692 mg/L
	Potassium Hydroxide	2C-4	pH = 6.1 – 8.9 S.U.
	Potassium permanganate	2C-4	Not analyzed. [c]
	Silver Nitrate	2C-4	Nitrate = 5.3 mg/L Silver was not detected.
	Sodium	2C-4	Not analyzed. [c]
	Sodium Fluoride	2C-4	Fluoride = 0.201 mg/L
	Sodium Hydroxide	2C-4	pH = 6.1 – 8.9 S.U.
	Sodium Hypochlorite	2C-4	Residual Chlorine = 0.4 mg/L
	Sodium Nitrite	2C-4	Nitrate = 5.3 mg/L
	Sodium Phosphate	2C-4	Total Phosphorus = 0.0692 mg/L
	Strontium	2C-3	Not analyzed. [c]
	Sulfuric Acid	2C-4	pH = 6.1 – 8.9 S.U.
	Toluene [b]	2C-4	Not detected.
	Trichloroethylene [b]	2C-4	Not detected.
	Uranium	2C-3	Not analyzed. [c]
	Uranyl Nitrate	2C-4	Nitrate = 5.3 mg/L.
	Vanadium	2C-3	Not analyzed. [c]
	Xylene [b]	2C-3	Not analyzed. [c]
	Zinc Acetate	2C-4	Zinc = 3.83 ug/L
	Zinc Chloride	2C-4	Residual Chlorine = 0.4 mg/L
	Zinc Nitrate	2C-4	Zinc = 3.83 ug/L Nitrate = 5.3 mg/L
	Zirconium	2C-3	Not analyzed. [c]

a. Results are from operational samples collected from the RLWTF Effluent Tanks. These samples are representative of the effluent after final treatment and the potential discharge to Outfall 051.
b. The potential pollutant was determined to not be associated with a "Listed" Resource Conservation and Recovery Act (RCRA) hazardous waste at the point of generation. This waste determination was documented with the associated waste stream profile form and in the waste characterization and tracking system database.
c. The potential pollutant was not analyzed because it is not specifically called out on the Form 2C.

EDTA = Ethylene Diamine Tetraacetic Acid

The safety data sheets associated with the chemicals used to treat water at the RLWTF are provided in Attachment E.

6.0 POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS [Section VI]

Section VI is not applicable to Outfall 051.

7.0 BIOLOGICAL TOXICITY TESTING DATA [Section VII]

Whole Effluent Toxicity (WET) 48-hr acute lethality was performed on September 24, 2018 to determine the results at a critical dilution of 100% using a dilution series of 32%, 42%, 56%, 75%, and 100%. The methods used in conducting these

tests followed the guidelines stablished by the EPA manual “Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition” (EPA-821-R-02-012). The WET including the following criteria as required by the permit:

- Daphnia pulex, 3-hr composite, 1/3 months

The WET test results indicated that the effluent from Outfall 051 passed the test for Daphnia pulex .

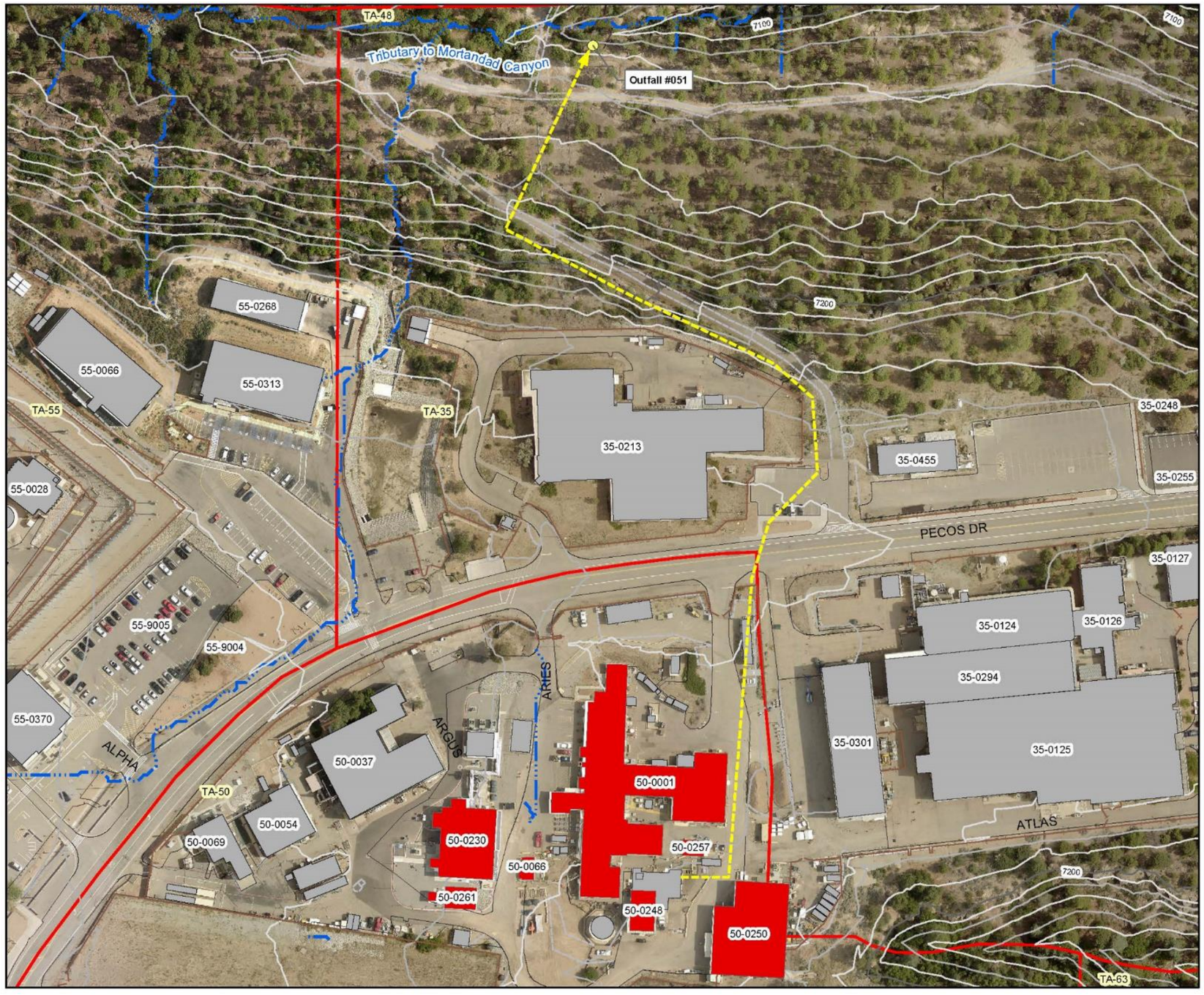
8.0 CONTRACT ANALYSIS INFORMATION [Section VIII]

Operational samples from the RWLTF effluent were collected on September 26, 2018 for the Form 2C constituents required by the permit application forms. These samples were submitted to independent laboratories as summarized in Table 6.

Table 6
List of Independent Laboratories Used for NPDES Water Analysis

Laboratory Name	Address and Contact Info	Analytes
GEL Laboratories LLC	2040 Savage Road Charleston SC 29407 (843) 556-8171	Biological Oxygen Demand, General Chemistry, Pesticides, Polychlorinated Biphenyls, Radiochemistry, Semi-volatile Organic Compounds, Total Metals, Total Suspended Solids, Volatile Organic Compounds
New Mexico Water Testing Laboratory, Inc.	401 North Coronado Ave Espanola, NM 87532 (505) 929-4545	E.coli
Cape Fear Analytical LLC	3306 Kitty Hawk Road Suite 120 Wilmington, NC 28405 (910) 795-0421	TCDD (Dioxin)
Pacific EcoRisk	2250 Cordelia Rd. Fairfield, CA 94534 (707) 207-7760	Whole Effluent Toxicity

ATTACHMENT A: Location Maps for the Radioactive Liquid Waste Treatment Facility Buildings, Collection System and Outfall 051



NPDES Permit Re-Application Project
TA-50 Buildings:
1, 66, 230, 248, 250, 257, 261
Outfall #051

Legend

- NPDES Outfall
- Springs
- Drainages
- 100ft Contours
- 20ft Contours
- 10ft Contours
- Fences
- Dirt Roads
- Paved Roads
- Source Structures
- Building Served by Source
- Structures
- LANL Boundary
- Technical Areas

N

Feet
0 45 90 180 270 360

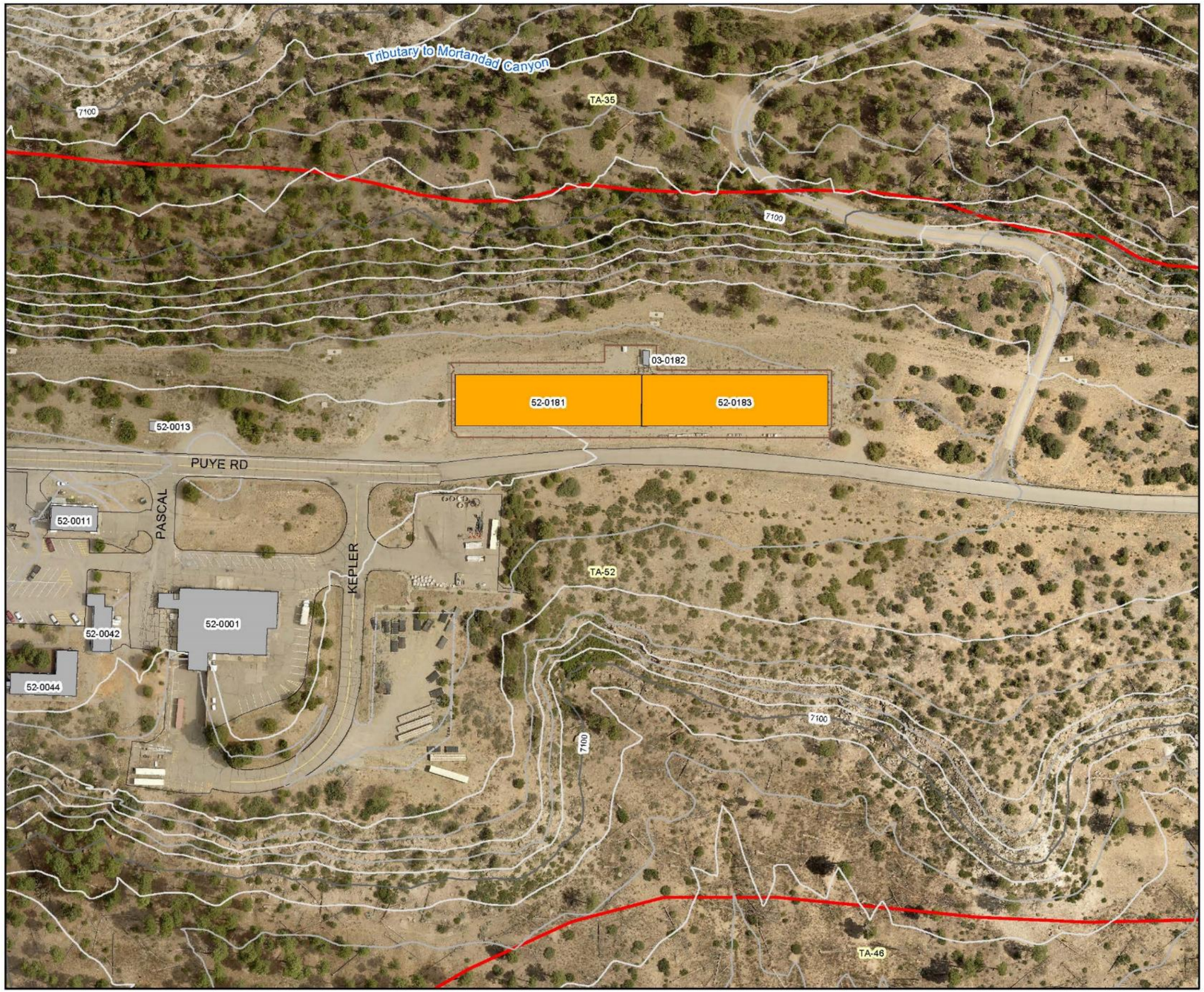
0 12.5 25 50 75 100
Meters

1:1,500

State Plane Coordinate System
New Mexico, Central Zone, US Feet
NAD 1983 Datum, NGVD 1929

Map Updated By: Bethann McVicker, IF-PROG
Map #18-129-08 05 February 2019

Disclaimer: This map was created for work processes associated with the Water Quality & RCRA. All other uses for this map should be confirmed with LANL EPC-RCRA staff.



TA-52 Solar Evaporation Tanks
Buildings: 181, 183

Legend

- NPDES Outfall
- Springs
- Drainages
- 100ft Contours
- 20ft Contours
- 10ft Contours
- Fences
- Dirt Roads
- Paved Roads
- Source Structures
- Building Served by Source
- Solar Evaporation Tanks
- Structures
- LANL Boundary
- Technical Areas

N

Feet
0 45 90 180 270 360

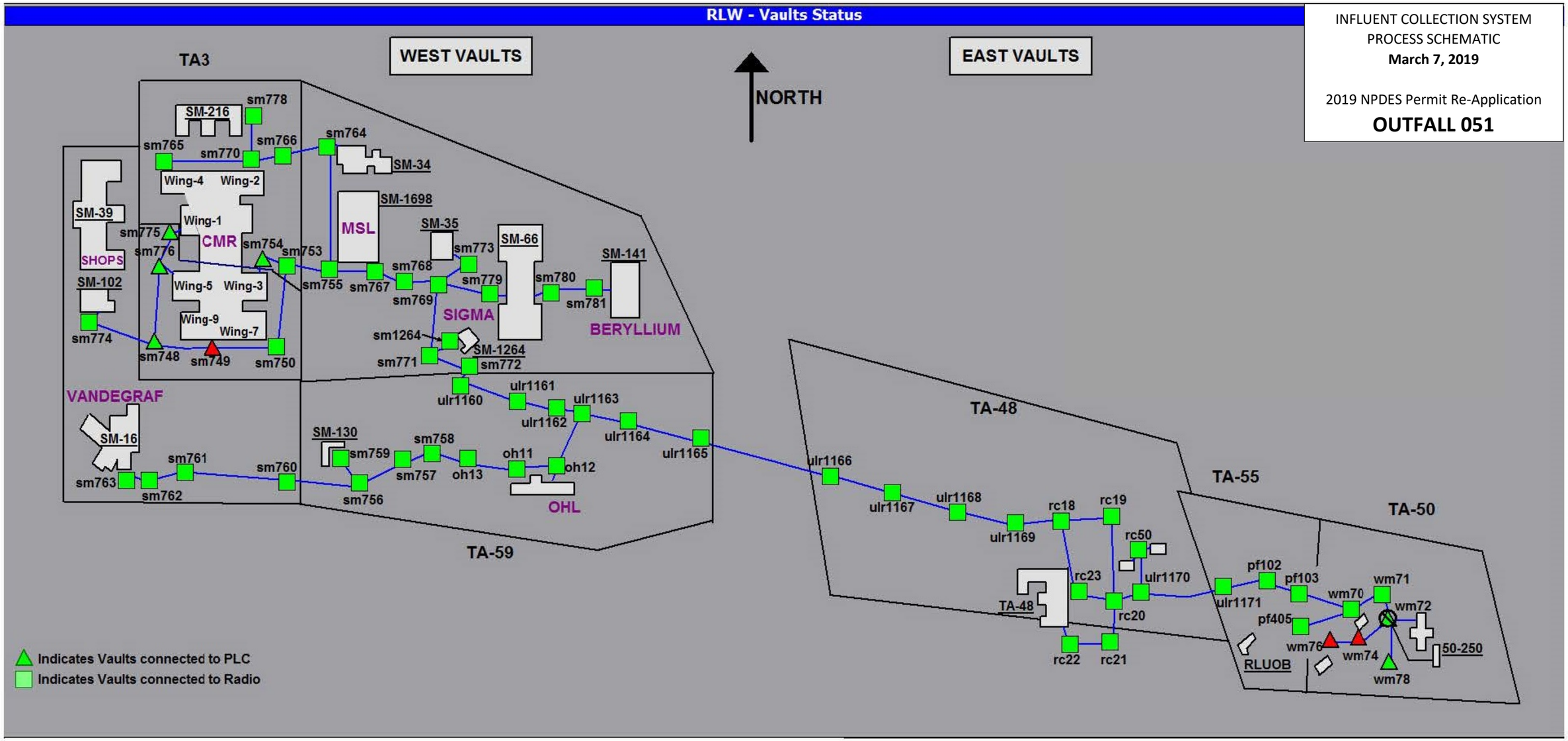
0 12.5 25 50 75 100
Meters

1:1,500

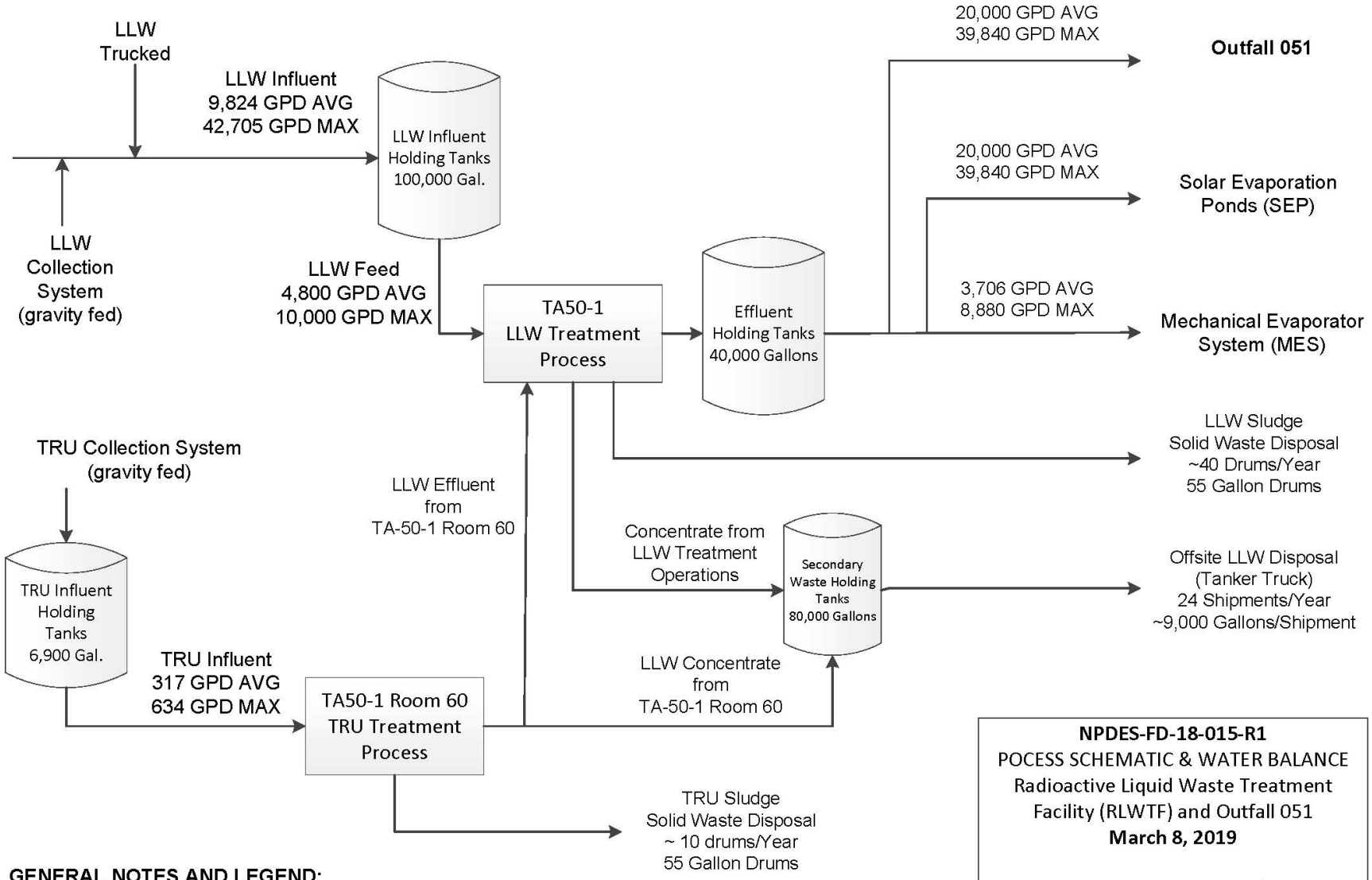
State Plane Coordinate System
New Mexico, Central Zone, US Feet
NAD 1983 Datum, NGVD 1929

Map Updated By: Bethann McVicker, IF-PROG
Map #18-129-26 05 February 2019

Disclaimer: This map was created for work processes associated with the Water Quality & RCRA. All other uses for this map should be confirmed with LANL EPC-RCRA staff.

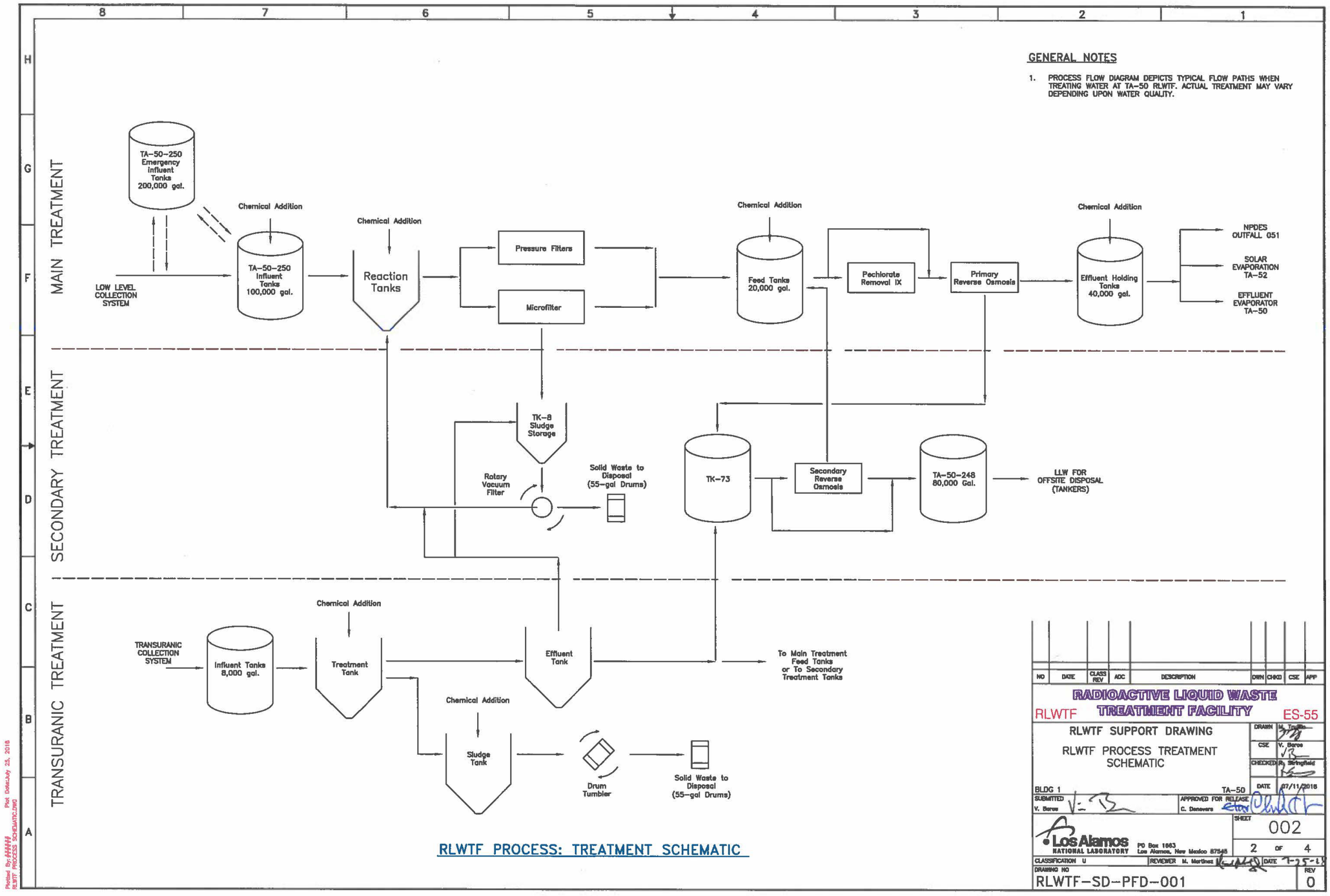

RLW - Vaults Status
INFLUENT COLLECTION SYSTEM
PROCESS SCHEMATIC
March 7, 2019
2019 NPDES Permit Re-Application
OUTFALL 051
TA3
WEST VAULTS
EAST VAULTS
NORTH
SM-216
sm778
sm765
sm770
sm766
sm764
SM-34
Wing-4
Wing-2
SM-1698
SM-39
Wing-1
MSL
SM-35
SM-66
SM-141
sm775
CMR
sm754
sm753
sm773
SHOPS
sm776
sm768
sm780
SM-102
Wing-5
Wing-3
sm755
sm767
sm779
sm781
sm769
SIGMA
BERYLLIUM
Wing-9
Wing-7
sm1264
sm774
SM-1264
sm748
sm749
sm750
sm771
sm772
ulr1161
ulr1160
ulr1163
VANDEGRAF
ulr1162
ulr1164
SM-130
sm758
ulr1165
SM-16
sm759
oh11
ulr1166
sm761
sm760
oh13
oh12
sm763
sm757
sm762
sm756
OHL
TA-48
TA-59
ulr1167
ulr1168
rc18
rc19
TA-55
TA-50
ulr1169
rc50
rc23
ulr1170
pf102
pf103
wm71
TA-48
ulr1171
wm70
wm72
rc20
pf405
50-250
wm76
wm74
rc22
rc21
RLUOB
wm78
Indicates Vaults connected to PLC
Indicates Vaults connected to Radio

ATTACHMENT B: Process Schematics and Water Balances



GENERAL NOTES AND LEGEND:

- Low level waste (LLW) influent is treated in batches.
- Transuranic (TRU) influent is transferred in 106 gallon/400 Liter batches over 4 hours. No more than 3 transfers is performed in a single day.


8
7
6
5
4
3
2
1
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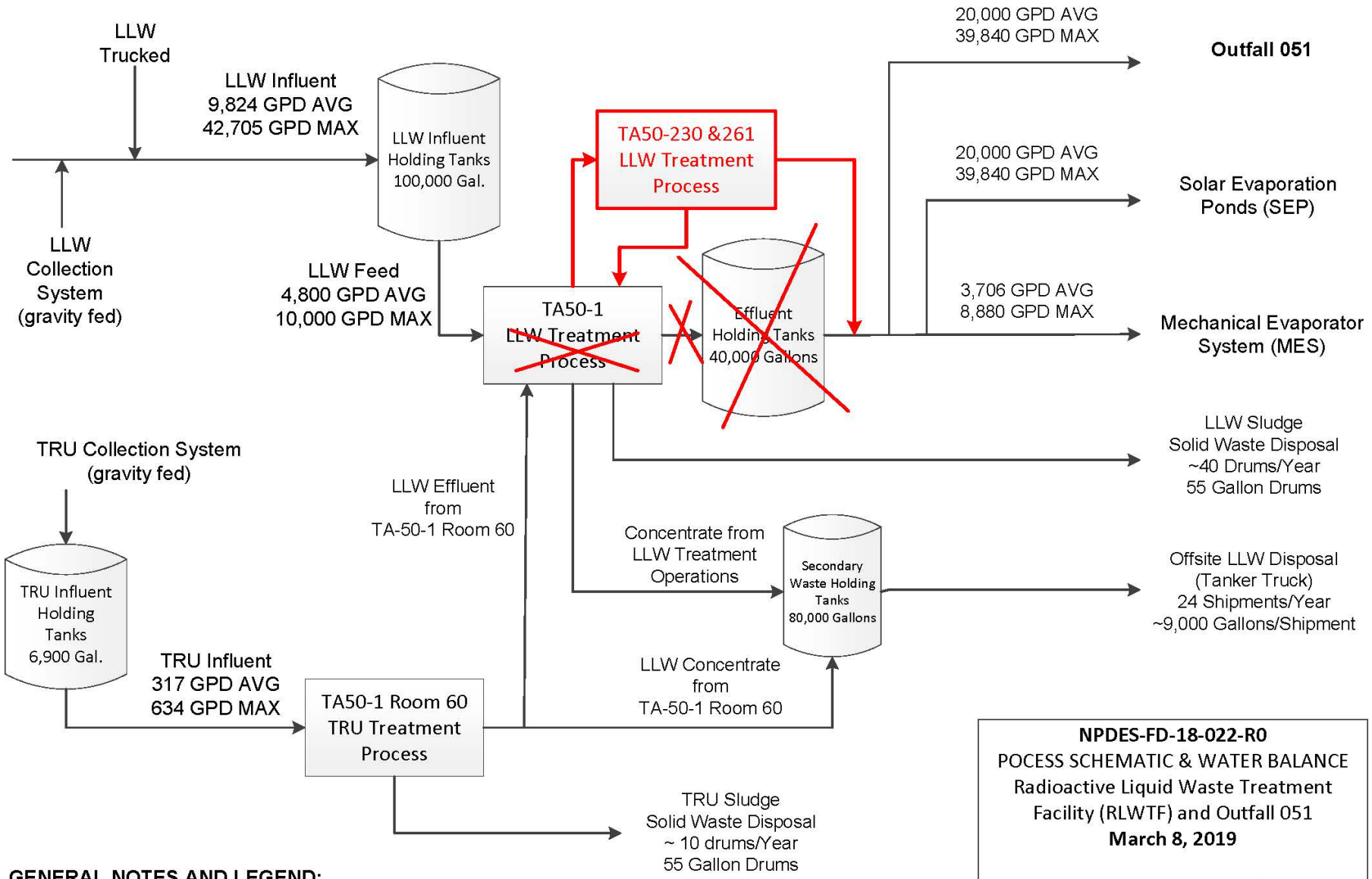
G
F
E
D
C
B
A
MAIN TREATMENT
SECONDARY TREATMENT
TRANSURANIC TREATMENT
GENERAL NOTES
1. PROCESS FLOW DIAGRAM DEPICTS TYPICAL FLOW PATHS WHEN TREATING WATER AT TA-50 RLWTF. ACTUAL TREATMENT MAY VARY DEPENDING UPON WATER QUALITY.
TA-50-250 Emergency Influent Tanks 200,000 gal.
LOW LEVEL COLLECTION SYSTEM
Chemical Addition
TA-50-250 Influent Tanks 100,000 gal.
Chemical Addition
Reaction Tanks
Pressure Filters
Microfilter
Chemical Addition
Feed Tanks 20,000 gal.
Pechlorate Removal IX
Primary Reverse Osmosis
Chemical Addition
Effluent Holding Tanks 40,000 gal.
NPDES OUTFALL 051
SOLAR EVAPORATION TA-52
EFFLUENT EVAPORATOR TA-50
TK-8 Sludge Storage
Rotary Vacuum Filter
Solid Waste to Disposal (55-gal Drums)
TK-73
Secondary Reverse Osmosis
TA-50-248 80,000 Gal.
LLW FOR OFFSITE DISPOSAL (TANKERS)
TRANSURANIC COLLECTION SYSTEM
Influent Tanks 8,000 gal.
Chemical Addition
Treatment Tank
Effluent Tank
To Main Treatment Feed Tanks or To Secondary Treatment Tanks
Chemical Addition
Sludge Tank
Drum Tumbler
Solid Waste to Disposal (55-gal Drums)
RLWTF PROCESS: TREATMENT SCHEMATIC
NO DATE CLASS REV ADC DESCRIPTION DWN CHKD CSE APP
RADIOACTIVE LIQUID WASTE TREATMENT FACILITY
RLWTF ES-55
RLWTF SUPPORT DRAWING
RLWTF PROCESS TREATMENT SCHEMATIC
BLDG 1 TA-50
DRAWN M. Trujillo
CSE V. Beros
CHECKED R. Stringfield
DATE 07/11/2016
SUBMITTED V. Beros
APPROVED FOR RELEASE C. Denevara
Los Alamos NATIONAL LABORATORY PO Box 1663 Los Alamos, New Mexico 87545
SHEET 002
2 OF 4
CLASSIFICATION U
REVIEWER M. Martinez
DATE 7-25-16
DRAWING NO RLWTF-SD-PFD-001
REV 0
Plotted By: ##### Plot Date: July 25, 2016
RLWTF PROCESS SCHEMATIC.DWG



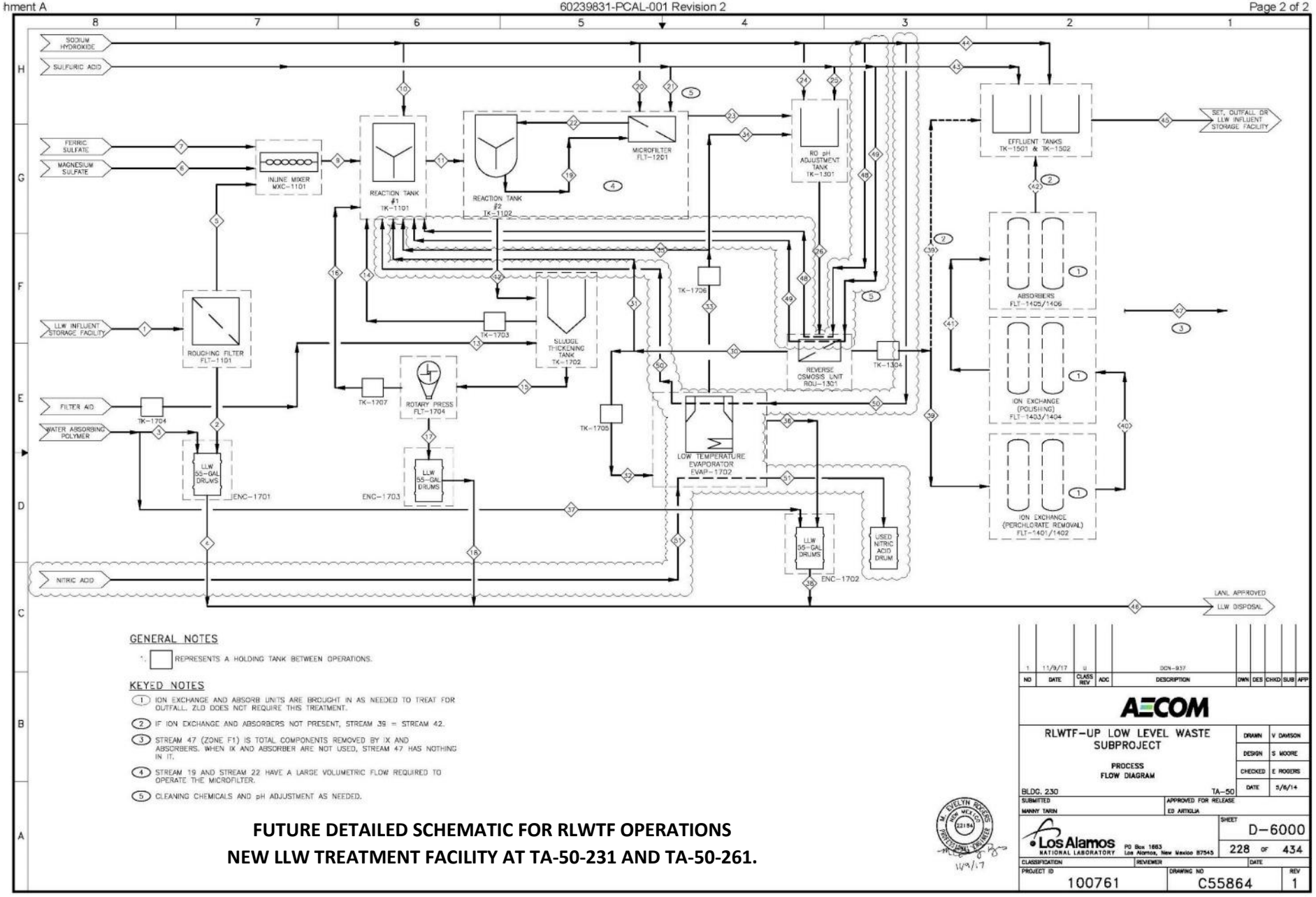
NPDES-FD-18-022-R0
POCESS SCHEMATIC & WATER BALANCE
Radioactive Liquid Waste Treatment Facility (RLWTF) and Outfall 051
March 8, 2019

2019 NPDES Permit Re-Application
OUTFALL 051

GENERAL NOTES AND LEGEND:

- Low level waste (LLW) influent is treated in batches.
- Transuranic (TRU) influent is transferred in 106 gallon/400 Liter batches over 4 hours. No more than 3 transfers is performed in a single day.

hment A 60239831-PCAL-001 Revision 2 Page 2 of 2



GENERAL NOTES

1. ☐ REPRESENTS A HOLDING TANK BETWEEN OPERATIONS.

KEYED NOTES

(1) ION EXCHANGE AND ABSORB UNITS ARE BROUGHT IN AS NEEDED TO TREAT FOR OUTFALL. ZLD DOES NOT REQUIRE THIS TREATMENT.

(2) IF ION EXCHANGE AND ABSORBERS NOT PRESENT, STREAM 39 = STREAM 42.

(3) STREAM 47 (ZONE F1) IS TOTAL COMPONENTS REMOVED BY IX AND ABSORBERS. WHEN IX AND ABSORBER ARE NOT USED, STREAM 47 HAS NOTHING IN IT.

(4) STREAM 19 AND STREAM 22 HAVE A LARGE VOLUMETRIC FLOW REQUIRED TO OPERATE THE MICROFILTER.

(5) CLEANING CHEMICALS AND pH ADJUSTMENT AS NEEDED.

NO	DATE	CLASS REV	ADC	DESCRIPTION	DWN	DES	CHKD	SUB	APP
1	11/9/17	U		DCN-937					

AECOM

RLWTF-UP LOW LEVEL WASTE SUBPROJECT

PROCESS FLOW DIAGRAM

DRAWN V DAVISON | DESIGN S MOORE | CHECKED E ROGERS | DATE 5/8/14

BLDG. 230 TA-50

SUBMITTED MANNY TARIN | APPROVED FOR RELEASE ED ARTIGLIA

Los Alamos NATIONAL LABORATORY PO Box 1663 Los Alamos, New Mexico 87545

SHEET D-6000 228 OF 434

CLASSIFICATION | REVIEWER | DATE

PROJECT ID 100761 | DRAWING NO C55864 | REV 1

FUTURE DETAILED SCHEMATIC FOR RLWTF OPERATIONS
NEW LLW TREATMENT FACILITY AT TA-50-231 AND TA-50-261.

ATTACHMENT C: Photographs

Photograph ID No.	Photograph Title
NPDES-051-19-001	Location of the Radioactive Liquid Waste Treatment Facility, Mechanical Evaporator System (MES), Solar Evaporation Tanks (SET), and Outfall 051
NPDES-051-18-003	Main LLW Treatment - Influent Tanks and Emergency Storage
NPDES-051-18-004	Main LLW Treatment – Reaction Tanks
NPDES-051-18-005	Main LLW Treatment – Pressure Filters
NPDES-051-18-006	Main LLW Treatment – Microfilter
NPDES-051-18-007	Main LLW Treatment – Ion Exchange/Reverse Osmosis Feed Tank TK9
NPDES-051-18-008	Main LLW Treatment – Ion Exchange Tanks
NPDES-051-18-009	Main LLW Treatment – Primary Reverse Osmosis
NPDES-051-18-010	Main LLW Treatment – Effluent Holding Tanks
NPDES-051-18-011	Main LLW Treatment – NPDES Outfall 051
NPDES-051-18-012	Main LLW Treatment – Mechanical Evaporation System (MES) at TA-50-257
NPDES-051-18-013	Main LLW Treatment – Solar Evaporation Tanks (SET) at TA-52-181 and 183
NPDES-051-18-014	Secondary Treatment – Sludge Tank
NPDES-051-18-015	Secondary Treatment – Rotarty Vacuum Filter
NPDES-051-18-016	Secondary Treatment – Secondary Feed Tank
NPDES-051-18-017	Secondary Treatment – Secondary Reverse Osmosis
NPDES-051-18-018	Secondary Treatment – Bottoms Holding Tanks at TA-50-248
NPDES-051-18-019	TRU Treatment – Influent Tanks at TA-50-66
NPDES-051-18-020	TRU Treatment – Treatment Tanks TK1 and TK2
NPDES-051-18-021	TRU Treatment – Pressure Filter
NPDES-051-18-022	TRU Treatment – Effluent Tank TK3
NPDES-051-18-023	TRU Treatment – Sludge Treatment Tank TK7A
NPDES-051-18-024	TRU Treatment – Drum Tumbler

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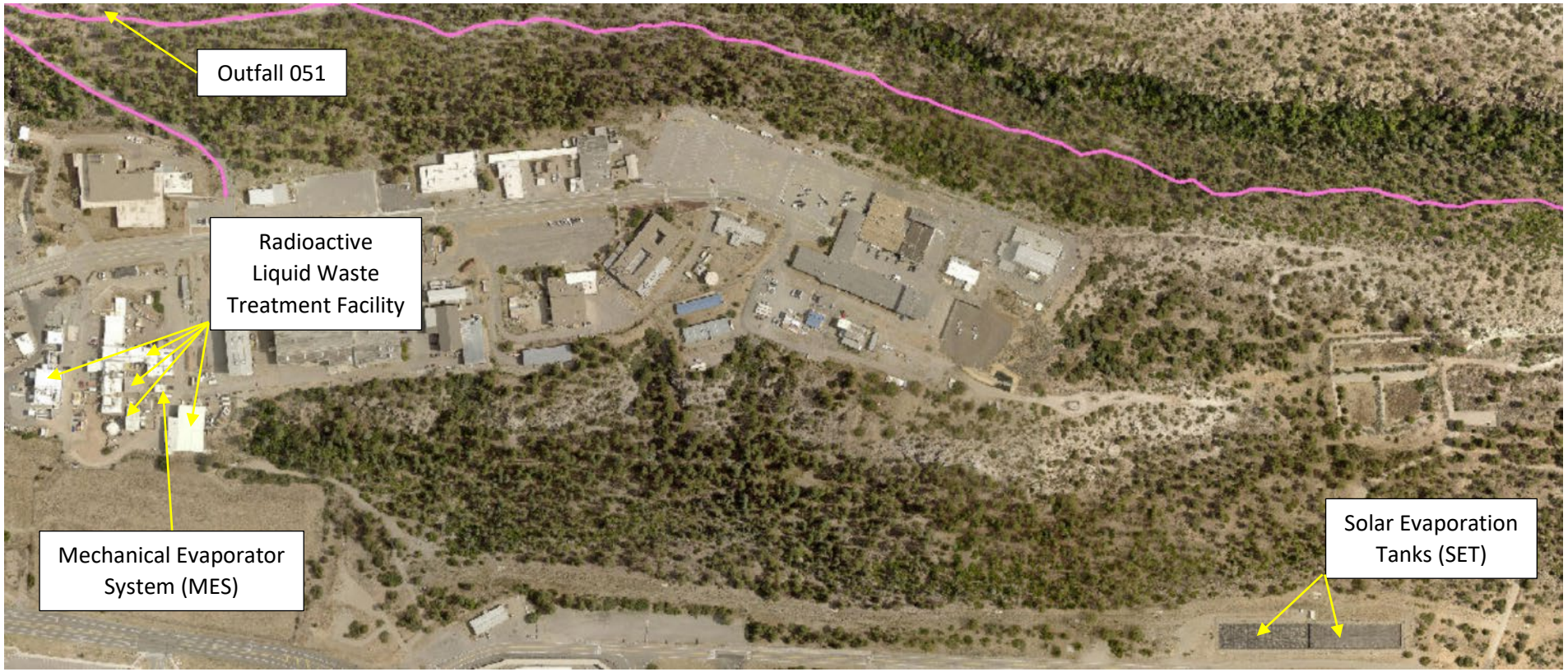


Photograph - NPDES-051-19-001
Location of the Radioactive Liquid Waste Treatment Facility, Mechanical Evaporator System (MES), Solar Evaporation Tanks (SET), and Outfall 051

Photograph - NPDES-051-18-003
Main LLW Treatment - Influent Tanks and Emergency Storage

Photograph - NPDES-051-18-004
Main LLW Treatment – Reaction Tanks

Photograph - NPDES-051-18-005
Main LLW Treatment – Pressure Filters

Photograph - NPDES-051-18-006
Main LLW Treatment – Microfilter

Photograph - NPDES-051-18-007
Main LLW Treatment – Ion Exchange/Reverse Osmosis Feed Tank TK9

Photograph - NPDES-051-18-008
Main LLW Treatment – Ion Exchange Tanks

Photograph - NPDES-051-18-009
Main LLW Treatment – Primary Reverse Osmosis

Photograph - NPDES-051-18-0010
Main LLW Treatment – Effluent Holding Tanks

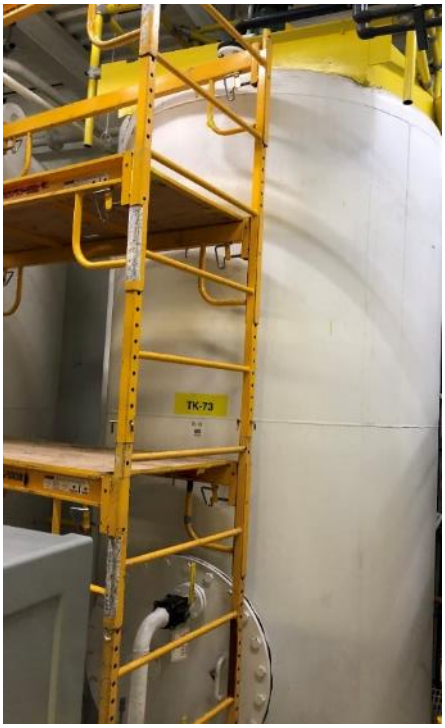
Photograph - NPDES-051-18-011
Main LLW Treatment – NPDES Outfall 051

Photograph - NPDES-051-18-012
Main LLW Treatment – Mechanical Evaporation System (MES) at TA-50-257

Photograph - NPDES-051-18-013
Main LLW Treatment – Solar Evaporation Tanks (SET) at TA-52-181 and 183

Photograph - NPDES-051-18-014
Secondary Treatment – Sludge Tank

Photograph - NPDES-051-18-015
Secondary Treatment – Rotarty Vacuum Filter



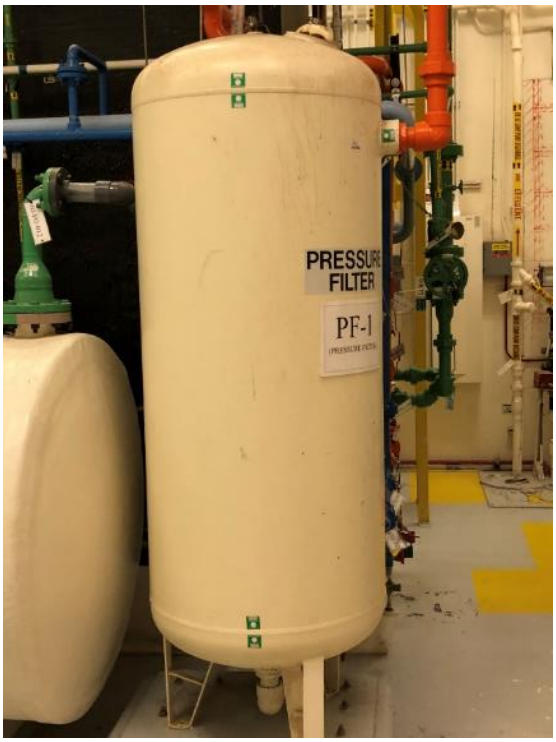
Photograph - NPDES-051-18-016
Secondary Treatment – Secondary Feed Tank

Photograph - NPDES-051-18-017
Secondary Treatment – Secondary Reverse Osmosis

Photograph - NPDES-051-18-018
Secondary Treatment – Bottoms Holding Tanks at TA-50-248

Photograph - NPDES-051-18-019
TRU Treatment – Influent Tanks at TA-50-66

Photograph - NPDES-051-18-020
TRU Treatment – Treatment Tanks TK1 and TK2



Photograph - NPDES-051-18-021
TRU Treatment – Pressure Filter

Photograph - NPDES-051-18-022
TRU Treatment – Effluent Tank TK3

Photograph - NPDES-051-18-023
TRU Treatment – Sludge Treatment Tank TK7A

Photograph - NPDES-051-18-024
TRU Treatment – Drum Tumbler

ATTACHMENT D: Safety Data Sheets

LIST OF SAFETY DATA SHEETS
EDTA
Ferric Sulfate
Hydrochloric Acid
Magnesium Hydroxide
Magnesium Sulfate
SIR-110
Sodium Bisulfite
Sodium Hydroxide 25%
Sulfuric Acid
WEST W-126
Bright Dyes FLT Yellow-Green Liquid
Bright Dyes FLT Yellow-Green Tablet

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EDTA

SIGMA-ALDRICH

sigma-aldrich.com

SAFETY DATA SHEET

Version 4.13
Revision Date 06/17/2018
Print Date 07/14/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Ethylenediaminetetraacetic acid

Product Number : E9884
Brand : Sigma-Aldrich
Index-No. : 607-429-00-8

CAS-No. : 60-00-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

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

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Eye irritation (Category 2A), H319

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H319 Causes serious eye irritation.

Precautionary statement(s)
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/ eye protection/ face protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313 If eye irritation persists: Get medical advice/ attention.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Edathamil

(Ethylenedinitrilo)tetraacetic acid
Ethylenedinitrilotetraacetic acid
EDTA

Formula	:	$C_{10}H_{16}N_2O_8$
Molecular weight	:	292.24 g/mol
CAS-No.	:	60-00-4
EC-No.	:	200-449-4
Index-No.	:	607-429-00-8
Registration number	:	01-2119486399-18-XXXX

Hazardous components

Component	Classification	Concentration
Edetic acid		
	Eye Irrit. 2A; H319	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

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

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: white
b)	Odour	odourless
c)	Odour Threshold	No data available
d)	pH	2.5 at 10 g/l at 23 °C (73 °F)
e)	Melting point/freezing point	Melting point/range: 250 °C (482 °F) - dec.
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.46 g/cm3 at 20 °C (68 °F)
n)	Water solubility	0.4 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 8.85 - 10.44 at 20 °C (68 °F)
p)	Auto-ignition temperature	> 400 °C (> 752 °F) at 1,013 hPa (760 mmHg)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Dissociation constant	8.85 - 10.44 at 20 °C (68 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx)
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 4,500 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation

Respiratory or skin sensitisation
Maximisation Test - Rabbit
Result: Does not cause skin sensitisation.

Germ cell mutagenicity
No data available

Carcinogenicity

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: AH4025000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 41 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 625 mg/l - 48 h

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus - 28 d - 80 µg/l Bioconcentration factor (BCF): 1.8

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
May be harmful to aquatic organisms due to the shift of the pH. Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Edetic acid)
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Edetic acid	60-00-4	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Edetic acid	60-00-4	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Edetic acid	60-00-4	2007-03-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Eye Irrit.	Eye irritation
H319	Causes serious eye irritation.

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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

Version: 4.13 Revision Date: 06/17/2018 Print Date: 07/14/2018

FERRIC SULFATE

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Univar
3075 Highland Pkwy STE 200
Downers Grove, IL 60515
425-889-3400

SAFETY DATA SHEET

1. Identification

Product identifier: FERRIC SULFATE 50%

Other means of identification

SDS number: 000100000813

Recommended use and restriction on use

Recommended use: Not available.

Restrictions on use: Not known.

Emergency telephone number:For emergency assistance Involving chemicals

call CHEMTREC day or night at: 1-800-424-9300. CHEMTREC INTERNATIONAL Tel# 703-527-3887

2. Hazard(s) identification

Hazard classification

Health hazards

Acute toxicity (Oral)	Category 4
Skin corrosion/irritation	Category 1A
Serious eye damage/eye irritation	Category 1
Carcinogenicity	Category 1A
Environmental hazards Acute hazards to the aquatic environment	Category 3

Label elements

Hazard symbol

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

Signal word	Danger
Hazard statement	Corrosive. Harmful if swallowed. Causes severe skin burns and eye damage. May cause cancer. Harmful to aquatic life.
Precautionary statement	
Prevention	Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust or mists. Wear protective gloves/protective clothing/eye protection/face protection. 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 INHALED: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. IF SWALLOWED: Call a POISON CENTER/doctor/ if you feel unwell. Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/doctor. Specific treatment (see this label). Wash contaminated clothing before reuse.
Storage	Store in a closed container. Store locked up.
Disposal	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

UNIVAR®

Other hazards which do not result in GHS classification	None.

3. Composition/information on ingredients

Substances

Chemical identity	Common name and synonyms	CAS number	Content in percent (%)*
Sulfuric acid, iron(3+) salt (3:2)	, Ferric Sulfate	10028-22-5	50%
Sulfuric Acid		7664-93-9	1%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Ingestion:	Do NOT induce vomiting. Never give liquid to an unconscious person. Get medical attention immediately.
Inhalation:	Move to fresh air. If breathing is difficult, give oxygen. Perform artificial respiration if breathing has stopped.
Skin contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Eye contact:	If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

Most important symptoms/effects, acute and delayed

Symptoms: No data available.

Indication of immediate medical attention and special treatment needed

Treatment: No data available.

5. Fire-fighting measures

General fire hazards: No data available.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use: Foam. Carbon dioxide or dry powder.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

Unsuitable extinguishing media:	No data available.
Specific hazards arising from the chemical:	No data available.
Special protective equipment and precautions for firefighters	
Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	No data available.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	No data available.
Methods and material for containment and cleaning up:	Absorb spillage with non-combustible, absorbent material. Dike for later disposal.

7. Handling and storage

Precautions for safe handling:	Avoid contact with eyes, skin, and clothing. Avoid breathing mists or vapors. Store away from incompatible materials. Use only with adequate ventilation.
Conditions for safe storage, including any incompatibilities:	No data available.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Chemical identity	Type	Exposure Limit values	Source
Sulfuric acid, iron(3+) salt (3:2) - as Fe	TWA	1 mg/m3	US. ACGIH Threshold Limit Values (03 2013)
	REL	1 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	TWA	1 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	TWA	1 mg/m3	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (06 2008)
Sulfuric acid, iron(3+) salt (3:2) - Particulate.	AN ESL	1 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013)
	ST ESL	10 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013)
Sulfuric acid, iron(3+) salt (3:2) - as Fe	TWA PEL	1 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (02 2012)
Sulfuric Acid - Thoracic fraction.	TWA	0.2 mg/m3	US. ACGIH Threshold Limit Values (03 2013)
Sulfuric Acid	REL	1 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	1 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	TWA	1 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	TWA	1 mg/m3	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (06 2008)
	TWA PEL	0.1 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (02 2012)
	STEL	3 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

			Contaminants (02 2012)

Appropriate engineering controls No data available.

Individual protection measures, such as personal protective equipment

General information: No data available.
Eye/face protection: No data available.
Skin protection
Hand protection: No data available.
Other: No data available.
Respiratory protection: No data available.
Hygiene measures: No data available.

9. Physical and chemical properties

Physical state:	Liquid
Form:	No data available.
Color:	No data available.
Odor:	No data available.
Odor threshold:	No data available.
pH:	< 2
Melting point/freezing point:	No data available.
Initial boiling point and boiling range:	No data available.
Flash Point:	No data available.
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	No data available.
Relative density:	No data available.
Solubility(ies)	
Solubility in water:	No data available.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	No data available.
Chemical stability:	No data available.
Possibility of hazardous reactions:	No data available.
Conditions to avoid:	No data available.
Incompatible materials:	No data available.
Hazardous decomposition products:	No data available.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Ingestion:	No data available.
Inhalation:	No data available.
Skin contact:	No data available.
Eye contact:	No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: ATEmix (): 507.627907 mg/kg

Dermal

Product: ATEmix (): 2,000 mg/kg

Inhalation

Product: No data available.

Specified substance(s):

Sulfuric Acid — LC 50 (Rat,): 375 mg/m3 (, No) 2 (reliable with restrictions)

Repeated dose toxicity

Product: No data available.

Skin corrosion/irritation

Product: No data available.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

Serious eye damage/eye irritation
Product: No data available.
Respiratory or skin sensitization
Product: No data available.
Carcinogenicity
Product: No data available.
IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

Sulfuric Acid	Overall evaluation: 1. Carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens:

Sulfuric Acid	Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified
Germ cell mutagenicity
In vitro
Product: No data available.
In vivo
Product: No data available.
Reproductive toxicity
Product: No data available.
Specific target organ toxicity - single exposure
Product: No data available.
Specific target organ toxicity - repeated exposure
Product: No data available.
Aspiration hazard
Product: No data available.
Other effects: No data available.

12. Ecological information

Ecotoxicity:
Acute hazards to the aquatic environment:
Fish
Product: No data available.
Specified substance(s):

Sulfuric acid, iron(3+) salt (3:2)	LC 50 (Western mosquitofish (Gambusia affinis), 24 h): 37.2 mg/l Mortality LC 50 (Western mosquitofish (Gambusia affinis), 48 h): 37.2 mg/l Mortality LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 37.2 mg/l Mortality

Sulfuric Acid	LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 42 mg/l Mortality

Aquatic invertebrates

Product:	No data available.

Chronic hazards to the aquatic environment:

Fish

Product:	No data available.

Aquatic invertebrates

Product:	No data available.

Toxicity to Aquatic Plants

Product:	No data available.

Persistence and degradability

Biodegradation

Product:	No data available.

BOD/COD ratio

Product:	No data available.

Bioaccumulative potential

Bioconcentration factor (BCF)

Product:	No data available.

Partition coefficient n-octanol / water (log Kow)

Product:	No data available.
Mobility in soil:	No data available.

Known or predicted distribution to environmental compartments

Diiron tris(sulphate)	No data available.
Sulphuric acid	No data available.

Known or predicted distribution to environmental compartments

Water	No data available.

13. Disposal considerations

Disposal instructions:	No data available.
Contaminated packaging:	No data available.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

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14. Transport information

DOT

UN number:	UN 3264
UN proper shipping name:	Corrosive liquid, acidic, inorganic, n.o.s.
Transport hazard class(es)	
Class:	8
Label(s):	8
Packing group:	III
Marine Pollutant:	Not regulated.
Special precautions for user:	–

IMDG

UN number:	UN 3264
UN proper shipping name:	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
Transport hazard class(es)	
Class:	8
Label(s):	8
EmS No.:	F-A, S-B
Packing group:	III
Marine Pollutant:	Not regulated.
Special precautions for user:	–

IATA

UN number:	UN 3264
Proper Shipping Name:	Corrosive liquid, acidic, inorganic, n.o.s.
Transport hazard class(es):	
Class:	8
Label(s):	8
Packing group:	III
Environmental hazards	Not regulated.
Special precautions for user:	–
Other information	
Passenger and cargo aircraft:	Allowed.

15. Regulatory information

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

US federal regulationsUS. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Sulfuric acid, iron(3+) salt (3:2)	Reportable quantity: 1000 lbs.
Sulfuric Acid	Reportable quantity: 1000 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

Not listed.

SARA 302 Extremely hazardous substance

Chemical identity	RQ	Threshold Planning Quantity
Sulfuric Acid	1000 lbs.	1000 lbs.

SARA 304 Emergency release notification

Chemical identity	RQ
Sulfuric acid, iron(3+) salt (3:2)	1000 lbs.
Sulfuric Acid	1000 lbs.

SARA 311/312 Hazardous chemical

Chemical identity	Threshold Planning Quantity
Sulfuric Acid	500lbs
Sulfuric acid, iron(3+) salt (3:2)	500 lbs

SARA 313 (TRI reporting)

Chemical identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
Sulfuric Acid	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Sulfuric acid, iron(3+) salt (3:2)	Reportable quantity: 1000 lbs.
Sulfuric Acid	Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

Sulfuric Acid	Threshold quantity: 10000 lbs

US state regulations

US. California Proposition 65

Sulfuric Acid	Carcinogenic.

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

US. New Jersey Worker and Community Right-to-Know Act

Sulfuric acid, iron(3+) salt (3:2)	Listed

US. Massachusetts RTK - Substance List

Sulfuric acid, iron(3+) salt (3:2)	Listed
Sulfuric Acid	Listed

US. Pennsylvania RTK - Hazardous Substances

Sulfuric acid, iron(3+) salt (3:2)	Listed

US. Rhode Island RTK

Sulfuric acid, iron(3+) salt (3:2)	Listed

UNIVAR USA INC.
ISSUE DATE:2015-06-01
Annotation:

SDS NO:10000813
VERSION:001 2016-03-01

Version: 1.0
Revision date: 06/01/2015

Inventory Status: Australia AICS:	Not in compliance with the inventory.
Canada DSL Inventory List:	Not in compliance with the inventory.
EU EINECS List:	Not in compliance with the inventory.
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	Not in compliance with the inventory.
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	Not in compliance with the inventory.
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	Not in compliance with the inventory.
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	Not in compliance with the inventory.
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

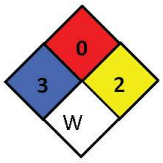
16.Other information, including date of preparation or last revision

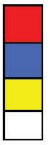
HMIS Hazard ID

K - Hood, Gloves, Protective Suit & Boots

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; *Chronic health effect

NFPA Hazard ID





Flammability
Health
Reactivity
Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
W: Water-reactive

Issue date:	06/01/2015
Revision date:	No data available.
Version #:	1.0
Further information:	No data available.

HYDROCHLORIC ACID

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Version: 4.4
Revision Date: 03-08-2018

SAFETY DATA SHEET

According to US Regulation 29 CFR 1910.1200 (HazCom 2012)

1. Identification

Product identifier: Hydrochloric Acid

Other means of identification

Synonyms: Muriatic Acid, Hydrogen Chloride, Aqueous
Product No.: 9385, 9538, 9165, V226, V187, V078, V001, 6900, 2624, 2515, H999, H987, H616, 5861, 2062, 5814, 2626, 2612, 5800, 9625, 5587, 9551, 9544, 9539, 9535, 9530, 9529, 5367, H613, 37825, 25496, 20620, 9553

Recommended restrictions

Recommended use: For Laboratory, Research or Manufacturing Use.
Restrictions on use: Not determined.

Details of the supplier of the safety data sheet

Manufacturer

Company Name:	Avantor Performance Materials, LLC.
Address:	3477 Corporate Parkway Center Valley, PA 18034
Telephone:	Customer Service: 855-282-6867
Fax:	610-573-2610
Contact Person:	Environmental Health & Safety
E-mail:	info@avantormaterials.com

Emergency telephone number:
CHEMTREC: 1-800-424-9300 within US and Canada

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metal	Category 1

Health Hazards

Acute toxicity (Oral)	Category 4
Skin Corrosion/Irritation	Category 1A
Serious Eye Damage/Eye Irritation	Category 1
Specific Target Organ Toxicity - Single Exposure	Category 3[1.]

Target Organs

1. Respiratory tract irritation.

Unknown toxicity - Health

Acute toxicity, oral	0 %
Acute toxicity, dermal	0 %

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Version: 4.4
Revision Date: 03-08-2018

Acute toxicity, inhalation, vapor	30 %
Acute toxicity, inhalation, dust or mist	30 %

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement:
May be corrosive to metals.
Harmful if swallowed.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

Precautionary Statements

Prevention: Keep only in original packaging. Wash thoroughly after handling. Do not breathe dust/fume/gas/mist/vapours/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product.

Response: Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower]. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a corrosion-resistant container with a resistant inner liner.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC): None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	CAS number	Content in percent (%)*
Hydrochloric acid	7647-01-0	20 - 40%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information:	Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.
Ingestion:	Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Inhalation:	Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing If breathing is difficult, give oxygen.
Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
Eye contact:	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms:	Causes severe skin and eye burns. Harmful if swallowed.
Hazards:	None known.

Indication of immediate medical attention and special treatment needed

Treatment:	Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards:	No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media:	None known.
Specific hazards arising from the chemical:	Fire or excessive heat may produce hazardous decomposition products.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.
Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

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Version: 4.4
Revision Date: 03-08-2018

Personal precautions, protective equipment and emergency procedures: Ventilate closed spaces before entering them. Keep unauthorized personnel away. Evacuate area. Keep upwind. See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Neutralize with lime or soda ash. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not eat, drink or smoke when using the product. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not breathe dust/fume/gas/mist/vapours/spray. Use caution when adding this material to water.

Conditions for safe storage, including any incompatibilities: Keep container tightly closed. Store in a well-ventilated place. Unsuitable containers: metals.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values		Source
Hydrochloric acid	Ceiling	2 ppm		US. ACGIH Threshold Limit Values (2011)
	Ceil_Time	5 ppm	7 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	Ceiling	5 ppm	7 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	5 ppm	7 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	Ceiling	5 ppm	7 mg/m3	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (06 2008)
	AN ESL		5.4 ppb	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (03 2014)
	ST ESL		130 ppb	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010)
	ST ESL		190 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010)
	AN ESL		7.9 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (03 2014)
	TWA PEL	0.3 ppm	0.45 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (01 2015)
	Ceiling	2 ppm		US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (01 2015)

Appropriate Engineering Controls No data available.

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Version: 4.4
Revision Date: 03-08-2018

Individual protection measures, such as personal protective equipment

General information:	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Eye/face protection:	Wear safety glasses with side shields (or goggles) and a face shield.
Skin Protection	
Hand Protection:	Chemical resistant gloves
Other:	Wear suitable protective clothing and gloves.
Respiratory Protection:	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.
Hygiene measures:	Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin.

9. Physical and chemical properties

Appearance	
Physical state:	Liquid
Form:	Liquid
Color:	Colorless
Odor:	Pungent
Odor threshold:	No data available.
pH:	0.1 (1 N aqueous solution)
Melting point/freezing point:	-35 °C
Initial boiling point and boiling range:	48 °C
Flash Point:	not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	14.1 kPa
Vapor density:	No data available.
Density:	1.18 g/ml (20 °C)
Relative density:	1.18 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.

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Version: 4.4
Revision Date: 03-08-2018

Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Avoid contact with strong reducing agents. Strong oxidizing agents. Contact with alkalis.
Incompatible Materials:	Amines. Alkalies. Metals. Reducing agents. Oxidizing agents.
Hazardous Decomposition Products:	Chlorine. Hydrogen chloride. By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Inhalation:	Causes severe burns.
Skin Contact:	Causes severe skin burns.
Eye contact:	Causes serious eye damage.
Ingestion:	Harmful if swallowed.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: ATEmix (Rat): 2,368.42 mg/kg

Dermal
Product: ATEmix (Rabbit) 3,813.16 mg/kg

Inhalation
Product: Not classified for acute toxicity based on available data.

Repeated dose toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation
Product: Causes serious eye damage.

Respiratory or Skin Sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure
Product: None known.

Target Organs
Specific Target Organ Toxicity - Single Exposure: Respiratory tract irritation.

Aspiration Hazard
Product: Not classified

Other effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
Hydrochloric acid — LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 282 mg/l

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
Hydrochloric acid — LC 50 (Green or European shore crab (Carcinus maenas), 48 h): 240 mg/l

LC 50 (Common shrimp, sand shrimp (Crangon crangon), 48 h): 260 mg/l

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: Expected to be readily biodegradable.

BOD/COD Ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in soil: The product is water soluble and may spread in water systems.

Other adverse effects: Large amounts of the product may affect the acidity (pH-factor) in water with possible risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number:	UN 1789
UN Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es)	
Class:	8
Label(s):	8
Packing Group:	II
Marine Pollutant:	No

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Version: 4.4
Revision Date: 03-08-2018

Special precautions for user: Not determined.

IMDG

UN Number:	UN 1789
UN Proper Shipping Name:	HYDROCHLORIC ACID
Transport Hazard Class(es)	
Class:	8
Label(s):	8
EmS No.:	F-A, S-B
Packing Group:	II
Marine Pollutant:	No
Special precautions for user:	Not determined.

IATA

UN Number:	UN 1789
Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es):	
Class:	8
Label(s):	8
Packing Group:	II
Marine Pollutant:	No
Special precautions for user:	Not determined.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
Hydrochloric acid	5000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Corrosive to metal
Acute toxicity (any route or exposure)
Skin Corrosion or Irritation
Serious eye damage or eye irritation
Specific target organ toxicity (single or repeated exposure)

SARA 302 Extremely Hazardous Substance

Chemical Identity	Reportable quantity	Threshold Planning Quantity
Hydrochloric acid	5000 lbs.	500 lbs.

SARA 304 Emergency Release Notification

Chemical Identity	Reportable quantity
Hydrochloric acid	5000 lbs.

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Version: 4.4
Revision Date: 03-08-2018

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
Hydrochloric acid	500 lbs.

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
Hydrochloric acid	10000 lbs.	25000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

Chemical Identity	Reportable quantity
Hydrochloric acid	5000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3):

Chemical Identity	Reportable quantity
Hydrochloric acid	Reportable quantity: 5000 lbs.

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity
Hydrochloric acid

US. Massachusetts RTK - Substance List

Chemical Identity
Hydrochloric acid

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
Hydrochloric acid

US. Rhode Island RTK

Chemical Identity
Hydrochloric acid

International regulations

Montreal protocol

not applicable

Stockholm convention

not applicable

Rotterdam convention

not applicable

Kyoto protocol

not applicable

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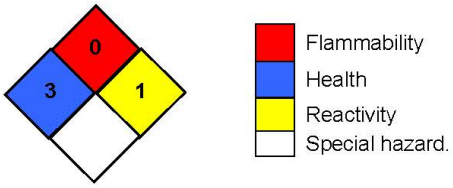
Version: 4.4
Revision Date: 03-08-2018

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Mexico INSQ:	On or in compliance with the inventory
Taiwan Chemical Substance Inventory:	On or in compliance with the inventory

16.Other information, including date of preparation or last revision

NFPA Hazard ID



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible

Issue Date:	03-08-2018
Revision Information:	Not relevant.
Version #:	4.4
Source of information:	Sources of information used in preparing this SDS included one or more of the following: results from in house or supplier toxicology studies, information from the Toxicology Data Network (TOXNET), European Chemical Agency (ECHA) substance dossiers, IARC Monographs, US National Toxicology Program data, the Agency for Toxic Substances and Disease Registry, other manufacturer's SDSs and other sources, as appropriate.
Further Information:	No data available.

avantor

Version: 4.4
Revision Date: 03-08-2018

Disclaimer:

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MAGNESIUM HYDROXIDE

SIGMA-ALDRICH

sigma-aldrich.com

SAFETY DATA SHEET

Version 4.4
Revision Date 04/05/2017
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Magnesium hydroxide

Product Number : 632309
Brand : Aldrich

CAS-No. : 1309-42-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

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

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : H_2MgO_2
Molecular weight : 58.32 g/mol
CAS-No. : 1309-42-8
EC-No. : 215-170-3

No components need to be disclosed according to the applicable regulations.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: white
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	9.5 - 10.5
e)	Melting point/freezing point	Melting point/range: 350 °C (662 °F) - lit.

f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	2.360 g/cm3
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	not auto-flammable
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong acids

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 8,500 mg/kg

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Eyes - Bovine cornea
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

reverse mutation assay
Salmonella typhimurium
Result: negative

Chromosome aberration test in vitro
lymphocyte
Result: negative

In vitro mammalian cell gene mutation test
mouse lymphoma cells
Result: negative

Carcinogenicity

No data available

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

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information

Repeated dose toxicity	Rat - Oral - NOAEL : >= 1,000 mg/kg - OECD Test Guideline 422

RTECS: OM3570000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 511.31 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	static test LC50 - Daphnia magna (Water flea) - ca. 284.76 mg/l - 48 h
Toxicity to algae	static test EC50 - Scenedesmus capricornutum (fresh water algae) - > 100 mg/l - 72 h

(OECD Test Guideline 201)

Toxicity to bacteria	EC50 - activated sludge - > 1,000 mg/l (OECD Test Guideline 209)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

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

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Magnesium hydroxide	1309-42-8	

	CAS-No.	Revision Date
Magnesium hydroxide	1309-42-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Magnesium hydroxide	1309-42-8	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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

Version: 4.4 Revision Date: 04/05/2017 Print Date: 07/13/2017

MAGNESIUM SULFATE

SIGMA-ALDRICH

sigma-aldrich.com

SAFETY DATA SHEET

Version 4.7
Revision Date 09/14/2017
Print Date 03/24/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Magnesium sulfate

Product Number : 208094
Brand : Sigma-Aldrich

CAS-No. : 7487-88-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Canada Co.
2149 Winston Park Drive
OAKVILLE ON L6H 6J8
CANADA

Telephone : +1 9058299500
Fax : +1 9058299292

1.4 Emergency telephone number

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

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Magnesium sulphate

Formula : $MgSO_4$
Molecular weight : 120.37 g/mol
CAS-No. : 7487-88-9
EC-No. : 231-298-2

No components need to be disclosed according to the applicable regulations.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

hygroscopic Keep in a dry place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: granular, powder
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available

g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	< 0.1 hPa (< 0.1 mmHg) at 20 °C (68 °F)
l)	Vapour density	No data available
m)	Relative density	1.070 g/cm3
n)	Water solubility	ca.73.8 g/l at 100 °C (212 °F)
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
hygroscopic

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Sulphur oxides, Magnesium oxide
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 2,000 mg/kg

LD50 Inhalation - Rabbit - > 2,000 mg/l

Dermal: No data available

LD50 Intraperitoneal - Mouse - 1,029 mg/kg

Skin corrosion/irritation
Skin - in vitro assay
Result: No skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
in vivo assay - Mouse
Result: Did not cause sensitisation on laboratory animals.
Does not cause skin sensitisation.
(OECD Test Guideline 429)
Remarks: No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: OM4500000

Diarrhoea, Vomiting, Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 2,820 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 343.56 mg/l - 48 h
Toxicity to algae	EC50 - Desmodesmus subspicatus (green algae) - 2,700 mg/l - 72 h (ISO 8692)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

TDG (Canada)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Version: 4.7 Revision Date: 09/14/2017 Print Date: 03/24/2018

ResinTech SIR-110-HP

Safety Data Sheet

Product Name: SIR-110-HP

(Perchlorate selective Strong Base Anion Exchange Resin Chloride Form)

Effective date February 23, 2018

Section 1: Identification

1a	Product Name	ResinTech SIR-110-HP
1b	Common Name	Perchlorate and nitrate Selective strong base anion resin in the chloride form.
1c	Intended use	Removal of perchlorate, iodide, and from water.
1d	Manufacturer Address	ResinTech, Inc. 160 Cooper Road, West Berlin, NJ 08091 USA
	Phone Email	856-768-9600 ixresin@resintech.com

Section 2: Hazard Identification

2a OSHA Hazard classification — Not hazardous or dangerous

Product Hazard Rating	Scale
Health = 0	0 = Negligible
Fire = 1	1 = Slight
Reactivity = 0	2 = Moderate
Special – N/A	3 = High
	4 = Extreme

2b	Product description	Light cream to light yellow colored solid beads with little or no odor.
2c	Precautions for use	Safety glasses and gloves recommended. Slipping hazard if spilled.
2c	Potential health effects	Will cause eye irritation. May casue mild skin irritation. Ingestion is not likely to pose a health risk.
2d	Environmental effects	Little or none.

Section 2A: Hazard classification UN OSHA globally harmonized system

Warning (contains ion exchange resin)

H320: Causes eye irritation (Category 2B)

Precautionary Statements

P264: Wash hands thoroughly after handling.

P280: Wear protective gloves/protective clothing/eye protection/face protection

P305+351+338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.

P333+313: If skin irritation or a rash occurs: Get medical advice/attention.

P337+313: If eye irritation persists get medical advice/attention.

P403+233: Store in a well-ventilated place. Keep container tightly closed.

P411: Store at temperatures not exceeding 50 °C/ 122 °F.

Please refer to the safety data sheet for additional information regarding this product

ResinTech, Inc.
160 Cooper Road
West Berlin, NJ 08091-9234
856 768-9600
lxresin@resintech.com

Section 3: Composition/ Information on Ingredients		
3a	Chemical name	Tributylamine functionalized chloromethylated copolymer of polystyrene in the chloride form.
3b	Ingredients Tributylamine functionalized chloromethlyated copolymer of styrene and divinylbenzene in the chloride form	CAS# 116565-72-1 (55 - 70%)
	Water	CAS# 7732-18-5 (30 – 45%)

Section 4: First Aid Measures		
4a	Inhalation	No adverse effects expected- normal use of product does not produce odors or vapors.
4b	Skin	Wash with soap and water- seek medical attention if a rash develops.
4c	Eye contact	Wash immediately with water-seek attention if discomfort continues.
4d	Ingestion	No adverse effects expected for small amounts, larger amounts can cause stomach irritation. Seek medical attention if discomfort occurs.

Section 5: Fire Fighting Measures		
5a	Flammability	NFPA Fire rating = 1
5b	Extinguishing media	Water, CO2, foam, dry powder
5c	Fire fighting Procedures	Follow general fire fighting procedures indicated in the work place.
5d	Protective Equipment	MSHA/NIOSH approved self-contained breathing gear, full protective clothing.
5e	Combustion Products	Carbon oxides and other toxic gasses and vapors.
5f	Unusual Hazards	Product is not combustible until moisture is removed. Resin begins to burn at approximately 230º C. Auto ignition can occur above 500º C.

Section 6: Accidental Release Measures		
6a	Personal Precautions	Keep people away, spilled resin can be a slipping hazard, wear gloves and safety glasses to minimize skin or eye contact.
6b	Incompatible Chemicals	Strong oxidants can create risk of combustion products similar to burning.
6c	Environmental Precautions	Keep out of public sewers and waterways.
6d	Containment Materials	Use plastic or paper containers.
6e	Methods of Clean-up	Sweep up material and transfer to containers.

Section 7: Handling and Storage		
7a	Handling	Avoid prolonged skin contact. Keep resin moist and avoid allowing resin to completely dry.
7b	Storage	Store in a cool dry place (0º to 45º C) in the original shipping container. This product is thermally sensitive and will have reduced shelf life if subjected to extended periods of time at temperatures exceeding 50º C. Although freezing does not usually damage ion exchange resins, avoid repeated freeze thaw cycles.

Section 8: Exposure Controls/Personal Protection		
8a	OSHA exposure limits	None noted.
8b	Engineering Controls	Provide adequate ventilation.
8c	Personal Protection Measures	
	Eye Protection	Safety glasses or goggles.
	Respiratory Protection	Not required for normal use.
	Protective Gloves	Recommended for extended contact.

Section 9: Physical and Chemical Properties	
Appearance	Light cream to light yellow beads approx. 0.6 mm diameter.
Flammability or explosive limits	Flammable above 500º C
Odor	Little or no odor
Physical State	Solid
Vapor pressure	Not available
Odor threshold	Not available
Vapor density	Not available
pH	Near neutral
Relative density	Approx 680 grams/Liter
Melting point/freezing point	Does not melt, freezes at approx. 0 C
Solubility	Insoluble in water and most solvents
Boiling point	Does not boil
Flash point	Approx 500º C
Evaporation rate	Does not evaporate
Partition Coefficient (n-octonol/water)	Not applicable
Auto-ignition temperature	Approx 500º C
Decomposition temperature	Above 230º C
Viscosity	Not applicable

Section 10: Stability and Reactivity	
10a Stability	Stable under normal conditions.
10b Conditions to Avoid	Heat, exposure to strong oxidants.
10c Hazardous by-products	Tributylamine, charred polystyrene, aromatic acids and hydrocarbons, organic amines, nitrogen oxides, carbon oxides, chlorinated hydrocarbons.
10d Incompatible materials	Strong oxidizing agents (such as HNO_3).
10e Hazardous Polymerization	Does not occur

Section 11: Toxicological Information

11a Likely Routes of Exposure	Oral, skin or eye contact.
11b Effects of exposure	
Delayed	None known.
Immediate (acute)	None known.
Chronic	None known.
11c Toxicity Measures	
Skin Adsorption	Unlikely.
Ingestion	Oral toxicity believed to be low but no LD50 has been established.
Inhalation	Unknown, vapors are very unlikely due to physical properties (insoluble solid).
11d Toxicity Symptoms	
Skin Adsorption	Mild rash.
Ingestion	Indigestion or general malaise.
Inhalation	Unknown.
11e Carcinogenicity	None known

Section 12: Ecological information

12a Eco toxicity	Not harmful to plant or animal life.
12b Mobility	Insoluble.
12c Biodegradability	Not biodegradable.
12d Bioaccumulation	Insignificant.
12e Other adverse effects	Not Harmful to the environment.

Section 13: Disposal Considerations	
13a General considerations	Material is non-hazardous.
13b Disposal Containers	Most plastic and paper containers are suitable.
13c Disposal methods	No specific method necessary.
13d Sewage Disposal	Not recommended.
13e Precautions for incineration	May release tributylamine and toxic vapors when burned.
13f Precautions for landfills	Resins used to remove hazardous materials may then become hazardous mixtures

Section 14: Transportation Information	
14a Transportation Class	Not classified as a dangerous good for transport by land, sea, or air.
14b TDG	Not regulated.
14c IATA	Not regulated.
14d DOT (49 CFR 172.101)	Not Regulated.

Section 15: Regulatory Information	
15a CERCLA	Not regulated
15b SARA Title III	Not regulated
15c Clean Air act	Not regulated
15d Clean Water Act	Not regulated
15e TSCA	Not regulated
15f Canadian Regulations	
WHMIS	Not a controlled product
TDG	Not regulated
15g Mexican Regulations	Not Dangerous

Section 16: Other Information

The information provided in this safety data sheet is presented in good faith and believed to be accurate as of the effective data shown above. However, no warranty or guarantee of accuracy, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that their activities comply with federal, state, and local laws.

16a Date of Revision 31 March 2015

SODIUM BISULFITE

SIGMA-ALDRICH

sigma-aldrich.com

SAFETY DATA SHEET

Version 5.9
Revision Date 05/17/2018
Print Date 07/01/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Sodium bisulfite

Product Number : 243973
Brand : Sigma-Aldrich

CAS-No. : 7631-90-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

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

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 3), H402

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H302 Harmful if swallowed.
H318 Causes serious eye damage.
H402 Harmful to aquatic life.

Precautionary statement(s)
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P273 Avoid release to the environment.
P280 Wear eye protection/ face protection.
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately

call a POISON CENTER/doctor.

P501 Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Synonyms : Sodium hydrogensulfite

Hazardous components

Component		Classification	Concentration
Sodium hydrogensulphite			
CAS-No. EC-No. Index-No.	7631-90-5 231-548-0 016-064-00-8	Acute Tox. 4; H302	90 - 100 %
Sodium metabisulphite			
CAS-No. EC-No. Index-No.	7681-57-4 231-673-0 016-063-00-2	Acute Tox. 4; Eye Dam. 1; Aquatic Acute 3; H302, H318, H402	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

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

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

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage. Do not store near acids.

Air and moisture sensitive.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Sodium hydrogensulphite	7631-90-5	TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Eye irritation Skin irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
Sodium metabisulphite	7681-57-4	TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Not classifiable as a human carcinogen		

		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

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

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 300 °C (572 °F)

f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong acids

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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, chest pain
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Sodium metabisulphite)
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

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

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sodium hydrogensulphite	7631-90-5	2007-03-01
Sodium metabisulphite	7681-57-4	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium hydrogensulphite	7631-90-5	2007-03-01
Sodium metabisulphite	7681-57-4	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sodium hydrogensulphite	7631-90-5	2007-03-01
Sodium metabisulphite	7681-57-4	2007-03-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

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

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Eye Dam.	Serious eye damage
H302	Harmful if swallowed.
H318	Causes serious eye damage.
H402	Harmful to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

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

Version: 5.9 Revision Date: 05/17/2018 Print Date: 07/01/2018

CAUSTIC SODA/SODIUM HYDROXIDE

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

The Version Date and Number for this MSDS is : 02/27/2009 - #021

PRODUCT NAME: CAUSTIC SODA LIQUID (ALL GRADES)

MSDS NUMBER: OZ32415

DATE ISSUED: 01/07/2009

SUPERSEDES: 11/12/2008

ISSUED BY: 008730

****
****

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Distributed by:
Univar USA Inc.
17425 NE Union Hill Rd.
Redmond, WA 98052
425-889-3400

Trade Name:
Caustic Soda Diaphragm Grade 10%, 15%, 18%, 20%, 25%, 30%, 35%, 40%, 50%, Caustic Soda Rayon Grade 18%, 20%, 25%, 30%, 50%, 50% Caustic Soda Rayon Grade OS, Caustic Soda Membrane 6%, 18%, 20%, 25%, 30%, 48%, 50%, 50% Caustic Soda Membrane OS, 50% Caustic Soda Diaphragm OS, Caustic Soda Low Salt 50%, 25% Caustic Soda Purified, 50% Caustic Soda Purified, 50% Caustic Soda Purified OS, Caustic Soda Liquid 70/30, Membrane Blended, 50% Caustic Soda Membrane (Northeast), 50% Caustic Soda Diaphragm (West Coast), 50% Blended Rayon Grade Blended, Membrane Cell Liquor

Synonyms: Sodium hydroxide solution, Liquid Caustic, Lye Solution, Caustic, Lye, Soda Lye

Product Use: Metal finishing, Cleaner, Process chemical, Petroleum industry

2. HAZARDS IDENTIFICATION EMERGENCY OVERVIEW:

Color:	Colorless to slightly colored
Physical State:	Liquid
Odor:	Odorless
Signal Word:	Danger

MAJOR HEALTH HAZARDS: CORROSIVE. CAUSES BURNS TO THE RESPIRATORY TRACT, SKIN, EYES AND GASTROINTESTINAL TRACT. CAUSES PERMANENT EYE DAMAGE.

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

PHYSICAL HAZARDS: CORROSIVE. Mixing with water, acid or incompatible materials may cause splattering and release of heat.

ECOLOGICAL HAZARDS: Keep out of water supplies and sewers. This material is alkaline and may raise the pH of surface waters. This material has exhibited moderate toxicity to aquatic organisms.

PRECAUTIONARY STATEMENTS: Avoid breathing vapors or mist. Avoid contact with skin, eyes and clothing. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation.

POTENTIAL HEALTH EFFECTS:

Inhalation: May cause irritation (possibly severe), chemical burns, and pulmonary edema.

Skin contact: May cause irritation (possibly severe) and chemical burns.

Eye contact: May cause irritation (possibly severe), chemical burns, eye damage, and blindness.

Ingestion: May cause irritation (possibly severe), chemical burns, nausea, and vomiting.

Target Organs Effected: Respiratory System, Skin, Eye

Medical Conditions Aggravated by Exposure: Asthma, Respiratory disorders

See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Component	Concentration (by weight %)	CAS - No.
Water	48.5 - 94.5	7732-18-5
Sodium hydroxide	5.5 - 51.5	1310-73-2
Sodium chloride (NaCl)	1 - 5	7647-14-5

4. FIRST AID MEASURES

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer basic life support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.

Skin Contact: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing before reuse. Discard contaminated leather goods. GET MEDICAL ATTENTION

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

IMMEDIATELY.

Eye Contact: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

Ingestion: Never give anything by mouth to an unconscious or convulsive person. If swallowed, do not induce vomiting. Give large amounts of water. If vomiting occurs spontaneously, keep airway clear. Give more water when vomiting stops. GET MEDICAL ATTENTION IMMEDIATELY.

Notes to Physician: The absence of visible signs or symptoms of burns does NOT reliably exclude the presence of actual tissue damage. Probable mucosal damage may contraindicate the use of gastric lavage.

5. FIRE-FIGHTING MEASURES

Fire Hazard: Negligible fire hazard.

Extinguishing Media: Use media appropriate for surrounding fire

Fire Fighting: Move container from fire area if it can be done without risk. Cool containers with water. Avoid contact with skin.

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Flash point: Not flammable

6. ACCIDENTAL RELEASE MEASURES

Occupational Release:
Wear appropriate personal protective equipment recommended in Section 8 of the MSDS. Completely contain spilled material with dikes, sandbags, etc. Shovel dry material into suitable container. Liquid material may be removed with a vacuum truck. Remaining material may be diluted with water and neutralized with dilute acid, then absorbed and collected. Flush spill area with water, if appropriate. Keep product and flush water out of water supplies and sewers. This material is alkaline and may raise the pH of surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies.

7. HANDLING AND STORAGE

Storage Conditions: Store and handle in accordance with all current regulations and standards. Keep container tightly closed and properly labeled. Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen gas may be generated. Keep separated

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

from incompatible substances.

Handling Procedures: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

OSHA Regulatory Exposure limit(s):

Hazardous Component	CAS-No.	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Sodium hydroxide	1310-73-2	2 mg/m3		

Non-Regulatory Exposure Limit(s):
The Non-Regulatory OSHA limits shown in the table are the Vacated 1989 PEL's (vacated by 58 FR 35338, June 30, 1993).

Hazardous Component	CAS-No.	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Sodium hydroxide	1310-73-2			2 mg/m3			2 mg/m3

ENGINEERING CONTROLS: Provide local exhaust ventilation where dust or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear chemical safety goggles with a faceshield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. Contaminated clothing should be removed, then discarded or laundered.

Hand Protection: Wear appropriate chemical resistant gloves Protective Material Types: Natural rubber, Neoprene, Nitrile

Hazardous Component	Immediately Dangerous to Life/ Health (IDLH)
Sodium hydroxide	10 mg/m3 IDLH

Respiratory Protection: A NIOSH approved respirator with N95 (dust, fume, mist) cartridges may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure. If eye

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

irritation occurs, a full face style mask should be used. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Clear to opaque
Color:	Colorless to slightly colored
Odor:	Odorless
Boiling Point/Range:	230 291 F (110 144 C)
Freezing Point/Range:	-26 to 59 F (-32 to 15 C)
Vapor Pressure:	13 - 135 mmHg @ 60 C
Vapor Density (air=1):	No data available
Specific Gravity (water=1):	1.11 1.53 @ 15.6 C
Water Solubility:	100%
pH:	14.0 (7.5% solution)
Volatility:	No data available
Evaporation Rate (ether=1):	No data available
Partition Coefficient (n-octanol/water):	No data available

10. STABILITY AND REACTIVITY

Reactivity/ Stability: Stable at normal temperatures and pressures.

Conditions to Avoid: Mixing with water, acid or incompatible materials may cause splattering and release of large amounts of heat. Will react with some metals forming flammable hydrogen gas. Carbon monoxide gas may form upon contact with reducing sugars, food and beverage products in enclosed spaces.

Incompatibilities/Materials to Avoid: Acids, Halogenated compounds, Prolonged contact with aluminum, brass, bronze, copper, lead, tin, zinc or other alkali sensitive metals or alloys

Hazardous Decomposition Products: Toxic fumes of sodium oxide

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:

Hazardous Component	LD50 Oral	LC50 Inhalation	LD50 Dermal
Sodium hydroxide	Not listed	Not listed	1350 mg/kg (Rabbit)
Sodium chloride (NaCl)	3 g/kg (Rat)	42 g/m3 (1 hr-Rat)	10 g/kg (Rabbit)

TOXICITY:
The severity of the tissue damage is a function of its concentration, the length of tissue contact time, and local tissue conditions. After exposure there may be a time delay before irritation and other effects occur. This material is a strong irritant and is corrosive to the skin, eyes, and mucous

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

membranes. This material may cause severe burns and permanent damage to any tissue with which it comes into contact. Inhalation will cause severe irritation and possible burns with pulmonary edema, which may lead to pneumonitis. Skin contact with this material may cause severe irritation and corrosion of tissue. Eye contact can cause severe irritation, corrosion with possible corneal damage and blindness. Ingestion may cause irritation, corrosion/ulceration, nausea, and vomiting. In general, chronic effects are due to long-term irritation. This material may cause dermatitis. In rare cases reports have noted long-term inhalation causes bronchial inflammatory reaction or obstructive airway dysfunction.

CARCINOGENICITY: This product is not classified as a carcinogen by NTP, IARC or OSHA.

12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: This material has exhibited moderate toxicity to aquatic organisms. Data provided are for sodium hydroxide.

Freshwater Fish Data:
LC50 brook trout: 25 ppm/24 hr
LC50 king salmon: 48 ppm

Invertebrate Toxicity Data:
EC50 daphnia magna: 100 ppm
EC50 shrimp: 33 100 ppm/48 hr
EC50 cockle: 330 1000 ppm/48 hr

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is alkaline and may raise the pH of surface waters with low buffering capacity. This material is believed to exist in the disassociated state in the environment.

BIOCONCENTRATION: This material is not expected to bioconcentrate in organisms.

ADDITIONAL ECOLOGICAL INFORMATION: This material has exhibited slight toxicity to terrestrial organisms.

13. DISPOSAL CONSIDERATIONS

Reuse or reprocess, if possible. Dispose in accordance with all applicable regulations. May be subject to disposal regulations: U.S. EPA 40 CFR 261. Hazardous Waste Number(s): D002

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Sodium Hydroxide Solution
DOT UN NUMBER: UN1824

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

HAZARD CLASS/ DIVISION: 8
PACKING GROUP: II
LABELING REQUIREMENTS: 8
DOT RQ (lbs): RQ 1000 lbs. (Sodium Hydroxide)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Sodium hydroxide solution
UN NUMBER: UN1824
CLASS: 8
PACKING/RISK GROUP: II

15. REGULATORY INFORMATION

U.S. REGULATIONS

OSHA REGULATORY STATUS:
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200) (US).

CERCLA SECTIONS 102a1103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 4262675.

Hazardous Component	CERCLA Reportable Quantities:
Sodium hydroxide	1000 lb (final RQ)

EPCRA EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30): No components are listed.

EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.21):
Acute Health Hazard

EPCRA SECTION 313 (40 CFR 372.65): No components are listed.

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated

NATIONAL INVENTORY STATUS

U.S. INVENTORY STATUS (TSCA): All components are listed or exempt

TSCA 12(b): This product is not subject to export notification

CANADIAN DOMESTIC SUBSTANCE LIST (DSL/NDSL): All components are listed.

STATE REGULATIONS

California Proposition 65: This product is not listed

Hazardous Component Sodium hydroxide

UNIVAR USA INC.
ISSUE DATE:2009-02-27
Annotation:

MSDS NO:OZ32415
VERSION:026 2010-05-20

California Proposition 65 Cancer WARNING:	Not Listed
California Proposition 65 CRT List - Male reproductive toxin:	Not Listed
California Proposition 65 CRT List - Female reproductive toxin:	Not Listed
Massachusetts Right to Know Hazardous Substance List	Listed
New Jersey Right to Know Hazardous Substance List	Listed
New Jersey Special Health Hazards Substance List	Listed
Pennsylvania Right to Know Hazardous Substance List	Listed
Pennsylvania Right to Know Environmental Hazard List	Listed
Rhode Island Right to Know Hazardous Substance List	Listed

CANADIAN REGULATIONS:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification: E

16. OTHER INFORMATION

HMIS: (SCALE 0-4) (Rated using National Paint & Coatings Association HMIS: Rating Instructions, 2nd Edition)
Health: 3 Flammability: 0 Reactivity: 1
NFPA 704 - Hazard Identification Ratings (SCALE 0-4)
Health: 3 Flammability: 0 Reactivity: 1

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

SULFURIC ACID

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 1: Identification

1.1. Product Identifier

Trade Name or Designation: Sulfuric Acid, 10% (v/v)

Product Number: 8150

Other Identifying Product Numbers: 8150-1, 8150-16, 8150-16G, 8150-2.5, 8150-32, 8150-5, 8150-55, 8150-5PT

1.2. Recommended Use and Restrictions on Use

General Laboratory Reagent

1.3. Details of the Supplier of the Safety Data Sheet

Company: Ricca Chemical Company

Address: 448 West Fork Drive
Arlington, TX 76012 USA

Telephone: 888-467-4222

1.4. Emergency Telephone Number (24 hours)

CHEMTREC (USA) 800-424-9300
CHEMTREC (International) 1+ 703-527-3887

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 2: Hazard(s) Identification

2.1. Classification of the Substance or Mixture (in accordance with OSHA HCS 29 CFR 1910.1200)

For the full text of the Hazard and Precautionary Statements listed below, see Section 16.

Hazard Class	Category	Hazard Statement	Precautionary Statements
Acute Toxicity - Inhalation	Category 3	H331	P261, P271, P304+P340, P311, P321, P403+P233, P405, P501
Skin Corrosion / Irritation	Category 1A	H314	P260, P264, P280, P301+P330+P331, P303+P361+P353, P363, P304+P340, P310, P321, P305+P351+P338, P405, P501
Eye Damage / Irritation	Category 1	H318	P280, P305+P351+P338, P310
Carcinogenicity	Category 1	H350	P201, P202, P280, P308+P313, P405, P501
Specific Target Organs/Systemic Toxicity Following Single Exposure	Category 1	H370	P260, P264, P270, P307+P311, P321, P405, P501
Specific Target Organs/Systemic Toxicity Following Repeated Exposure	Category 1	H372	P260, P264, P270, P314, P501
Corrosive to Metals	Category 1	H290	P234, P390, P406
Hazardous to the Aquatic Environment (Acute)	Category 2	H401	P273, P501

2.2. GHS Label Elements

Pictograms:

Signal Word: **Danger**

Hazard Statements:

Hazard Number	Hazard Statement
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
H350	May cause cancer.
H370	Causes damage to organs.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

Precautionary Statements:

Precautionary Number:	Precautionary Number:
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P234	Keep only in original container.
P260	Do not breathe fumes, mist, vapors, or spray.
P261	Avoid breathing fumes, mist, vapors, or spray.
P264	Wash arms, hands and face thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves and eye protection.
P301+P330+P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P307+P311	IF exposed: Call a POISON CENTER or physician.
P308+P313	IF exposed or concerned: Get medical attention.
P310	Immediately call a POISON CENTER or physician.
P311	Call a POISON CENTER or physician.
P314	Get medical attention if you feel unwell.
P321	Specific treatment (Wash areas of contact with water. If possible, wipe off areas of contact with dry cloth before flushing with water).
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P406	Store in corrosive resistant container with a resistant inner liner.
P501	Dispose of contents in accordance with local, state, federal and international regulations.

2.3. WHMIS Classification

WHMIS classification is not included based on the recommended option (Option 4) found in the Canada Gazette Part II, Vol. 149, No.3, page 458

2.4. Hazards not Otherwise Classified or Covered by GHS

Data not available.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 3: Composition / Information on Ingredients

3.1. Components of Substance or Mixture

Chemical Name	Formula	Molecular Weight	CAS Number	Weight%
Water	H_2O	18.01 g/mol	7732-18-5	83.76%
Sulfuric Acid	H_2SO_4	98.07 g/mol	7664-93-9	16.24%

SECTION 4: First-Aid Measures

4.1. General First Aid Information

Eye Contact: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Eye contact causes tissue damage and blindness.

Inhalation: IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Skin Contact: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. Skin contact causes burns, blistering, local necrosis, and membrane ulceration. Burns may be 2nd or 3rd degree.

Ingestion: IF SWALLOWED: rinse mouth. Do NOT induce vomiting. Do not induce vomiting. Give large quantity of water. Call a physician immediately.

4.2. Most Important Symptoms and Effects, Acute and Delayed

Corrosive liquid. Causes severe burns. Eye contact causes tissue damage and blindness. Ingestion causes corrosion of the mucosa of the mouth, throat and esophagus with stomach discomfort and pain. If ingested, dilute with large quantity of water. Do not induce vomiting. Call a physician. Wash areas of contact with plenty of water for at least 15 minutes. If possible, wipe off areas of contact with dry cloth before flushing with water, as water contact will generate heat. EYE CONTACT: Eye contact causes tissue damage and blindness. SKIN CONTACT: Skin contact causes burns, blistering, local necrosis, and membrane ulceration. Burns may be 2nd or 3rd degree. CHRONIC EFFECTS / CARCINOGENICITY: May affect the skin, liver, kidneys and blood.

4.3. Medical Attention or Special Treatment Needed

Immediately call a POISON CENTER or physician. Specific treatment (Wash areas of contact with water. If possible, wipe off areas of contact with dry cloth before flushing with water).

SECTION 5: Fire-Fighting Measures

5.1. Extinguishing Media

Dry chemical, foam, or carbon dioxide. Reacts with water producing heat and toxic fumes.

5.2. Specific Hazards Arising from the Substance or Mixture

Not combustible. Strong dehydrating agent, which may cause ignition of finely divided materials on contact. Reaction with metals may produce hydrogen gas. Oxides of sulfur may be produced in fire.

5.3. Special Protective Equipment for Firefighters

Wear special protective clothing and positive pressure self-contained breathing apparatus. Butyl rubber, natural rubber, Neoprene, polyethylene, polyvinyl chloride, Teflon, Viton, or Saranex barrier recommended.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 6: Accidental Release Measures

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

Wear protective gloves and eye protection.

6.2. Cleanup and Containment Methods and Materials

Keep water away from release. Stop or control the leak, if this can be done without undue risk. Control runoff and isolate discharged material for proper disposal.

SECTION 7: Handling and Storage

7.1. Precautions for Safe Handling and Storage Conditions

Store in corrosive resistant container with a resistant inner liner. As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. Do not mix with bases. Contact with water will generate heat.

SECTION 8: Exposure Controls / Personal Protection

Control Parameters

Chemical Name	Limit Type	Country	Exposure Limit	Information Source
Sulfuric Acid (7664-93-9)	TWA	USA	1 mg/m³ TWA	U.S. - OSHA - Final PELs - Time Weighted Averages (TWAs)
Sulfuric Acid (7664-93-9)	TLV-TWA	USA	0.2 mg/m³ TWA (thoracic fraction)	ACGIH - Threshold Limit Values - Time Weighted Averages (TLV-TWA)

8.2. Exposure Controls

Engineering Controls: Use only outdoors or in a well-ventilated area. No specific controls are needed. Normal room ventilation is adequate.

Respiratory Protection: Normal room ventilation is adequate.

Skin Protection: Wear protective gloves and eye protection. Chemical resistant gloves.

Eye Protection: Wear protective gloves and eye protection. Safety glasses or goggles.

8.3. Personal Protective Equipment

Wear protective gloves and eye protection. Normal room ventilation is adequate. Chemical resistant gloves. Safety glasses or goggles.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 9: Physical and Chemical Properties

9.1. Basic Physical and Chemical Properties

Appearance: Colorless liquid
Physical State: Liquid
Odor: Data not available.
Odor Threshold: Data not available.
pH: < 1
Melting/Freezing Point: Approximately 0°C
Initial Boiling Point/Range: Approximately 100°C - Approximately 100°C
Flash Point: Data not available.
Evaporation Rate: Data not available.
Flammability: Data not available.
Flammability/Explosive Limits: Data not available.
Vapor Pressure: Data not available.
Vapor Density: Data not available.
Relative Density: 1.11
Solubility: Miscible
Partition Coefficient: Data not available.
Auto-Ignition Temperature: Data not available.
Decomposition Temperature: Data not available.
Viscosity: Data not available.
Explosive Properties: Data not available.
Oxidizing Properties: Data not available.

SECTION 10: Stability and Reactivity

10.1. Reactivity and Chemical Stability

Stable under normal conditions of use and storage.

10.2. Possibility of Hazardous Reactions

Data not available.

10.3. Conditions to Avoid and Incompatible Materials

Keep only in original container. Organics, chlorates, carbides, fulminates, picrates, alkalines, reducing agents, nitrates, Acetic Acid, oxidizing agents, metals.

10.4. Hazardous Decomposition Products

Will not occur.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 11: Toxicological Information

11.1. Information on Toxicological Effects

Acute Toxicity - Oral Exposure:

Not applicable.

Acute Toxicity - Dermal Exposure:

Not applicable.

Acute Toxicity - Inhalation Exposure:

Toxic if inhaled. Avoid breathing fumes, mist, vapors, or spray. Use only outdoors or in a well-ventilated area. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician. Specific treatment (Wash areas of contact with water. If possible, wipe off areas of contact with dry cloth before flushing with water). Store in a well-ventilated place. Keep container tightly closed. Store locked up. Dispose of contents in accordance with local, state, federal and international regulations.

Acute Toxicity - Other Information:

LD50, Oral, Rat: 2140 mg/kg (Sulfuric Acid), details of toxic effects not reported other than lethal dose value. LC50, Inhalation, Rat: (Sulfuric Acid) 510 mg/m3/2H, No toxic effect noted.

Skin Corrosion and Irritation:

Causes severe skin burns and eye damage. Do not breathe fumes, mist, vapors, or spray. Wash arms, hands and face thoroughly after handling. Wear protective gloves and eye protection. IF SWALLOWED: rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. Wash contaminated clothing before reuse. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. Specific treatment (Wash areas of contact with water. If possible, wipe off areas of contact with dry cloth before flushing with water). IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Store locked up. Dispose of contents in accordance with local, state, federal and international regulations.

Serious Eye Damage and Irritation:

Causes serious eye damage. Wear protective gloves and eye protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Respiratory Sensitization:

Not applicable.

Skin Sensitization:

Not applicable.

Germ Cell Mutagenicity:

Not applicable.

Carcinogenicity:

May cause cancer. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves and eye protection. IF exposed or concerned: Get medical attention. Store locked up. Dispose of contents in accordance with local, state, federal and international regulations.

Reproductive Toxicity:

Not applicable.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

Specific Target Organ Toxicity from Single Exposure:

Causes damage to organs. Do not breathe fumes, mist, vapors, or spray. Wash arms, hands and face thoroughly after handling. Do not eat, drink or smoke when using this product. IF exposed: Call a POISON CENTER or physician. Specific treatment (Wash areas of contact with water. If possible, wipe off areas of contact with dry cloth before flushing with water). Store locked up. Dispose of contents in accordance with local, state, federal and international regulations.

Specific Target Organ Toxicity from Repeated Exposure:

Causes damage to organs through prolonged or repeated exposure. Do not breathe fumes, mist, vapors, or spray. Wash arms, hands and face thoroughly after handling. Do not eat, drink or smoke when using this product. Get medical attention if you feel unwell. Dispose of contents in accordance with local, state, federal and international regulations.

Aspiration Hazard:

Not applicable.

Additional Toxicology Information:

Data not available.

SECTION 12: Ecological Information

12.1. Ecotoxicity

Toxic to aquatic life. Avoid release to the environment. Dispose of contents in accordance with local, state, federal and international regulations.

12.2. Persistence and Degradability

Data not available.

12.3. Bioaccumulative Potential

Data not available.

12.4. Mobility in Soil

Data not available.

12.5. Other Adverse Ecological Effects

Data not available.

SECTION 13: Disposal Considerations

13.1. Waste Treatment Methods

Data not available.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 14: Transportation Information

14.1. Transportation by Land-Department of Transportation (DOT, United States of America)

Sizes: 1 L, 2.5 L, 2.5 L, 2.5 L, 4 L, 10 L, 16 Gal, 20 L, 55 Gal, 500 mL, 500 mL, 500 mL

UN Number: UN2796

Proper Shipping Name: Sulphuric Acid Solution

Hazard Class: 8

Packing Group: II

Hazard Placard Labels:

14.2. Transportation by Air - International Air Transport Association (IATA)

Sizes: 1 L, 2.5 L, 2.5 L, 2.5 L, 4 L, 10 L, 16 Gal, 20 L, 55 Gal, 500 mL, 500 mL, 500 mL

UN Number: UN2796

Proper Shipping Name: Sulphuric Acid Solution

Hazard Class: 8

Packing Group: II

Hazard Placard Labels:

SECTION 15: Regulatory Information

15.1. Occupational Safety and Health Administration (OSHA) Hazards

Not listed.

15.2. Superfund Amendments and Reauthorization Act (SARA) 302 Extremely Hazardous Substances

Sulfuric Acid (CAS # 7664-93-9): 1000 lb EPCRA RQ
Sulfuric Acid (CAS # 7664-93-9): 1000 lb TPQ

15.3. Superfund Amendments and Reauthorization Act (SARA) 311/312 Hazardous Chemicals

Sulfuric Acid (CAS # 7664-93-9): 1000 lb final RQ; 454 kg final RQ

15.4. Superfund Amendments and Reauthorization Act (SARA) 313 Toxic Release Inventory (TRI)

Sulfuric Acid (CAS # 7664-93-9): 1.0 % de minimis concentration (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size)

RICCA CHEMICAL COMPANY®

Safety Data Sheet

15.5. Massachusetts Right-to-Know Substance List

Sulfuric Acid (CAS # 7664-93-9): Extraordinarily hazardous

15.6. Pennsylvania Right-to-Know Hazardous Substances

Sulfuric Acid (CAS # 7664-93-9): Environmental hazard
Sulfuric Acid (CAS # 7664-93-9): Present
Water (CAS # 7732-18-5): Present

15.7. New Jersey Worker and Community Right-to-Know Components

Sulfuric Acid (CAS # 7664-93-9): carcinogen; corrosive; reactive - second degree
Sulfuric Acid (CAS # 7664-93-9): sn 1761
Sulfuric Acid (CAS # 7664-93-9): SN 1761 500 lb TPQ

15.8. California Proposition 65

Sulfuric Acid (CAS # 7664-93-9): carcinogen, 3/14/2003

15.9. Canada Domestic Substances List / Non-Domestic Substances List (DSL/NDSL)

Sulfuric Acid (CAS # 7664-93-9): Present (DSL)
Water (CAS # 7732-18-5): Present (DSL)

15.10. United States of America Toxic Substances Control Act (TSCA) List

Sulfuric Acid (CAS # 7664-93-9): Present
Water (CAS # 7732-18-5): Present

15.11. European Inventory of Existing Commercial Chemical Substances (EINECS), European List of Notified Chemical Substances (ELINCS), and No Longer Polymers (NLP)

Not listed.

RICCA CHEMICAL COMPANY®

Safety Data Sheet

SECTION 16: Other Information

16.1. Full Text of Hazard Statements and Precautionary Statements

May be corrosive to metals. Causes severe skin burns and eye damage. Causes serious eye damage. Toxic if inhaled. May cause cancer. Causes damage to organs. Causes damage to organs through prolonged or repeated exposure. Toxic to aquatic life.

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep only in original container. Do not breathe fumes, mist, vapors, or spray. Wash arms, hands and face thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves and eye protection.

IF SWALLOWED: rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF exposed: Call a POISON CENTER or physician. Get medical attention if you feel unwell. Specific treatment (Wash areas of contact with water. If possible, wipe off areas of contact with dry cloth before flushing with water). Wash contaminated clothing before reuse. Absorb spillage to prevent material damage.

Store in a well-ventilated place. Keep container tightly closed. Store locked up. Store in corrosive resistant container with a resistant inner liner.

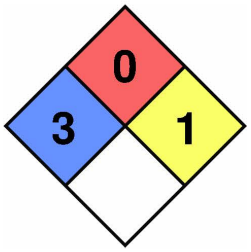
Dispose of contents in accordance with local, state, federal and international regulations.

16.2. Miscellaneous Hazard Classes

Canadian Carcinogenicity Hazard Class: Not Applicable.
Physical Hazards Not Otherwise Classified (PHNOC): Not Applicable.
Health Hazards Not Otherwise Classified (HHNOC): Not Applicable.
Biohazardous Infectious Materials Hazard Class: Not Applicable.

16.3. National Fire Protection Association (NFPA) Rating

Health: 3
Flammability: 0
Reactivity: 1
Special Hazard:



16.4. Document Revision

Last Revision Date: 5/14/2018

RICCA CHEMICAL COMPANY®

Safety Data Sheet

DISCLAIMER

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

WEST W-126

MATERIAL SAFETY DATA SHEET

WEST

WEST W-126

HMIS RATING:
HEALTH 1
FLAMMABILITY 1
REACTIVITY 0
OTHER B

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: WEST W-126 Flocculent
PRODUCT DESCRIPTION: WEST W-124 is an ionic co-polymer used as a flocculent in wastewater treatment processes.

MANUFACTURER:
Water & Energy Systems Technology, Inc.
13109 Arctic Circle
Santa Fe Springs, CA 92801
Customer Service: (562) 921-5191

24 HR. EMERGENCY TELEPHONE NUMBER
Chem-Tel (U.S.): (800) 255-3924

2. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	EXPOSURE LIMITS OSHA PEL	EXPOSURE LIMITS ACGIH TLV
2-Propenoic acid, sodium salt, polymer with 2-propenamide	25085-02-3	Not Established	Not Established
Petroleum distillates, hydro treated light	64742-47-8	Not Established	Not Established
Poly(oxy-1,2-ethanediyl), α-(4-nonylphenyl)-ω-hydroxy-, branched	127087-87-0	Not Established	Not Established

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

PRIMARY ROUTES OF ENTRY: Eye or Skin contact.
PHYSICAL APPEARANCE: White or off-white liquid.
ODOR: Slight, mild odor.
IMMEDIATE CONCERNS: Eye and skin irritant.
PRECAUTIONARY MEASURES: Do not get in eyes, on skin, on clothing. Wash thoroughly after handling. Avoid prolonged or repeated inhalation of dust or skin contact. Slip hazard when wet.
SIGNS & SYMPTOMS OF EXPOSURE: Contact with the eye may produce irritation and/or redness. Prolonged or repeated skin contact tends to remove skin oils, possibly leading to dry skin, irritation and/or dermatitis. Vapors may irritate eyes and respiratory tract, and result in headache or dizziness.
CONDITION AGGRAVATED BY EXPOSURE: Existing skin conditions.

CARCINOGENICITY: This product's ingredients are not found in the Federal or Cal OSHA, NTP, IARC lists of suspected cancer causing agents.

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.
SKIN: Remove contaminated clothing and launder before reuse. Wash effected area with soap and water.
INGESTION: Consult a physician. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air. If symptoms persist, consult a physician.

MATERIAL SAFETY DATA SHEET
WEST W-126

5. FIRE FIGHTING MEASURES

Flash Point: > 200° F (> 93 ° C)
Flash Point Method Used: PMCC
Flammable Limits in Air (Lower - % by volume): Not Evaluated
Flammable Limits in Air (Upper - % by volume): Not Evaluated
Autoignition: Not Evaluated
Sensitivity to Mechanical Impact: None
Sensitivity to Static Discharge: Not Evaluated.
Fire Fighting Extinguishing Media: Carbon dioxide, dry chemical or foam.
Fire Fighting Equipment: Firefighters should wear normal protective equipment. SCBA is recommended for confined areas. Cool exposed drums or tanks with water.
Fire and Explosion Hazards: Wetted product presents an extreme slip hazard. Pedestrian and vehicular traffic must proceed with caution where even a small amount of wet product may exist.
Extinguishing Media to Avoid: Water may create a slip hazard with product.
Hazardous Combustion Products: Oxides of carbon and nitrogen.

6. ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Remove all ignition sources. Dike area to control run off and collect spill in appropriate container(s). Use an inert absorbent such as vermiculite to collect residual liquid. Then water wash area to waste treatment to eliminate slip hazard.

Water Spill: Note: The petroleum distillates in this product are classified as an oil under Section 311 of the Clean Water Act. Spills, entering (A) surface waters or (B) any water courses or sewers entering or leading to surface water, that cause a sheen must be reported to the National Response Center at 800-424-8802.

7. HANDLING AND STORAGE

Other Handling Information: Avoid high temperatures and open systems to minimize vapor release and exposures. Keep containers closed and properly labeled. Do not reuse containers before contents are completely removed, and the container is properly cleaned and reconditioned. (Refer also to Section VII). Good personal hygiene practices can reduce potential exposure. Wash with soap and water following any contact with this product, as well as before breaks and meals. Shower and change clothing at end of work shift. If clothing becomes contaminated, remove and launder or dry-clean before reuse.

Storage Information: Product may be difficult to handle if cold. Maintain temperature between 20°C and 30°C.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Skin Protection: Chemical resistant gloves.
Respiratory Protection: Not required under normal operating conditions.
Eye Protection: Full side shield safety glasses or goggles (ANSI Z87.1 standard).
Engineering Controls: Recommended general area ventilation.
Additional Information: Provide eyewash station(s). Select additional protective equipment (eg apron, face shield, etc.), depending on conditions of use.

MATERIAL SAFETY DATA SHEET
WEST W-126

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	Liquid
Color:	White to off-white
Odor:	Slight hydrocarbon oil like odor
Odor Threshold:	Not applicable
Physical State:	Liquid
Solubility in Water:	Soluble, solubility limited by viscosity
Vapor Pressure:	Not Evaluated
Specific Gravity:	~1
Boiling Point:	Not Established
Melting Point:	Not Applicable
Freezing Point:	Not Applicable
Decomposition Temperature:	Not Evaluated
Evaporation Rate:	Not Evaluated
Vapor Density:	Not Evaluated
VOC:	Not Evaluated
pH:	Not Established

10. STABILITY AND REACTIVITY

Materials to Avoid: Strong oxidants.
Stability: Stable.
Hazardous Polymerization: Will not occur.
Hazardous Decomposition Products: Thermal decomposition or combustion may produce oxides of carbon and nitrogen, various hydrocarbons, ammonia and/or hydrogen chloride vapor. Vapor may be irritating or harmful.
Incompatibility: Strong oxidants such as liquid chlorine, enriched gaseous or liquid oxygen, and sodium or calcium hypochlorite.

11. TOXICOLOGICAL INFORMATION

Acute and Chronic Toxicity:

A: General Product Information

Eye and skin irritant. May aggravate existing medical conditions such as rashes, allergies or other sensitive areas. Symptoms may include reddening, swelling of affected areas with possible itching, burning or other discomfort.

B: Acute Toxicity – LD50/LC50

LC50: Ceriodaphnia dubia
48 hours: 11.0 ppm
LC50: Pimphales promealas
48 hours: 31.4 ppm

Carcinogenicity: Not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

12. ECOLOGICAL INFORMATION

Ecotoxicity

A: General Product Information

C.O.D.: 2,176,000 mg/l
B.O.D.: 548,000 mg/l

MATERIAL SAFETY DATA SHEET
WEST W-126

13. DISPOSAL CONSIDERATIONS

RCRA Hazard Class: This product, when unadulterated, is not a RCRA regulated hazardous waste.
Waste Disposal Method: Disposal must be arranged in accordance with local, state and federal regulations. Care must be taken to prevent environmental contamination from the disposal of material, residues and containers.

14. TRANSPORT INFORMATION

DOT:
Proper Shipping Name: NOT A DOT/IMO HAZARDOUS MATERIAL
IATA:
Proper Shipping Name: NOT HAZARDOUS FOR TRANSPORT BY AIR
IMDG:
Proper Shipping Name: NOT A DOT/IMO HAZARDOUS MATERIAL

Department of Transportation: This product is considered to be an oil per the definitions in 49 CFR 130.2. If packed in a container with a capacity of 3,500 gallons or more, the Communication requirements at 49 CFR 130.11 and the Response Plan Requirements at 49 CFR 130.31 and 130.33 apply to Domestic transportation by motor vehicles and rolling stock.

Notification of releases to the National Response Center (NRC), 800-424-8802, may be necessary. In the Washington, DC metropolitan area, call 202-426-2675.

15. REGULATORY INFORMATION

US Federal Regulations:
Chemical Weapons Convention (CWC): This product does not contain any chemicals listed under the Chemical Weapons Convention Schedules of Chemicals.

16. OTHER INFORMATION

DATE PREPARED: 2/21/2006
MSDS No: W126

MANUFACTURER DISCLAIMER: The information contained herein is provided in good faith and believed to be correct as of the date hereof. However, WEST, Inc. makes no representation as to the comprehensiveness or accuracy of the information. It is expected that individuals receiving the information will exercise their independent judgement in determining its appropriateness for a particular purpose. Accordingly, WEST, Inc. will not be responsible for damages of any kind resulting from the use of or reliance upon such information. No representations, or warranties, either expressed or implied, of merchantability fitness for a particular purpose or of any other nature are made hereunder with respect to the information set fourth herein or to the product to which the information refers.

Bright Dyes® FLT Yellow/Green Liquid

Kingscote CHEMICALS

Safety Data Sheet

Issue Date: 04-Oct-2013 **Revision Date:** 06-Feb-2017 **Version Number:** 1.1

1. Identification

Product Identifiers
Product Name: Bright Dyes® FLT Yellow/Green Liquid

Product Number: 106001

Recommended Use & Restrictions on Use
Water tracing & leak detection dye

Manufacturer/Supplier
Kingscote Chemicals, Inc.
3334 South Tech Blvd.
Miamisburg, OH 45342
U.S.A.

Emergency Telephone Number
Company Telephone Number: (937) 886-9100
Emergency Telephone (24 hr): INFOTRAC (800) 535-5053 (North America)
+1-352-323-3500 (International)

2. Hazards Identification

Classification
This chemical does not meet the hazardous criteria set forth by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200). However, this Safety Data Sheet (SDS) contains valuable information critical to the safe handling and proper use of this product. This SDS should be retained and available for employees and other users of this product.

3. Composition/Information on Ingredients

This product is not hazardous according to OSHA 29 CFR 1910.1200. Components not listed are not hazardous or are below reportable limits.

4. First-Aid Measures

First-Aid Measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists: Get medical advice/attention.
Skin Contact	Wash thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
Inhalation	Remove to fresh air. If breathing is difficult, administer oxygen; seek medical attention immediately.

Bright Dyes® FLT Yellow/Green Liquid **Revision Date:** 06-Feb-2017

Ingestion Rinse mouth. DO NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person. Get medical attention if large quantities were ingested or if nausea occurs.

Most Important Symptoms and Effects

Symptoms Will cause staining of the skin on contact. May cause eye irritation. Inhalation of dust may cause respiratory irritation. Ingestion may cause urine to be a yellow/green color until the dye has been washed through the system.

Indication of Any Immediate Medical Attention and Special Treatment Needed

Notes to Physician Treat symptomatically.

5. Fire-Fighting Measures

Suitable Extinguishing Media
Water spray (fog). Carbon dioxide (CO2). Dry chemical. Regular foam.

Unsuitable Extinguishing Media
Not determined

Specific Hazards Arising from the Chemical
Product is not flammable. Burning/combustion may produce oxides of carbon and nitrogen (NOx).

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

6. Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures

Personal Precautions Use personal protective equipment as recommended in Section 8.

Environmental Precautions Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12 and Section 13.

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 Sweep up and collect into suitable containers for disposal. Flush area with water.

7. Handling and Storage

Precautions for Safe Handling

Advice on Safe Handling Handle in accordance with good industrial hygiene and safety practices. Use personal protection recommended in Section 8. Avoid contact with skin, eyes, or clothing. Avoid breathing dusts. Contaminated clothing should be thoroughly washed before reuse.

Bright Dyes® FLT Yellow/Green Liquid **Revision Date:** 06-Feb-2017

Conditions for Safe Storage, Including Incompatibilities

Storage Conditions	Keep container tightly closed and store in a cool, dry, and well-ventilated area. Keep from freezing.
Incompatible Materials	Acids.

8. Exposure Controls / Personal Protection

Exposure Guidelines
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Controls
Ensure adequate ventilation, especially in confined areas. Eyewash stations. Showers.

Individual Protection Measures, Such as Personal Protective Equipment:

Eye/Face Protection	Goggles.
Skin & Body Protection	Rubber gloves. Suitable protective clothing.
Respiratory Protection	No protection is ordinarily required under normal conditions of use.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practices.

9. Physical and Chemical Properties

Information on Basic Physical and Chemical Properties

Physical State	Liquid	**Odor**	None apparent
Appearance	Yellow/green liquid	**Odor Threshold**	Not determined
Color	Yellow/green		

Property	Values
pH	>8.0
Melting/Freezing Point	~32° F
Boiling Point/Range	~212° F
Flash Point	Not applicable
Evaporation Rate	1.8
Flammability (solid, gas)	Liquid – not applicable
Upper Flammability Limits	Not applicable
Lower Flammability Limits	Not applicable
Vapor Pressure	Not applicable
Vapor Density	0.6
Relative Density	Not applicable
Specific Gravity	Not determined
Solubility	Highly soluble in water
Partition Coefficient	Not determined
Auto-ignition Temperature	Not determined
Decomposition Temperature	Not determined
Viscosity	Not determined

10. Stability and Reactivity

Reactivity
Not reactive under normal conditions.

Chemical Stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Conditions to Avoid
Keep separated from incompatible substances. Keep out of reach of children.

Incompatible Materials
Acids. Strong oxidizing agents.

Hazardous Decomposition Products
Oxides of carbon and nitrogen (NOx).

11: Toxicological Information

Information on Likely Routes of Exposure

Inhalation	Avoid breathing vapors or mists.
Ingestion	Do not ingest.
Skin Contact	May cause an allergic skin reaction.
Eye Contact	Avoid contact with eyes.

Delayed, Immediate, and Chronic Effects from Short- and Long-Term Exposure
May cause an allergic skin reaction.

Numerical Measures of Toxicity
Not determined

Symptoms Associated with Exposure
See Section 4 of this SDS for symptoms.

Carcinogenicity

NTP	None
IARC	None
OSHA	None

Bright Dyes® FLT Yellow/Green Liquid **Revision Date:** 06-Feb-2017

12. Ecological Information

Ecotoxicity
This product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Component Information
Not available

Persistence/Degradability
Not determined

Bioaccumulation
Not determined

Mobility
Not determined

Other Adverse Effects
Not determined

13. Disposal Considerations

Waste Disposal Methods
Dispose of in accordance with federal, state, and local regulations.

Contaminated Packaging
Do not re-use empty containers. Dispose of containers in accordance with federal, state, and local regulations.

14. Transport Information

Note
See current shipping paper for most up-to-date shipping information, including exemptions and special circumstances.

DOT	Not regulated
IATA	Not regulated
OMDG	Not regulated

15: Regulatory Information

International Inventories

TASCA	This product is not subject to TSCA 12(b) reporting requirements.

U.S. Federal Regulations

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).

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.

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).

U.S. State Regulations

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know This product does not contain any substances regulated under applicable state right-to-know regulations.

16: Other Information

HMIS

Health Hazards	Flammability	Instability	Special Hazards
1	0	0	Not determined

NFPA

Health Hazards	Flammability	Physical Hazards	Personal Protection
1	0	0	B

Issue Date 04-Oct-2013

Revision Date 06-Feb-2017

Revision Note Content Review

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 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 Safety Data Sheet

Bright Dyes® FLT Yellow/Green Tablets

Kingscote CHEMICALS

Safety Data Sheet

Issue Date: 09-Nov-2013 **Revision Date:** 06-Feb-2017 **Version Number:** 2.1

1. Identification

Product Identifiers
Product Name: Bright Dyes® FLT Yellow/Green Tablet

Product Number: 101101

Recommended Use & Restrictions on Use
Water tracing & leak detection dye

Manufacturer/Supplier
Kingscote Chemicals, Inc.
3334 South Tech Blvd.
Miamisburg, OH 45342
U.S.A.

Emergency Telephone Number
Company Telephone Number: (937) 886-9100
Emergency Telephone (24 hr): INFOTRAC (800) 535-5053 (North America)
+1-352-323-3500 (International)

2. Hazards Identification

Classification
This chemical does not meet the hazardous criteria set forth by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200). However, this Safety Data Sheet (SDS) contains valuable information critical to the safe handling and proper use of this product. This SDS should be retained and available for employees and other users of this product.

3. Composition/Information on Ingredients

This product is not hazardous according to OSHA 29 CFR 1910.1200. Components not listed are not hazardous or are below reportable limits.

4. First-Aid Measures

First-Aid Measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists: Get medical advice/attention.
Skin Contact	Wash thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
Inhalation	Remove to fresh air. If breathing is difficult, administer oxygen; seek medical attention immediately.

Bright Dyes® FLT Yellow/Green Tablet **Revision Date:** 06-Feb-2017

Ingestion Rinse mouth. DO NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person. Get medical attention if large quantities were ingested or if nausea occurs.

Most Important Symptoms and Effects

Symptoms Will cause staining of the skin on contact. May cause eye irritation. Inhalation of dust may cause respiratory irritation. Ingestion may cause urine to be a yellow/green color until the dye has been washed through the system.

Indication of Any Immediate Medical Attention and Special Treatment Needed

Notes to Physician Treat symptomatically.

5. Fire-Fighting Measures

Suitable Extinguishing Media
Water spray (fog). Carbon dioxide (CO2). Dry chemical.

Unsuitable Extinguishing Media
Not determined

Specific Hazards Arising from the Chemical
Remote possibility of dust explosion. Burning may produce oxides of carbon and nitrogen (NOx).

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

6. Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures

Personal Precautions Use personal protective equipment as recommended in Section 8.

Environmental Precautions Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12 and Section 13.

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 Sweep up and collect into suitable containers for disposal. Flush area with water.

7. Handling and Storage

Precautions for Safe Handling

Advice on Safe Handling Handle in accordance with good industrial hygiene and safety practices. Use personal protection recommended in Section 8. Avoid contact with skin, eyes, or clothing. Avoid breathing dusts. Contaminated clothing should not be allowed out of the workplace.

Bright Dyes® FLT Yellow/Green Tablet **Revision Date:** 06-Feb-2017

Conditions for Safe Storage, Including Incompatibilities

Storage Conditions	Keep container tightly closed and store in a cool, dry, and well-ventilated area. Store away from heat, sparks, open flame or any other ignition source.
Incompatible Materials	Bromine trifluoride. Lithium. Strong acids, bases, and oxidizing agents.

8. Exposure Controls / Personal Protection

Exposure Guidelines
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Controls
Ensure adequate ventilation, especially in confined areas. Eyewash stations. Showers.

Individual Protection Measures, Such as Personal Protective Equipment:

Eye/Face Protection	Avoid contact with eyes.
Skin & Body Protection	Rubber gloves. Suitable protective clothing.
Respiratory Protection	Use NIOSH-approved dust mask if dusty conditions exist.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practices.

9. Physical and Chemical Properties

Information on Basic Physical and Chemical Properties

Physical State	Solid	**Odor**	None apparent
Appearance	Orange tablet	**Odor Threshold**	Not determined
Color	Orange		

Property	Values
pH	Not applicable
Melting/Freezing Point	Not applicable
Boiling Point/Range	Not applicable
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid, gas)	Not flammable
Upper Flammability Limits	Not applicable
Lower Flammability Limits	Not applicable
Vapor Pressure	Not applicable
Vapor Density	Not applicable
Relative Density	Not applicable
Specific Gravity	Not applicable
Solubility	Highly soluble in water with small amounts of insoluble residue
Partition Coefficient	Not determined
Auto-ignition Temperature	Not determined
Decomposition Temperature	Not determined
Viscosity	Not determined

Bright Dyes® FLT Yellow/Green Tablet **Revision Date:** 06-Feb-2017

10. Stability and Reactivity

Reactivity
Not reactive under normal conditions.

Chemical Stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Conditions to Avoid
Keep separated from incompatible substances. Keep out of reach of children.

Incompatible Materials
Bromine trifluoride. Lithium. Strong acids, bases, and oxidizing agents.

Hazardous Decomposition Products
Oxides of carbon and nitrogen (NOx).

11: Toxicological Information

Information on Likely Routes of Exposure

Inhalation	Avoid inhalation of dust.
Ingestion	Do not ingest.
Skin Contact	May cause an allergic skin reaction.
Eye Contact	Avoid contact with eyes.

Delayed, Immediate, and Chronic Effects from Short- and Long-Term Exposure
May cause an allergic skin reaction.

Numerical Measures of Toxicity
Not determined

Symptoms Associated with Exposure
See Section 4 of this SDS for symptoms.

Carcinogenicity

NTP	None
IARC	None
OSHA	None

Bright Dyes® FLT Yellow/Green Tablet **Revision Date:** 06-Feb-2017

12. Ecological Information

Ecotoxicity
This product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Component Information
Not available

Persistence/Degradability
This product is biodegradable.

Bioaccumulation
Not determined

Mobility
Not determined

Other Adverse Effects
Not determined

13. Disposal Considerations

Waste Disposal Methods
Dispose of in accordance with federal, state, and local regulations.

Contaminated Packaging
Do not re-use empty containers. Dispose of containers in accordance with federal, state, and local regulations.

14. Transport Information

Note
See current shipping paper for most up-to-date shipping information, including exemptions and special circumstances.

DOT	Not regulated
IATA	Not regulated
OMDG	Not regulated

15: Regulatory Information

International Inventories
Not determined

U.S. Federal Regulations

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).

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.

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).

U.S. State Regulations

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know This product does not contain any substances regulated under applicable state right-to-know regulations.

16: Other Information

HMIS

Health Hazards	Flammability	Instability	Special Hazards
1	0	0	Not determined

NFPA

Health Hazards	Flammability	Physical Hazards	Personal Protection
1	0	0	B

Issue Date 09-Nov-2013

Revision Date 06-Feb-2017

Revision Note Content Review

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End of Safety Data Sheet