CONESTOGA-ROVERS
& ASSOCIATES

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March 14, 2013

Reference No. 017303

Mr. Luther Blackburn
Industrial Pretreatment Program Supervisor
Ypsilanti Community Utilities Authority (YCUA)
2777 State Road
Ypsilanti, Michigan 48198-9112

Dear Mr. Blackburn:

Re: Upcoming Remediation Activities
Industrial User Permit #RA 12-15
Revitalizing Auto Communities Environmental Response Trust (RACER)
Company Vehicle Operations Area (CVO)
2901 Tyler Road, Ypsilanti, Michigan

On behalf of Revitalizing Auto Communities Environmental Response Trust (RACER), Conestoga-Rovers & Associates (CRA) has prepared this letter to provide a summary of the remediation activities anticipated in 2013 at the Company Vehicle Operations Area (CVO) located at 2901 Tyler Road, Ypsilanti, Michigan (Site).

Currently RACER discharges treated groundwater from a remediation system to Ypsilanti Community Utilities Authority (YCUA) under industrial user permit # RA 12-15. The treated groundwater that is discharged is part of an interim measure in place at the Site to prevent contaminated groundwater from behind the sheet pile wall to discharge to Tyler Pond. Excavation of the source material responsible for the contamination of the groundwater is planned to begin in late spring of 2013. During the excavation activities which will be completed by The Environmental Quality Company (EQ), storm and groundwater will be recovered, treated, and discharged to YCUA. Following completion of the excavation activities, groundwater will be recovered and discharged to YCUA for a limited period of time (through fall/winter 2013) to determine if groundwater concentrations are reduced sufficiently to discontinue recovering water.

This letter serves to inform YCUA of changes in the treatment processes associated with pre-remediation, during remediation and post remediation activities at the Site so that YCUA can advise on any modifications that may be required to the existing permit # RA 12-15 due to the proposed remediation activities at the Site.

BACKGROUND

Industrial permits (#RA 6-12 and RA 12-15) were issued in 2011 and 2012, respectively, for the discharge of process wastewater from the Site to the YCUA sewage treatment system. The process approved in these permits is described below. Groundwater is collected from the French drain located along the sheet pile wall (see Figure 1) and is pumped into a 20,000 gallon equalization tank. From the equalization tank the groundwater is pumped via a 2-inch transfer pump through a bag filtration unit (2 canisters in parallel) equipped with a 100-micron bag filters to remove suspended solids. Effluent from the bag filtration unit is then processed through two 1,000 lb Granular Activated Carbon (GAC) vessels in series (lead/lag configuration) for removal of volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs), if present, prior to discharge to the YCUA sewer system through MH-6, the discharge location authorized in the permits.

Groundwater was treated and discharged in approximately 16,000 gallon batches every 3 to 4 weeks during 2011 and 2012. Samples were collected and reports were submitted as part of the permit requirements.

Treatment Process Modifications in 2012: Vinyl Chloride exceeded the discharge limits twice in 2012. In response to the first violation of the permit (reported on May 15, 2012 via email), sodium permanganate was added to the equalization tank to reduce the VOCs concentrations prior to treatment through the existing treatment process (bag filters and carbon units).

The second violation occurred and was reported on July 9, 2012. Due to a recurring violation, the carbon treatment vessels were replaced with two 1,500 pound carbon units filled with coconut shell based carbon. Groundwater was treated through the new carbon units and bag filters. No violation occurred; however, vinyl chloride concentrations were detected again.

Based on these observations, it appears that carbon may not be suitable for reducing vinyl chloride concentrations at the Site. It should be noted that PCBs have not been observed in groundwater in the equalization tank during previous monitoring of the on-Site treatment system. It was, therefore, determined that groundwater would not be treated through the carbon system at the Site.

Subsequently, sodium permanganate was added to the equalization tank to ensure that VOC concentrations are not detected. No exceedances of VOCs and PCBs were reported upon treatment with sodium permanganate. The carbon treatment system was decommissioned and the purple water was treated through the bag filters for the last treatment of 2012 and was discharged to MH-6.

PROPOSED ACTIVITIES

I. PRE-REMEDIATION ACTIVITIES

Groundwater treatment and discharge is anticipated in April 2013 and will be similar to the treatment process in 2012. Groundwater will be collected from the existing French drain located along the sheet pile wall and will be pumped into a 20,000 gallon equalization tank. CRA will continue to add the sodium permanganate to the equalization tank to reduce the VOC concentrations. The equalization tank will be treated with sodium permanganate until the water is purple, which will indicate all of the chlorinated VOCs have reacted and permanganate is still available. The water will then be discharged through the bag filters to MH-6. Carbon units will not be used for the treatment.

Due to the addition of sodium permanganate, purple colored water may be discharged to the YCUA sewer. As previously discussed with YCUA representatives, the colored water will not have any adverse effects on the YCUA treatment process.

II. REMEDIATION ACTIVITIES

Remediation activities are proposed along the sheet pile wall area at the Site to reduce the VOCs and PCBs in soils. The field work is scheduled to begin in late spring of 2013 and is anticipated to require at least three months for completion. As shown on Figure 1, remediation activities will be in the same area from where groundwater has been collected and discharged to YCUA sewers (following treatment) over the past two years. The PAOC 18 AFR (Area for Remediation) identified on Figure 1 is the area of soil to be remediated.

The selected remediation approach is to condition, excavate and dispose the impacted soils to remove the source material. Conditioning will involve in-place mixing of oxidants and an activator within the excavation area. The conditioning reagents include Klozur persulfate manufactured by FMC Environmental Solutions (FMC), using lime as the activator and potassium permanganate manufactured by Carus. Attachment 1 provides the material safety data sheets for these reagents.

Groundwater Collection: Groundwater will be recovered from the excavation using the existing French drain and sumps installed in the excavation. The water will be pumped to one or more 20,000 gallon equalization tank(s). The French drain will remain in place for as long as possible during the excavation to provide groundwater containment and protection of the pond. Following excavation of the impacted material, the French drain system will be reinstalled to allow for groundwater recovery/monitoring following completion of the interim

measure. Decontamination water from equipment will be transferred to the same equalization tanks. Where DNAPL is observed in the excavation, the water/DNAPL mixture will be pumped through weir tanks to facilitate separation of DNAPL from water. The tanks will allow for drainage of DNAPL from the bottom into drums. Water from the weir tanks will then be pumped through a bag filter to the frac tank(s) for storage of water pumped from excavation.

Groundwater Treatment: Oxidant (sodium persulfate and/or potassium permanganate) will be added to the water in the equalization tank(s) to reduce VOCs concentrations. The amount of oxidant added will be based on the concentrations of VOCs in the water in the equalization tank. Periodic testing of water stored in the equalization tank will be completed by the onsite lab to gauge if additional oxidant is required. Due to the addition of permanganate, purple color water may be discharged to the YCUA sewer.

Groundwater will then be treated two multi-bag filter housings and two 1,500 lb activated carbon pressure filtration vessels. This size is able to support up to 100 gallons per minute (gpm) and maintain 7.5 minutes of Empty Bed Contact Time. Although designed for a flow rate up to 100 gpm, the planned discharge rate to the sanitary sewer will be 50 gpm or less.

Monitoring and Reporting: Monitoring and reporting requirements in the YCUA discharge permit will be strictly followed.

III. POST-REMEDIATION ACTIVITIES

Groundwater recovery will continue for a period of time following the remediation activities at the Site. It is expected that the French drain (removed and reinstalled during excavation) will be used to recover groundwater which will be sampled and discharged following treatment, if necessary. The expected treatment would include either the use of chemical additives (sodium or potassium permanganate) or the use of carbon units depending on the constituents and concentrations observed following remediation activities. The goal is to decommission the water recovery system prior to the Winter of 2013 and not reestablish it in the Spring of 2014.

Please provide your acknowledgment of this letter and advice on whether any modification to the existing permit or sampling approach is needed. If a call or meeting to discuss the proposed changes would be of assistance to you, please let us know. As stated above, the remediation work is anticipated to begin in late spring of 2013; CRA would appreciate your response prior to April 15, 2013.

Should you have any questions, please do not hesitate to contact me at (734) 453-5123.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

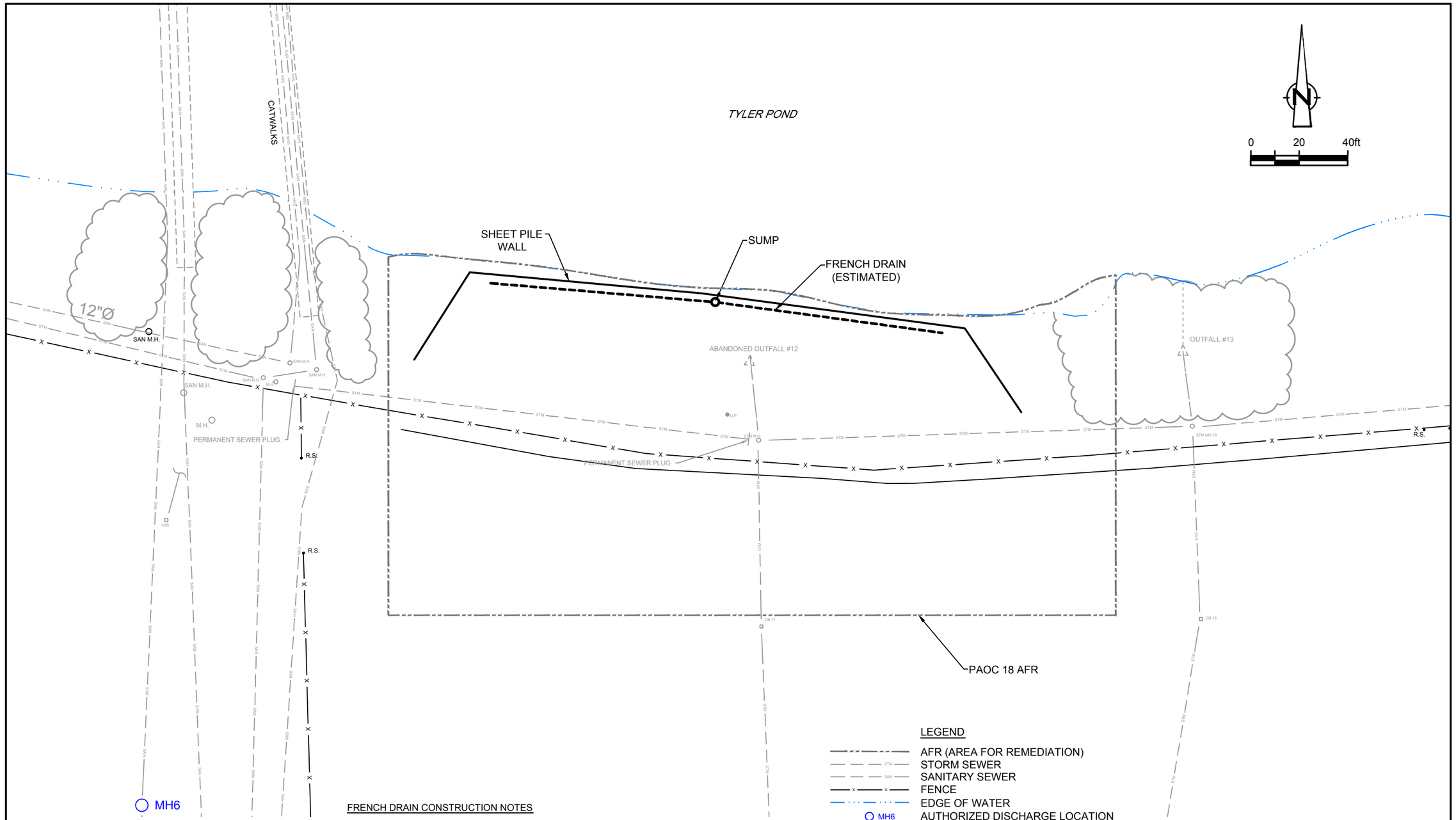
Beth Landale

Beth Landale

ab/bw/31/Det.

cc: Perry Thomas, YCUA
Grant Trigger, RACER
David Favero, RACER
Ron Evenson, EQ

FIGURES



FRENCH DRAIN CONSTRUCTION NOTES

1. APPROXIMATELY 200 FEET LONG BY 18 INCHES WIDE.
2. 4 INCH DIAMETER HDPE PERFORATED PIPE IN 12 INCHES OF PEASTONE.
3. CENTER SUMP EQUIPPED WITH SUMP PUMP FOR WATER RECOVERY AND DISCHARGE.

LEGEND

- AFR (AREA FOR REMEDIATION)
- STORM SEWER
- SANITARY SEWER
- FENCE
- EDGE OF WATER
- MH6 AUTHORIZED DISCHARGE LOCATION

figure 1

UPCOMING REMEDIATION ACTIVITIES
PERMIT # RA12-15
WILLOW RUN COMPANY VEHICLE OPERATIONS AREA
Ypsilanti, Michigan

17303-T01(BLAC31D)GN-WI001 MAR 12/2013

ATTACHMENT 1

MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

Klozür™

MSDS Ref. No.: 7775-27-1-12
Date Approved: 02/22/2005
Revision No.: 1

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200; the Canada's Workplace Hazardous Materials Information System (WHMIS) and, the EC Directive, 2001/58/EC.

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	Klozür™
SYNONYMS:	Sodium Persulfate, Sodium Peroxydisulfate; Disodium Peroxydisulfate
GENERAL USE:	In situ and ex situ chemical oxidation of contaminants and compounds of concern for environmental remediation applications.

MANUFACTURER

FMC CORPORATION
Active Oxidants Division
1735 Market Street
Philadelphia, PA 19103
(215) 299-6000 (General Information)

EMERGENCY TELEPHONE NUMBERS

(800) 424-9300 (CHEMTREC - U.S.)
(303) 595-9048 (Medical - Call Collect)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

- White, odorless, crystals
- Oxidizer.
- Decomposes in storage under conditions of moisture (water/water vapor) and/or excessive heat causing release of oxides of sulfur and oxygen that supports combustion. Decomposition could form a high temperature melt. See Section 10 ("Stability and Reactivity").

POTENTIAL HEALTH EFFECTS: Airborne persulfate dust may be irritating to eyes, nose, lungs, throat and skin upon contact. Exposure to high levels of persulfate dust may cause difficulty in breathing in sensitive persons.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt.%	EC No.	EC Class
Sodium Persulfate	7775-27-1	>99	231-892-1	Not classified as hazardous

4. FIRST AID MEASURES

EYES: Flush with plenty of water. Get medical attention if irritation occurs and persists.

SKIN: Wash with plenty of soap and water. Get medical attention if irritation occurs and persists.

INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: This product has low oral toxicity and is not irritating to the eyes and skin. Flooding of exposed areas with water is suggested, but gastric lavage or emesis induction for ingestions must consider possible aggravation of esophageal injury and the expected absence of system effects. Treatment is controlled removal of exposure followed by symptomatic and supportive care.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Deluge with water.

FIRE / EXPLOSION HAZARDS: Product is non-combustible. On decomposition releases oxygen which may intensify fire. Presence of water accelerates decomposition.

FIRE FIGHTING PROCEDURES: Do not use carbon dioxide or other gas filled fire extinguishers; they will have no effect on decomposing persulfates. Wear full protective clothing and self-contained breathing apparatus.

FLAMMABLE LIMITS: Non-combustible

SENSITIVITY TO IMPACT: No data available

SENSITIVITY TO STATIC DISCHARGE: Not available

6. ACCIDENTAL RELEASE MEASURES

RELEASE NOTES: Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to regulatory agencies procedures.

7. HANDLING AND STORAGE

HANDLING: Use adequate ventilation when transferring product from bags or drums. Wear respiratory protection if ventilation is inadequate or not available. Use eye and skin protection. Use clean plastic or stainless steel scoops only.

STORAGE: Store (unopened) in a cool, clean, dry place away from point sources of heat, e.g. radiant heaters or steam pipes. Use first in, first out storage system. Avoid contamination of opened product. In case of fire or decomposition (fuming/smoking) deluge with plenty of water to control decomposition. For storage, refer to NFPA Bulletin 430 on storage of liquid and solid oxidizing materials.

COMMENTS: VENTILATION: Provide mechanical general and/or local exhaust ventilation to prevent release of dust into work environment. Spills should be collected into suitable containers to prevent dispersion into the air.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
Sodium Persulfate	0.1 mg/m^3 (TWA)		

ENGINEERING CONTROLS: Provide mechanical local general room ventilation to prevent release of dust into the work environment. Remove contaminated clothing immediately and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Use cup type chemical goggles. Full face shield may be used.

RESPIRATORY: Use approved dust respirator when airborne dust is expected.

PROTECTIVE CLOTHING: Normal work clothes. Rubber or neoprene footwear.

GLOVES: Rubber or neoprene gloves. Thoroughly wash the outside of gloves with soap and water prior to removal. Inspect regularly for leaks.

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	None
APPEARANCE:	White crystals
AUTOIGNITION TEMPERATURE:	Not applicable. No evidence of combustion up to 800°C. Decomposition will occur upon heating.
BOILING POINT:	Not applicable
COEFFICIENT OF OIL / WATER:	Not applicable
DENSITY / WEIGHT PER VOLUME:	Not available
EVAPORATION RATE:	Not applicable (Butyl Acetate = 1)
FLASH POINT:	Non-combustible
MELTING POINT:	Decomposes
ODOR THRESHOLD:	Not applicable
OXIDIZING PROPERTIES:	Oxidizer
PERCENT VOLATILE:	Not applicable
pH:	typically 5.0 - 7.0 @ 25 °C (1% solution)
SOLUBILITY IN WATER:	73 % @ 25 °C (by wt.)
SPECIFIC GRAVITY:	2.6 (H_2O=1)
VAPOR DENSITY:	Not applicable (Air = 1)
VAPOR PRESSURE:	Not applicable

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Heat, moisture and contamination.
STABILITY:	Stable (becomes unstable in presence of heat, moisture and/or contamination).
POLYMERIZATION:	Will not occur
INCOMPATIBLE MATERIALS:	Acids, alkalis, halides (fluorides, chlorides, bromides and iodides), combustible materials, most metals and heavy metals, oxidizable materials, other oxidizers, reducing agents, cleaners, and organic or carbon containing compounds. Contact

with incompatible materials can result in a material decomposition or other uncontrolled reactions.

HAZARDOUS DECOMPOSITION PRODUCTS: Oxygen that supports combustion and oxides of sulfur.

COMMENTS: PRECAUTIONARY STATEMENT: Pumping and transport of Klozür persulfate requires appropriate precautions and design considerations for pressure and thermal relief.

Decomposing persulfates will evolve large volumes of gas and/or vapor, can accelerate exponentially with heat generation, and create significant and hazardous pressures if contained and not properly controlled or mitigated.

Use with alcohols in the presence of water has been demonstrated to generate conditions that require rigorous adherence to process safety methods and standards to prevent escalation to an uncontrolled reaction.

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11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: Non-irritating (rabbit) [FMC Study Number: ICG/T-79.029]

SKIN EFFECTS: Non-irritating (rabbit) [FMC Study Number: ICG/T-79.029]

DERMAL LD_{50}: > 10 g/kg [FMC Study Number: ICG/T-79.029]

ORAL LD_{50}: 895 mg/kg (rat) [FMC Study Number: ICG/T-79.029]

INHALATION LC_{50}: 5.1 mg/l (rat) [FMC I95-2017]

SENSITIZATION: May be sensitizing to allergic persons. [FMC Study Number: ICG/T-79.029]

TARGET ORGANS: Eyes, skin, respiratory passages

ACUTE EFFECTS FROM OVEREXPOSURE: Dust may be harmful and irritating. May be harmful if swallowed.

CHRONIC EFFECTS FROM OVEREXPOSURE: Sensitive persons may develop dermatitis and asthma [Respiration 38:144, 1979]. Groups of male and female rats were fed 0, 300 or 3000 ppm sodium persulfate in the diet for 13 weeks, followed by 5000 ppm for 5 weeks. Microscopic examination of tissues revealed some injury to the gastrointestinal tract at the high dose (3000 ppm) only. This effect is not unexpected for an oxidizer at high concentrations. [Ref. FMC I90-1151, Toxicologist 1:149, 1981].

CARCINOGENICITY:

NTP:	Not listed
IARC:	Not listed
OSHA:	Not listed
OTHER:	ACGIH: Not listed

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION:

Bluegill sunfish, 96-hour LC_{50} = 771 mg/L [FMC Study I92-1250]
Rainbow trout, 96-hour LC_{50} = 163 mg/L [FMC Study I92-1251]
Daphnia, 48-hour LC_{50} = 133 mg/L [FMC Study I92-1252]
Grass shrimp, 96-hour LC_{50} = 519 mg/L [FMC Study I92-1253]

CHEMICAL FATE INFORMATION: Biodegradability does not apply to inorganic substances.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose as a hazardous waste in accordance with local, state and federal regulatory agencies.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME:	Sodium Persulfate
PRIMARY HAZARD CLASS / DIVISION:	5.1 (Oxidizer)
UN/NA NUMBER:	UN 1505
PACKING GROUP:	III
LABEL(S):	5.1 (Oxidizer)
PLACARD(S):	5.1 (Oxidizer)
MARKING(S):	Sodium Persulfate, UN 1505
ADDITIONAL INFORMATION:	Hazardous Substance/RQ: Not applicable

49 STCC Number: 4918733

This material is shipped in 225 lb. fiber drums, 55 lb. poly bags and 1000 - 2200 lb. IBC's (supersacks).

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

PROPER SHIPPING NAME: Sodium Persulfate

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) / INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

PROPER SHIPPING NAME: Sodium Persulfate

OTHER INFORMATION:

Protect from physical damage. Do not store near acids, moisture or heat.

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15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):
Not applicable

SECTION 311 HAZARD CATEGORIES (40 CFR 370):
Fire Hazard, Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):
The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.:
None

SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):
Not listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):
Unlisted, RQ = 100 lbs., Ignitability

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA INVENTORY STATUS (40 CFR 710):

Listed

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
RCRA IDENTIFICATION OF HAZARDOUS WASTE (40 CFR 261):
Waste Number: D001

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):

Product Identification Number: 1505
Hazard Classification / Division: Class C (Oxidizer), Class D, Div. 2, Subdiv. B. (Toxic)
Ingredient Disclosure List: Listed

INTERNATIONAL LISTINGS

Sodium persulfate:
Australia (AICS): Listed
China: Listed
Japan (ENCS): (1)-1131
Korea: KE-12369
Philippines (PICCS): Listed

HAZARD, RISK AND SAFETY PHRASE DESCRIPTIONS:

EC Symbols: (Not classified as hazardous)

EC Risk Phrases: (Not classified as hazardous)

EC Safety Phrases: (Not classified as hazardous)

16. OTHER INFORMATION

HMIS

Health	1
Flammability	0
Physical Hazard	1
Personal Protection (PPE)	J

Protection = J (Safety goggles, gloves, apron & combination dust & vapor respirator)

HMIS = Hazardous Materials Identification System

Degree of Hazard Code:
4 = Severe

3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

NFPA

Health	1
Flammability	0
Reactivity	1
Special	OX

SPECIAL = OX (Oxidizer)

NFPA = National Fire Protection Association

Degree of Hazard Code:
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

REVISION SUMMARY:
New MSDS

Klozür and FMC Logo - FMC Trademarks

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RemOx® L
ISCO Reagent

EC- SAFETY DATA SHEET according to Regulation (EC) № 1907/2006 of the European Parliament and of the Council, of 18 December 2006 concerning REACH

Material Safety Data Sheet

Section 1 Chemical Product and Company Identification

PRODUCT NAME: RemOx® L ISCO Reagent **TRADE NAME:** RemOx® L ISCO Reagent	**Revision Date: April 2008**

USES OF SUBSTANCE: RemOx® L ISCO Reagent is a liquid oxidant recommended for in-situ and ex-situ remediation of sites that require a strong oxidant.

COMPANY NAME (Europe): CARUS NALON S.L.	**COMPANY ADDRESS:** Carus Nalon S.L. Barrio Nalon, s/n 33100 Trubia-Oviedo Espana, Spain **INFORMATION:** (34) 985-785-513 (34) 985-785-513 www.caruseurope.com (Web) carus@carusnalon.com (Email) **EMERGENCY TELEPHONE:** (34) 985-785-513
COMPANY NAME (US): CARUS CORPORATION	**COMPANY ADDRESS:** 315 Fifth Street Peru, IL 61354, USA **INFORMATION:** (815)-223-1500 www.caruscorporation.com (Web) salesmkt@caruscorporation.com (Email) **EMERGENCY TELEPHONE:** (800) 435 –6856 (USA) (800) 424-9300 (CHEMTREC, USA) (815-223-1500 (Other countries)

Section 2 Hazards Identification

1. Eye Contact
   RemOx® L ISCO Reagent is damaging to eye tissue on contact. It may cause burns that result in damage to the eye.
2. Skin Contact
   Momentary contact of solution at room temperature may be irritating to the skin, leaving brown stains. Prolonged contact is damaging to the skin.
3. Inhalation
   Acute inhalation toxicity data are not available. However, airborne concentrations of RemOx® L ISCO Reagent in the form of mist may cause irritation to the respiratory tract.
4. Ingestion
   RemOx® L ISCO Reagent if swallowed, may cause burns to mucous membranes of the mouth, throat, esophagus, and stomach.

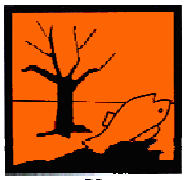
Section 3 Hazardous Ingredients

Material or Component	CAS No.	%	Hazard Data
Sodium Permanganate	10101-50-5	40	**PEL/C** 5 mg Mn per cubic meter of air **TLV-TWA** 0.2 mg Mn per cubic meter of air

HAZARD SYMBOLS:


O


Xn


N

RISK PHRASES:

8 Contact with combustibles may case fire.
22 Harmful if swallowed.
50/53 Very toxic to aquatic organisms, may cause long-term effects in the aquatic environment.

SAFETY PHRASES:

17 Keep away from combustible materials.
24/25 Avoid contact with skin and eyes.
26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice

Section 4 First Aid Measures

1. Eyes
   Immediately flush eyes with large amounts of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Do not attempt to neutralize chemically. Seek medical attention immediately. Note to physician: Decomposition products are alkaline.
2. Skin
   Immediately wash contaminated areas with water. Remove contaminated clothing and footwear. (Caution: Solution may ignite certain textiles). Wash clothing and decontaminate footwear before reuse. Seek medical attention immediately if irritation is severe and persistent.
3. Inhalation
   Remove person from contaminated area to fresh air. If breathing has stopped, resuscitate and administer oxygen if readily available. Seek medical attention immediately.
4. Ingestion
   Never give anything by mouth to an unconscious or convulsing person. If person is conscious, give large quantities of water or milk. Seek medical attention immediately.

Section 5 Fire Fighting Measures

NFPA* HAZARD SIGNS:

Health Hazard 1 = Materials which under fire conditions would give off irritating combustion products. (less than 1 hour exposure) Materials which on the skin could cause irritation.
Flammability Hazard 0 = Materials that will not burn.
Reactivity Hazard 0 = Materials which in themselves are normally stable, even under fire exposure

conditions, and which are not reactive with water.

Special Hazard OX = Oxidizer

***National Fire Protection Association 704**

FIRST RESPONDERS:
Wear protective gloves, boots, goggles, and respirator. In case of fire, wear positive pressure breathing apparatus. Approach incident with caution. Use 2004 Emergency Response Guidebook (U.S. DOT RSPA, TC and STC). Guide No. 140. (http://hazmat.dot.gov/pubs/erg2004/erg2004.pdf).

FLASHPOINT	None
FLAMMABLE OR EXPLOSIVE LIMITS	Lower: Nonflammable Upper: Nonflammable
EXTINGUISHING MEDIA	Use large quantities of water. Water will turn pink to purple if in contact with RemOx® L ISCO Reagent. Dike to contain. Do not use dry chemicals, CO_2Halon® or foams.
SPECIAL FIREFIGHTING PROCEDURES	If material is involved in fire, flood with water. Cool all affected containers with large quantities of water. Apply water from as far as a distance as possible. Wear self-contained breathing apparatus and full protective clothing.
UNUSUAL FIRE AND EXPLOSION	Powerful oxidizing material. May decompose spontaneously if exposed to heat (135°C/275°F). May be explosive in contact with certain other chemicals (Section 10). May react violently with finely divided and readily oxidizable substances. Increases burning rate of combustible material. May ignite wood and cloth.

Section 6 Accidental Release Measures

PERSONAL PRECAUTIONS

Personnel should wear protective clothing suitable for the task. Remove all ignition sources and incompatible materials before attempting clean up.

ENVIRONMENTAL PRECAUTIONS:

Do not flush into sanitary sewer system or surface water. If accidental release into the environment occurs, inform the responsible authorities. Keep the product away from drains, sewers, surface and ground water and soil.

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Contain spill by collecting the liquid in a pit or holding behind a dam (sand or soil). Dilute to approximately 6% with water, and then reduce with sodium thiosulfate, a bisulfite or ferrous salt solution. The bisulfite or ferrous

salt may require some dilute sulfuric acid (10% w/w) to promote reduction. Neutralize with sodium carbonate to neutral pH, if acid was used. Decant or filter and deposit sludge in approved landfill. Where permitted, the sludge may be drained into sewer with large quantities of water. To clean contaminated floors, flush with abundant quantities of water into sewer, if permitted by federal, state, and local regulations. If not, collect water and treat as above.

Section 7 Handling and Storage

WORK/HYGIENIC PRACTICES

Wash hands thoroughly with soap and water after handling RemOx® L ISCO Reagent. Do not eat, drink or smoke when working with RemOx® L ISCO Reagent . Wear proper protective equipment. Remove clothing, if it becomes contaminated.

VENTILATION REQUIREMETNS

Provide sufficient mechanical and/or local exhaust to maintain exposure below the TLV/TWA.

CONDITIONS FOR SAFE STORAGE

Store in accordance with NFPA 430 requirements for Class II oxidizers. Protect containers from physical damage. Store in a cool, dry area in closed containers. Segregate from acids, peroxides, formaldehyde, and all combustible, organic, or easily oxidizable materials including antifreeze and hydraulic fluid.

Section 8 Exposure Controls and Personal Protection

RESPIRATORY PROTECTION

In cases where overexposure to mist may occur, the use of an approved NIOSH-MSHA mist respirator or an air supplied respirator is advised. Engineering or administrative controls should be implemented to control mist.

EYE

Faceshield, goggles, or safety glasses with side shields should be worn. Provide eyewash in working area.

GLOVES

Rubber or plastic gloves should be worn.

OTHER PROTECTIVE EQUIPMENT

Normal work clothing covering arms and legs, and rubber, or plastic apron should be worn. Caution: If clothing becomes contaminated, wash off immediately. Spontaneous ignition may occur with cloth or paper.

Section 9 Physical and Chemical Properties

APPEARANCE AND ODOR	Dark purple solution, odorless
BOILING POINT, 760 mm Hg	105 °C
VAPOR PRESSURE (mm Hg)	760 mm at 105ºC
SOLUBILITY IN WATER % BY SOLUTION	Miscible in all proportions
PERCENT VOLATILE BY VOLUME	61% (as water)
EVAPORATION RATE	Same as water
FREEZING POINT	-15.0 °C
SPECIFIC GRAVITY	1.36-1.39

pH	5-9
OXIDIZING PROPERTIES	Strong oxidizer. May ignite wood and cloth.
EXPLOSIVE PROPERTIES	Explosive in contact with sulfuric acid or peroxides, or readily oxidizable substances.

Section 10 Stability and Reactivity

STABILITY	Under normal conditions, the material is stable.
CONDITIONS TO AVOID	Contact with incompatible materials or heat (135°C / 275ºF) could result in violent exothermic chemical reaction.
INCOMPATIBLE MATERIALS	Acids, peroxides, formaldehyde, antifreeze, hydraulic fluids, and all combustible organic or readily oxidizable materials, including metal powders. With hydrochloric acid, toxic chlorine gas is liberated.
HAZARDOUS DECOMPOSITION PRODUCTS	When involved in a fire, liquid permanganate may form corrosive fumes.
CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION	Material is not known to polymerize.

Section 11 Toxicological Information

SODIUM PERMANGANATE: Acute oral LD_{50} not known.

1. Acute toxicity

Irritating to body tissue with which it comes into contact. No acute toxicity data is available for sodium permanganate. Toxicity is expected to be similar to that of potassium permanganate. The toxicity data for potassium permanganate is given below:

Ingestion:
LD 50 oral rat: 780 mg/kg male (14 days); 525 mg/kg female (14 days).
Harmful if swallowed. ALD: 10g. Ingestion may cause nausea, vomiting, sore throat, stomach-ache and eventually lead to a perforation of the intestine. Liver and kidney injuries may occur.

Skin contact:
LD 50 dermal no data available.
The product may be absorbed into the body through the skin. Major effects of exposure: severe irritation, brown staining of skin.

Inhalation:
LC 50 inhal. no data available.
The product may be absorbed into the body by inhalation. Major effects of exposure: respiratory disorder, cough.

2. Chronic toxicity

No known cases of chronic poisoning due to permanganates have been reported. Prolonged exposure, usually

over many years, to heavy concentrations of manganese oxides in the form of dust and fumes may lead to chronic manganese poisoning, chiefly involving the central nervous system.

3. Carcinogenicity
Sodium permanganate has not been classified as a carcinogen by ACGIH, NIOSH, OSHA, NTP, or IARC.

4. Medical Conditions Generally Aggravated by Exposure
Sodium permanganate solution will cause further irritation of tissue, open wounds, burns or mucous membranes.

Section 12 Ecological Information

Entry to the Environment
Permanganate has a low estimated lifetime in the environment, being readily converted by oxidizable materials to insoluble MnO_2.

Bioconcentration Potential
In non-reducing and non-acidic environments MnO_2 is insoluble and has a very low bioaccumulative potential.

Aquatic Toxicity
No data.

Section 13 Disposal Considerations

Waste Disposal

RemOx® L ISCO Reagent, once it becomes a waste, is considered a D001 hazardous (ignitable) waste. For disposal of RemOx® L ISCO Reagent solutions, follow procedures in Section 6 and deactivate the permanganate to insoluble manganese dioxide. Dispose of it in a permitted landfill. Contact Carus Chemical Company for additional recommendations.

Section 14 Transport Information

USA (land, D.O.T.)	**Proper Shipping Name:** 49 CFR172.101 Permanganates, inorganic, aqueous solution, n.o.s .(contains sodium permanganate **Hazard Class:** 49 CFR172.101….Oxidizer **ID Number:** 49 CFR172.101….UN 3214 **Packing Group:** 49 CFR172.101….II **Division:** 49 CFR172.101….5.1
European Labeling in accordance Road/Rail Transport (ADR/RID)	**ID Number:** UN 3214 **ADR/RID Class** 5.1 **Description of Goods:** Permanganates, inorganic, aqueous solution, n.o.s (contains sodium permanganate) **Hazard Identification No.** 50
European Labeling in accordance with EC directive (Water, I.M.O.)	**Proper Shipping Name:** Permanganates, inorganic, aqueous solution, n.o.s (contains sodium permanganate) **Hazard Class:** Oxidizer **ID Number:** UN 3214

	Packing Group:	II
	Division:	5.1
	Marine Pollutant:	No
European Labeling in accordance with EC directive (Air, I.C.A.O.)	**Proper Shipping Name:**	Permanganates, inorganic, aqueous solution, n.o.s (contains sodium permanganate)
	Hazard Class:	Oxidizer
	ID Number:	UN 3214
	Packing Group:	II
	Division:	5.1

Section 15 Regulatory Information (Sodium Permanganate)

TSCA	Listed in the Toxic Substances Control Act (TSCA) Chemical Substance Inventory.	
CERCLA	Not listed.	
RCRA	Oxidizers such as RemOx® L ISCO Reagent solution meet the criteria of ignitable waste. 40 CFR 261.21.	
SARA TITLE III Information		
	Section 302/303	Extremely hazardous substance: Not listed
	Section 311/312	Hazard categories: Fire, acute and chronic toxicity.
	Section 313	RemOx® L ISCO Reagent contains 40% manganese compounds as part of the chemical and is subject to the reporting requirements of Section 313 of Title III, Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.
FOREIGN LIST	Canadian Non-Domestic Substance List , EINECS	

Section 16 Other Information

NIOSH	National Institute for Occupational Safety and Health
MSHA	Mine Safety and Health Administration
OSHA	Occupational Safety and Health Administration
NTP	National Toxicology Program
IARC	International Agency for Research on Cancer
PEL	Permissible Exposure Limit
C	Ceiling Exposure Limit
TLV-TWA	Threshold Limit Value-Time Weighted Average
CAS	Chemical Abstract Service
EINECS	Inventory of Existing Chemical Substances (European)

Chithambarathanu Pillai (S.O.F.)
April 2008

I. Product and Company Information — Created on 6/19/06

Manufacturer: Western Lime Corporation
206 N. 6th Avenue
West Bend, WI 53095

Information: 800-433-0036

Chemical Name	Chemical Family	Chemical Formula
Calcium Oxide	Alkaline earth oxide	Mostly CaO
Molecular weight CaO = 56.08	Trade Names/Synonyms Quicklime, (Pebble)Lime, Calcium Oxide	Material Use Flux, Caustic agent, pH adjustment, absorption

II. Composition and Information on Ingredients

Component	CAS#	Exposure Limits	% by weight
Calcium Oxide	1305-78-8	OSHA PEL: 5 mg/m3 ACGH TLV: 2mg/m3	> 90%
Magnesium Oxide	1309-48-4	OSHA PEL: 15 mg/m3 ACGIH TLV: 10 mg/m3	< 2.0%
Crystalline Silica	14808-60-7	OSHA PEL: 10 mg/m3 (% SiO2 resp +2) ACGIH TLV: 0.025 mg/m3	N/A

III. Hazards Identification

Emergency Overview: Quicklime is an odorless white or greyish-white granular powder. Contact can cause irritation to eyes, skin, respiratory system, and gastrointestinal tract. Quicklime reacts violently with water, releasing sufficient heat to ignite combustible materials.	
Eyes:	Contact can cause severe irritation or burning of eyes, including permanent damage.
Skin:	Contact can cause severe irritation or burning of skin, especially in the presence of moisture.
Ingestion:	This product can cause severe irritation or burning of gastro-intestinal tract if swallowed
Inhalation:	This product can cause severe irritation of the respiratory system. Long-term exposure may cause permanent damage. Quicklime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain crystalline silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled in the form of quartz or crystobalite. Inhalation of silica can cause a chronic lung disorder, silicosis.
Medical Conditions Aggravated by Exposure: Contact may aggravate disorders of eyes, skin, gastrointestinal tract, and respiratory system.	
Potential Environmental Effects: This material is alkaline and if released into water or soil will cause and increase in its pH.	

IV. First Aid Measures

Eyes:	Immediately flush eyes with large amounts of water for at least 15 minutes. Pull back the eyelid to make sure all the lime dust has been washed out.
Skin:	Flush exposed area with large amounts of water. Seek medical attention immediately.
Inhalation:	Remove to fresh air. Seek medical attention if necessary. If breathing has stopped, give artificial respiration.
Ingestion:	Give large quantities of water or fruit juice. Do not induct vomiting. Seek medical attention immediately. Never give anything by mouth if victim is rapidly losing consciousness or is unconscious or convulsing.
Note to Physicians: Provide general supportive measures and treat symptomatically.	

V. Fire Fighting Measures	
Fire Hazards:	Quicklime is not combustible or flammable. However, quicklime reacts violently with water, releasing sufficient heat to ignite combustible materials in certain instances. Quicklime is not an explosion hazard, although reaction with water or other incompatible materials causes the material to swell and may rupture containers.
Hazardous Combustion Products:	None Identified.
Extinguishing Media:	Use dry chemical fire extinguisher. Do not use water or halogenated compounds, except that water may be used to deluge small amounts of quicklime.
Fire Fighting Instructions:	Keep personnel removed from and upwind of fire. Wear full fire-fighting turn-out gear(full Bunker gear), and respiratory protection (SCBA)

VI. Accidental Release Measures	
Spill/Leak Procedures:	DO NOT use water on bulk material spills. Lime Reacts violently with water, producing heat. Use proper protective equipment.
Small Spills:	Use dry methods to collect spilled materials. Do not clean up with compressed air. Store spilled materials in dry, sealed plastic or metal containers. Surfaces contaminated with residual amounts may be water washed.
Large Spills:	Use dry methods to collect spilled materials. Evacuate area down wind of clean-up operations to avoid dust exposure. Store spilled materials in dry, sealed plastic or metal containers.
Containment:	For large spills, as much as possible avoid the generation of dusts. Do not release into sewers or waterways.
Cleanup:	Residual amounts can be flushed with large amounts of water. Equipment can be decontaminated by washing with either a mild vinegar and water solution, or detergent and water solution.

VII. Handling and Storage	
Handling:	Keep in tightly closed containers. Protect from physical damage. Avoid direct contact with material.
Storage:	Store in a cool, dry and well ventilated location. Do not store near incompatible materials. Keep away from moisture. Do not store or ship in aluminum containers.

VIII. Exposure controls/Personal Protection Equipment	
Personal Protective Equipment (PPE)	Wear clean, dry gloves, full length pants over boots, long sleeved shirt buttoned at the neck, head protection and approved eye protection selected for the working conditions.
Gloves	Gauntlets cuff style
Respiratory	NIOSH approved filtering anti-dust mask
Eyes	Tight fitting goggles/glasses with side shield
Footwear	Resistant to caustics
Clothing	Fully covering skin

IX. Physical and chemical properties			
Physical State: Solid	Appearance: White granular substance	Odor: No Odor	Specific Gravity: 3.2 – 3.4
Boiling Point: 5162 F, 2850 C	Vapor Pressure: N/A	pH (25^{o} C): Sat Soln CaO: 12.45	Density (kg/m3): 720 - 1130
Melting Point: 4658 F, 2570 C	Vapor Density: N/A	Solubility in Water: 0.125/100 g Sat.soln	Freezing Point: 2580 C

X. Stability and Reactivity	
Stability:	Chemically stable, but reacts rapidly with water to form calcium hydroxide, generating heat.
Incompatibility/Conditions to avoid:	Quicklime should not be mixed or stored with the following materials, due to the potential for violent reaction and release of heat. Water, Acids, Reactive Fluorinated Compounds, Reactive Brominated Compounds, Reactive Powdered Metals, Organic Acid Anhydrides, Nitro-Organic Compounds, Reactive Phosphorous Compounds.
Hazardous Decomposition Products:	None
Hazardous Polymerization:	None

XI. Toxicological Information
No LD50/LC50 have been identified for this products components. Quicklime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain crystalline silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled in the form of quartz or crystobalite.

XII. Ecological Information	
Ecotoxicity:	Because of the high pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Environmental Fate:	This material shows no bioaccumulation or food chain toxicity potential.

XIII. Disposal Considerations:
Dispose of in accordance with all applicable federal, state, and local environmental regulations. If this product as supplied becomes a waste, it does not meet the criteria of a hazardous waste as defined under the Resource Conservation Act

XIV. Transportation Information
Quicklime is not classified as a hazardous material by DOT when transported When being transported by air, quicklime is classified in the Department of Transportation (DOT) regulations as a hazardous material. (49 CFR 172, Table 172.101:Calcium Oxide by aircraft only. Class 8 Corrosives. PIN UN1910. Packing Group III. Maximum Net per package – passenger vehicles, 25 kg.)

XV. Regulatory Information	
EPA Regulations	
RCRA Hazardous Waste Number (40 CFR 261.33)	Not Listed
RCRA Hazardous Waste Classification (40 CFR 261)	Not Listed
CERCLA Hazardous Substance (40 CFR 261)	Not Listed
CERLA Reportable Quantity (RQ)	Not Listed
SARA 311/312 codes	Not Listed
Sara Toxic Chemical (40 CFR 372.65)	Not Listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355)	Not Listed
Threshold Planning Quantity (TPQ)	Not Listed
All components are listed on the USEPA TSCA Inventory List	
OSHA/MSHA Regulations	
Air Contaminant (29 CFR 1910.1000, Table Z-1)	Not Listed
MSHA	Not Listed
OSHA Specifically Regulated Substance (29CFR 1910)	Not Listed
State Regulations: Consult state and local authorities for guidance	
Canadian Environmental Protection Act (CEPA)	
Domestic Substances List	Listed

XVI. Other Information		
HMIS	Health Risks Flammability Reactivity Personal Protection	1 0 1 E
NFPA	Health Hazard Fire Hazard Reactivity	3 0 1
WHIMS Classification	“E” Corrosive Materials	
WHIMS Classification	“D2A” Materials Causing Other toxic effects	