LANGAN

Technical Memorandum

Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology D.P.C.
21 Penn Plaza, 360 West 31st Street, 8th Floor New York, NY 10001 T: 212.479.5400 F: 212.479.5444

To: Ruth Curley – NYSDEC

From: Ryan J. Wohlstrom – Langan
Stewart Abrams, P.E. – Langan

Info: Michael Komoroske – NYSDEC
Michael Goldberg, Jonathan Seplowitz – Enclave on 241 LLC
Jamie P. Barr – Langan

Date: 20 December 2019 **(Revised 30 January 2020)**

Re: In-situ Groundwater Treatment Work Plan
714 East 241st Street (the "site")
Bronx, New York
BCP Site Number C203077
Langan Project No.: 140115301

This technical memorandum presents an in-situ treatment plan to remediate residual impacts to groundwater prior to the start of redevelopment excavation activities the Brownfield Cleanup Program (BCP) site located at 714 East 241st Street in the Wakefield section of the Bronx, New York (the "site"). A Site Location Map is provided as Figure 1. This document supplements Langan's March 2016 Remedial Action Work Plan (RAWP) and the New York State Department of Environmental Conservation (NYSDEC)-approved Decision Document. The RAWP/Decision Document describes the following general remedial measures for addressing site impacts:

- Site-wide excavation to remove soil that exceeds protection of groundwater soil cleanup objectives (PG-SCOs) for those contaminants found above the groundwater table smear zone and that exceed groundwater standards on-site, such as 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, xylene, toluene, ethylbenzene and any other contaminants that meet the conditions.
- Site-wide dewatering to support excavation at or below the groundwater, and associated treatment prior to discharge to the New York City sewer system;
- In-situ treatment of groundwater with the application of an oxygen containing additive (e.g., Oxygen Release Compound, or ORC®) following excavation, off-site soil disposal, and dewatering/treatment to promote aerobic bioremediation.

Based on feedback provided by NYSDEC, remedial activities for groundwater must be performed now, ahead of the site-wide construction activities. Without excavation, the groundwater concentrations are expected to be remain relatively high, and application of aerobic bioremediation by itself would not result in effective reduction in VOC concentrations. Also, higher VOC concentrations are potentially toxic to microbial growth related to ORC

bioremediation. Therefore, in-situ chemical oxidation (ISCO), a more robust remedial approach, has been proposed under this technical memorandum.

BACKGROUND

The BCP site encompasses 26,690 square feet and includes approximately 100 feet of frontage along White Plains Road, 185 feet of frontage along 241st Street, and 171 feet of frontage along Furman Avenue. The New York City Transit Authority (NYCTA) #2 rail corridor and station platform are allocated above grade along the northwestern property line. Prior to demolition activities (completed in 2018), the site contained four buildings including an approximate 1,086-square-foot one-story office building with basement, an approximate 3,375-square foot one-story former auto body shop building, an approximate 1,500-square foot one-story former auto body shop building, and an approximate 2,400-square foot, two-story residential building with a basement.

The general stratigraphy at the site consists of uncontrolled fill ranging in depth from about 6 to 15 feet below grade surface (bgs), underlain by a layer of sand interbedded with silt, clay and boulders, overlying bedrock. The depth to groundwater is about 9 to 12 feet bgs and flows to the south.

The proposed development will consist of a new 11-story residential building, with a below-grade parking garage, and retail on the first floor. The below-grade parking garage will occupy all but an approximately 350-square-foot area of the BCP site footprint[1].

Volatile organic compounds (VOCs) have been detected at the site at concentrations exceeding NYSDEC Division of Water Technical and Operation Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) for Class GA groundwater. VOC concentrations in groundwater are greatest in the northern and western portions of the site (in the vicinity of the former gasoline filling station and automobile repair shop), and decrease to the south and east. Based on analytical results, the source of onsite VOC contamination is likely petroleum releases from the former (now removed) on-site underground storage tank (USTs).

In June 2018, Langan was onsite to collect groundwater samples from five monitoring wells (MW07B, MW08B, MW16B, MW17B, and MW31). The groundwater samples were submitted for laboratory for analysis of VOCs (including MTBE), metals, 1,4-dixoane, and polyfluoroalkyl

1 The decision document for the project indicates that the top 2 feet of soil in the rear of the site (outside the proposed building) will be removed and replaced with clean soil cover. This area previously (circa 2016) covered ±2,000 square feet. However, based on the updated redevelopment plan, the proposed building footprint was extended toward the rear of the site and, in turn, this area (outside the proposed building) was reduced to only 325 square feet. Moreover, the area outside the building footprint will no longer be used for landscaping. While this area will still be excavated to a depth of at least 2 feet during site-wide construction activities, the excavation is now slated to be backfilled with virgin crushed stone (not topsoil).

substances (PFAS) A summary of the groundwater sample laboratory detections compared to NYSDEC TOGS 1.1.1 Class GA AWQS is included as Appendix A.

IN-SITU CHEMICAL OXIDATION APPROACH

Remedial Approach

The remedial objective for the ISCO is to achieve reduction in groundwater concentrations of VOCs, namely benzene, ethyl benzene, xylenes, 1,2,4- and 1,3,5-trimethylbenzene, p-isopropylbenzene, n-propylbenzene, sec-butylbenzene, p-isopropyltoluene, and methyl tert-butyl ether (MTBE). Previously, an application of aerobic bioremediation using ORC® was proposed (March 2016 RAWP). The original plan was to excavate contaminated soils across the site to a depth of approximately 15 feet bgs to accommodate future building foundation components and apply ORC® for treating residual contamination at the bottom of the excavation.

ISCO is based on application of a chemical oxidant that degrades contaminants via a vigorous chemical reaction. Activated persulfate is a strong oxidant and is highly effective on benzene, ethylbenzene, and xylenes. It has also been shown, to a lesser extent, to be effective on site contaminants propylbenzene, trimethybenzene, and p-isopropyltoluene. "Activated" refers to the need for a catalyst to induce the creation of sulfate radicals and hydroxyl radicals, which are especially effective for the degradation of the site contaminants. A bench-scale laboratory treatability test will be performed to determine chemical dosage and to verify effectiveness of the oxidant in decreasing groundwater concentrations.

Alkaline (high pH) activated persulfate will be used for chemical oxidation of the residual petroleum-related VOCs. A pre-blended persulfate product Klozur®CR[2] will be used. Klozur®CR is a single formulated product consisting of alkaline activated persulfate and an engineered calcium peroxide (Permeox®Ultra), uniting the strengths of both these products to treat the high concentrations present, as well as provide a oxygen longer term oxidation and aerobic degradation. A safety data sheet for Klozur®CR is provided in Appendix B. ISCO will be implemented by delivering the reagent into the ground using temporary injection points.

Treatment Areas

Treatment areas (refer to Figure 2) for the application of ISCO were determined based on the soil and groundwater concentrations of the residual petroleum-related VOCs. Two separate treatment areas were defined as follows:

2 A combination of Klozur® SP (sodium persulfate) and PermeOx® Ultra (mainly calcium peroxide, similar to ORC®), a product of PeroxyChem, Philadelphia, PA

- Treatment Area 1 is approximately 1,900 square feet and 7.5 feet thick (from 9.5 to 17 feet bgs)
- Treatment Area 2 is approximately 1,000 square feet and 10 feet thick (from 10 to 20 feet bgs)

Treatability Testing

Treatability testing will be performed to verify the feasibility and effectiveness of ISCO in decreasing groundwater concentrations. This step is necessary as the groundwater has a mixture of relatively high VOC concentrations, as well as a number of constituents that are less amenable to ISCO than others. These conditions necessitate a potentially high dosage of ISCO chemicals. Also, presence of high soil concentrations would results in rebound of groundwater VOC concentrations and may require application oxidant during subsequent injections.

The treatability testing would involve a combined soil oxidant demand (SOD) and effectiveness test. Measuring SOD is critical because ISCO dosage is not solely a function of the contaminant concentrations, but also the soil characteristics, the background soils organics, and any reduced metals (e.g., iron, manganese) in the soil. The effectiveness test would further verify the technology by ascertaining if the approach destroys significant mass of contaminant in the sample(s). Because alkaline activated persulfate has been selected; a pH titration test will also be performed to establish the dosage of the alkaline pH adjustment reagent.

Four new monitoring wells (MW-40 through MW-43, see Figure 2) will be installed and sampled during the treatability testing phase. Approximately 15 pounds of soil will be collected for the treatability testing from Treatment Areas 1 and 2 during the installation of the proposed monitoring wells. Soil samples will be collected for analysis of the parameters listed in Table 1. Approximately ten liters of groundwater will be collected from existing monitoring well MW-08B for the treatability testing. Groundwater samples will also be collected for laboratory analysis of parameters listed in Table 1. Soil and groundwater samples collected for the treatability study will be delivered to and refrigerated at Langan's Treatability Facility at the New Jersey Institute of Technology (NJIT) located in Newark, NJ, until used. Soil and groundwater samples will be analyzed by York Analytical Laboratories, Inc. (York) located in Stafford, CT.

To set up the combined SOD and effectiveness test, soil collected from the site will be homogenized and baseline (including duplicate) soil VOC samples will be collected. Soil and groundwater samples will be analyzed by York Analytical Laboratories, Inc. (York) located in Stafford, CT. The homogenized soil will also be used to perform a soil buffering capacity test, as it is critical that during alkaline activation, high pH (>10.5 SU) conditions be maintained through the treatment duration. Site groundwater and the homogenized soil will be used to set up a test with three doses of Klozur®CR along with controls. In addition, common sodium persulfate and

alkali (sodium hydroxide) will also be tested along with controls. All tests would be performed in duplicate. Approximately two weeks after setup, the treatability test will be terminated and samples for analysis of residual persulfate, soil VOCs, aqueous phase VOCs, aqueous total and dissolved metals, soil total organic content (TOC), pH and oxidation-reduction potential (ORP) will be collected. VOCs, TOC, and metals will be analyzed by York and other parameters will be analyzed at the NJIT laboratory.

The laboratory test data will be summarized into tables and figures and will be presented in a letter report for discussion with NYSDEC. The test data will be used to determine the full-scale oxidant dosage and assess effectiveness.

Injection Reagents and Dosage

Klozur®CR will be used as an oxidant and the dosage of the oxidant will be determined based on the treatability testing data. If the treatability testing shows that Klozur®CR demand and effectiveness is out-performed by application sodium persulfate and sodium hydroxide separately, then a modification of the ISCO reagent will be recommended after the treatability testing. A desktop estimation of Klozur®CR demand for each treatment area is provide in Table 2. Based upon the site investigation data, the subsurface is presumed to consist mostly of sandy soil and fill. The estimation of Klozur®CR demand is based on the assumption that groundwater contaminant concentrations are moderately high, soil has low natural oxidant demand, and low fraction of naturally occurring organic carbon, as would be typical for the soils at the site. The laboratory treatability test will be essential as to verify the dosage and cost-effectiveness of the ISCO approach.

Exploratory Petroleum Source Excavation

As requested by NYSDEC, Langan will also oversee exploratory shallow excavation activities in the northwest corner of the site (in the area of the former AOC-3; see Figure 2) to look for grossly contaminated soil or underground piping that may contain free product and be a contributing source to the groundwater contamination. If encountered, grossly contaminated soil and/or underground piping will be excavated and transported off-site for disposal. Continuous real-time monitoring for organic vapors (with a photoionization detector [PID]) and dust conditions (with a DustTrak aerosol monitor or similar) will be performed during all intrusive activities. The findings of the exploratory excavation will be presented in a letter report for discussion with NYSDEC.

IN-SITU CHEMICAL OXIDATION IMPLEMENTATION

The remedy implementation will consist of preparing an ISCO health and safely plan, monitoring well installation, baseline sampling, site preparation, reagent procurement, staging, injections and process monitoring, groundwater monitoring and reporting.

In addition, coordination with regulatory agencies, including the United States Environmental Protection Agency (EPA) will be required to perform remedial injections. Per NYSDEC's Guidance on Injections for Remediation, dated 21 April 2014, Langan will notify the EPA 30 days prior to the implementation of the injection plan and will prepare an EPA Injection Notification Form.

Health and Safety Plan

The existing site-specific health and safety plan will be revised to include reagent and chemical substance handling and storage guidelines, first aid and spill control measures, and exposure limits for all additives to be used.

Monitoring Well Installation

As discussed above, four new monitoring wells (MW-40 through MW-43, see Figure 2) will be installed. Each well will be constructed with 2-inch diameter, threaded, flush-joint, polyvinyl chloride (PVC) casing and 0.01-inch slotted screens and will be screened from about 8 to 18 feet bgs. Clean sand will be used to fill the annulus around the well screen to a height of approximately one foot above the top of the screened interval. The remainder of the annular space will be filled with a hydrated bentonite seal to near ground surface. The well locations and screen interval may be revised as needed based on field observations.

Soil and groundwater samples for the treatability study will be collected during installation of the new monitoring wells. After installation, the monitoring wells will be developed until the water is visibly clear. The wells will be surveyed by a New York State-licensed surveyor.

Baseline Sampling

Baseline monitoring will include groundwater sampling at existing (MW-07B, MW-08B, MW-16B, MW-17B, and MW-29) and proposed monitoring wells (MW-40 through MW-43). Each monitoring well will be sampled in accordance with the procedures defined in the United States USEPA Low Stress Purging and Sampling of Groundwater Samples from Monitoring Wells dated July 1996. The low-flow sampling technique involves purging the monitoring well through a flow through cell. Groundwater quality parameters including dissolved oxygen, pH, temperature, turbidity, specific conductance, and oxidation-reduction potential are measured in the flow through cell until stabilization is achieved. Groundwater samples will be analyzed for parameters listed in Table 3, including VOCs, metals (total and dissolved), and sulfate.

Site Preparation and Staging for Injections

The proposed injection locations and monitoring wells are located in an open area with unencumbered access. Injection locations will be marked with cones and areas for staging of

injection equipment will be cordoned off by yellow caution tape. Remediation reagents and injection equipment will be staged within a secondary containment. Hose bridges will be used during injections to reduce trip and fall hazards.

Injections

Injection mix: A solution or low-concentration slurry of Klozur®CR in water will be prepared in small batches (about 100 gallons) and will be continuously mixed to avoid settling of solids. Slurry concentrations of about 10 to 20% by weight will be used for the injections.

Injections: Reagent injections will be performed at temporary injection locations established using direct push technology (DPT). Injection locations are shown on Figure 3. Injections at each locations will be performed from bottom up, using 2-foot lifts. The injection slurry will be pumped from the mixing tank to the well head through an injection manifold. The injection manifold will be equipped with ball valves, gate vales, and flow totalizers to regulate and monitor the injection flow. Each injection location will be fitted with a well head that will be equipped with a pressure gauge and a threaded adaptor to connect to the injection location and camlock fittings to connect with similarly fitted hoses. Injection pressures will be sufficiently high to assure distribution through the formation.

Injections will be performed to target a 10 to 25% pore volume. Estimated total injection volume, slurry concentration and injection time are provided in Table 2. The slurry concentration and target pore volume for injections will be revised once treatability testing is completed and reagent demand is updated.

Each temporary injection location will be flushed with potable water after injection to rinse the injection hoses and push out reagents away from the injection location. The borings will be abandoned by backfilling with bentonite chips. NYSDEC will be notified at least 7 days prior to performing any in-situ treatment.

Field Monitoring

Field monitoring will consists of water quality monitoring and process monitoring and is summarized in Table 4.

Water quality monitoring: Water quality parameters (pH, temperature, ORP, dissolved oxygen, turbidity, total dissolved solids, and conductivity) will be measured at each monitoring location (including MW-07B, MW-08B, MW-29, MW-40, MW-41, MW-42, and MW-43) during injection activities. Wells within and near Treatment Area 1 will be monitored when injections are performed in Area 1 and similarly wells in or near Treatment Area 2 will be monitored when injections are performed in Area 2.

Process monitoring: Injection pressure will be monitored at all injection locations and injection flow will be monitored at the injection equipment.

Batch monitoring: Each batch of injection mixture will be logged, specifically for the amount of reagent and dilution water used.

Post-Injection Performance Monitoring

Post-injection monitoring will consist of groundwater sampling and water quality monitoring. Three rounds of post-injection groundwater samples will be collected from MW-08B, MW-16B, MW-29, MW-40, MW-41, MW-42, and MW-43 at three, six and nine months after injections are completed. Groundwater samples will be collected by low-flow method and will be analyzed for parameters listed in Table 4, including VOCs, SVOCs, metals (filtered and unfiltered), sulfate, plate count, and microbial genes (for total bacteria [EBAC] and toluene dioxygenase [TOD]). Microbial gene analysis is included to evaluate if aerobic microbial growth was enhanced by the remedy. Groundwater quality parameters (pH, temperature, ORP, dissolved oxygen, turbidity, total dissolved solids, and conductivity) will be collected during each round of groundwater sampling event.

Reporting to NYSDEC

Following the injection event, the injection volumes, reagent dosage, injection and field monitoring data will be will be presented in a letter report for discussion with NYSDEC. Additionally, the results of the post-injection performance monitoring well be presented to NYSDEC in Langan's monthly progress reports.

SCHEDULE

Following approval from NYSDEC, implementation of the remediation activities proposed herein is expected to progress under the following schedule:

	Task	Duration
1	Installation of new wells and soil sampling for treatability testing.	2 days
2	Groundwater sampling across site (for baseline and treatability testing)	1 Day (performed at least 1 week after new well installation).
3	Treatability testing, data analysis, reagent demand, and reporting.	4 to 5 weeks
4	Subcontractor coordination, reagent purchase/delivery	3 to 4 weeks
5	Mobilization	2 days
6	Injections	10 to 12 days

7	Demobilization	2 days
9	Performance monitoring	Groundwater monitoring at 3, 6, and 9 months after injections.

CLOSING

Should you have any questions regarding the responses presented in this Work Plan, please feel free to call us at 203-784-3069.

Sincerely,
Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C.

Ryan J. Wohlstrom
Senior Project Manager

Stewart Abrams, P.E.
Principal/Vice President
Director of Remediation Technology

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Appendices
Appendix A: June 2018 Groundwater Sampling Data Table
Appendix B: Safety Data Sheet for Klozur®CR

CERTIFICATION

I, Stewart Abrams, P.E., certify that I am currently a NYS registered professional engineer and that the Remedial Design Document – In-Situ Groundwater Treatment Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Stewart H. Abrams
NYS Professional Engineer 078830

1/30/2020
Date

TABLES

Table 1 - Treatability Study Field Sample Collection and Analysis
714 East 241 Street
Bronx, New York
Langan Project No. 140115301
11/14/2019

Location	Treatment Area	Soil Analytical Parameters				
		VOCs EPA 8260	TAL Metals EPA 200	Total Organic Carbon Lloyd Kahn	TPH-GRO SW846 8015	COD SM 5220
SB/MW-40	2	X	X	X	X	X
SB/MW-42	2	X	X	X	X	X

Location	Treatment Area	Groundwater Analytical Parameters					
		VOCs EPA 8260	Total and Dissolved Iron EPA 200	Total Organic Carbon Lloyd Kahn	TPH-GRO SW846 8015	COD SM 5220	Alkalinity
MW-07B	1	X					
MW-08B	1	X	X	X	X	X	X
MW-16	N/A	X					
MW-17B	N/A	X					
MW-40	2	X					
MW-41	2	X					
MW-42	1	X					
MW-43	N/A	X					

Notes:
VOCs - Volatile Organic Compounds
TOC - Total organic carbon
COD - Chemical oxygen demand
TPH -GRO - Total petroleum hydrocarbons - gasoline range
1. Soil analytical samples will be collected during well installation and soil sample collection for the treatability study.
2. Groundwater analytical samples will be collected in the field during groundwater sampling for the treatability study.
3. Groundwater VOC samples will be collected using low flow techniques.
4. Duplicates, field blanks and trip blanks will be collected as part of the sampling events for quality assurance and quality control.
5. Water quality parameters include pH, temperature, dissolved oxygen, specific conductivity, oxidation reduction potential, salinity, total dissolved solids, and turbidity (optional) will be measured using a Horiba water quality meter, or equivalent.
6. Approximately 15 pounds of soil will be collected for the treatability study.
7. Approximately 10 liters of groundwater will be collected for the treatability study.
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Table 2 - Reagent Demand and Injection Volume
714 East 241 Street
Bronx, New York
Langan Project No. 140115301
11/14/2019

	Treatment Area 1	Treatment Area 2
Reagent Demand		
Area (square feet)	1900	1100
Depth to water (feet bgs)	9.5-10	12
Bottom of treatment depth (feet bgs)[a]	17	17
Treatment depth (feet)	7.5	5
Porosity	0.3	0.3
Soil Volume (cubic feet)	14250	5500
Soil Mass (Kg)	582955	225000
Klozur® CR dosage (g/Kg)	5	5
Klozur® CR demand (lb)	6413	2475
Total Klozur® CR demand (lb)	8888	
Injections		
Groundwater volume (gallons)	31977	12342
Targeted pore volume[b] (%)	20	20
Targeted pore volume (gallons)	6395	2468
Total injection volume (gallons)	8864	
Klozur® CR slurry concentration[c] (%)	11	
Number of injection locations	10	6
Injection time (days)	9.0	
Field mobilization and demobilization (days)	3	

Notes:

[a] - Bottom of the treatment depth is based on the depth of the proposed excavation.

[b] - It is assumed that up between 10 to 30% of the pore volume will be targeted with injections. The targeted pore volume will be updated once reagent demand is updated

[c] - Klozur CR injection slurry with 10 to 30% concentration (weight basis) would be used. Final concertation of the slurry will be updated based on treatability test data.

Density of soil is assumed to be 90 pounds per cubic foot

bgs - below ground surface

lb - pound

g/Kg - grams per kilogram

Table 3 - Groundwater Analytical Monitoring Plan
714 East 241 Street
Bronx, New York
Langan Project No. 140115301
11/14/2019

Well ID	Treatment Area	Screen Interval (feet bgs)	Analytical Parameters				
			VOCs EPA 8260	TAL Metals[a] EPA 200	Sulfate EPA 300	Standard Plate Count SM 9215B[b]	Census qPCR[b,c]
MW-08	1	5-15	X	X	X	X	X
MW-42	1	8-18	X	X	X	X	
MW-40	2	8-18	X	X	X	X	X
MW-41	2	8-18	X	X	X	X	
MW-43	downgradient	8-18	X	X	X	X	

Notes:
feet bgs - feet below ground surface
VOCs - Volatile Organic Compounds
qPCR - quantitative polymerase chain reaction
[a] - Metals will be analyzed using filtered and unfiltered samples and will include analysis of iron, manganese and sodium and other metals in
[b] - Samples for analysis total plate count and Census analysis will be collected during six and nine months groundwater sampling event.
[c] - Census analysis will include analysis of microbial genes for total eubacteria (EBAC), and toluene dioxygenase (TOD)
1. VOC samples will be collected using low flow techniques.
2. Duplicates, field blanks and trip blanks will be collected as part of the sampling events for quality assurance and quality control.
3. Water quality parameters include pH, temperature, dissolved oxygen, specific conductivity, oxidation reduction potential, salinity, total dissolved solids, and turbidity (optional) will be measured using a Horiba water quality meter, or equivalent.
4. Baseline samples and three rounds of post-injection groundwater monitoring samples will be collected from each well listed above.
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Table 4 - Injection Process and Field Monitoring Plan
714 East 241 Street
Bronx, New York
Langan Project No. 140115301
11/14/2019

Injection Monitoring			
Parameters	**Equipment**	**Monitoring Location**	**Frequency of Monitoring**
Groundwater quality	Horiba-22 or 52	Monitoring wells	Before injection event begins and before daily injections.
Depth to groundwater	Water level meter	Monitoring wells	Before daily injections and periodically during injections
Process Monitoring			
Parameters	**Equipment**	**Monitoring Location**	**Frequency of Monitoring**
Pressure	Pressure gauge	At the injection well head	Every hour
Total flow	Totalizer	Injection skid	
Surfacing/Leaks	-	All wells within each treatment area	
Injection Batch Monitoring			
Parameters	**Equipment**	**Monitoring Location**	**Frequency of Monitoring**
Mixing ratios	Level markings on totes and pails	Injection mix tote	During each batch preparation

Notes:

- Groundwater quality parameters: pH, temperature, dissolved oxygen, specific conductivity, oxidation reduction potential, salinity, total dissolved solids, and turbidity (optional) will be measured using a Horiba U-22 water quality meter, or equivalent.
- Note color and sample odor

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FIGURES

Figure 1 – Site Location Map

BCP Site No: C203077

ENCLAVE ON 241ST STREET DEVELOPMENT

NOTES

1. BASE MAP PROVIDED BY PERFECT POINT LAND SURVEYING RT (DATED 4 APRIL 2019).
2. THIS PLAN SHOULD BE VIEWED AS A COLOR COPY AS THE BORING LOCATIONS AND BOUNDARIES ARE COLOR COORDINATED.
3. AOC – AREA OF CONCERN
4. THE TOTAL TREATMENT AREA IS APPROXIMATELY 3000 SQUARE FEET: TREATMENT AREA 1 IS ~1900 SQUARE FEET, AND AREA 2 IS ~1100 SQUARE FEET.

LEGEND

- SITE BOUNDARY
- EXISTING GROUNDWATER MONITORING WELL
- HISTORICAL GROUNDWATER MONITORING WELL (REMOVED)
- PROPOSED GROUNDWATER MONITORING WELL LOCATION
- APPROXIMATE EXTENTS OF TARGET TREATMENT AREA

SCALE IN FEET: 30 0 15 30

LANGAN
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

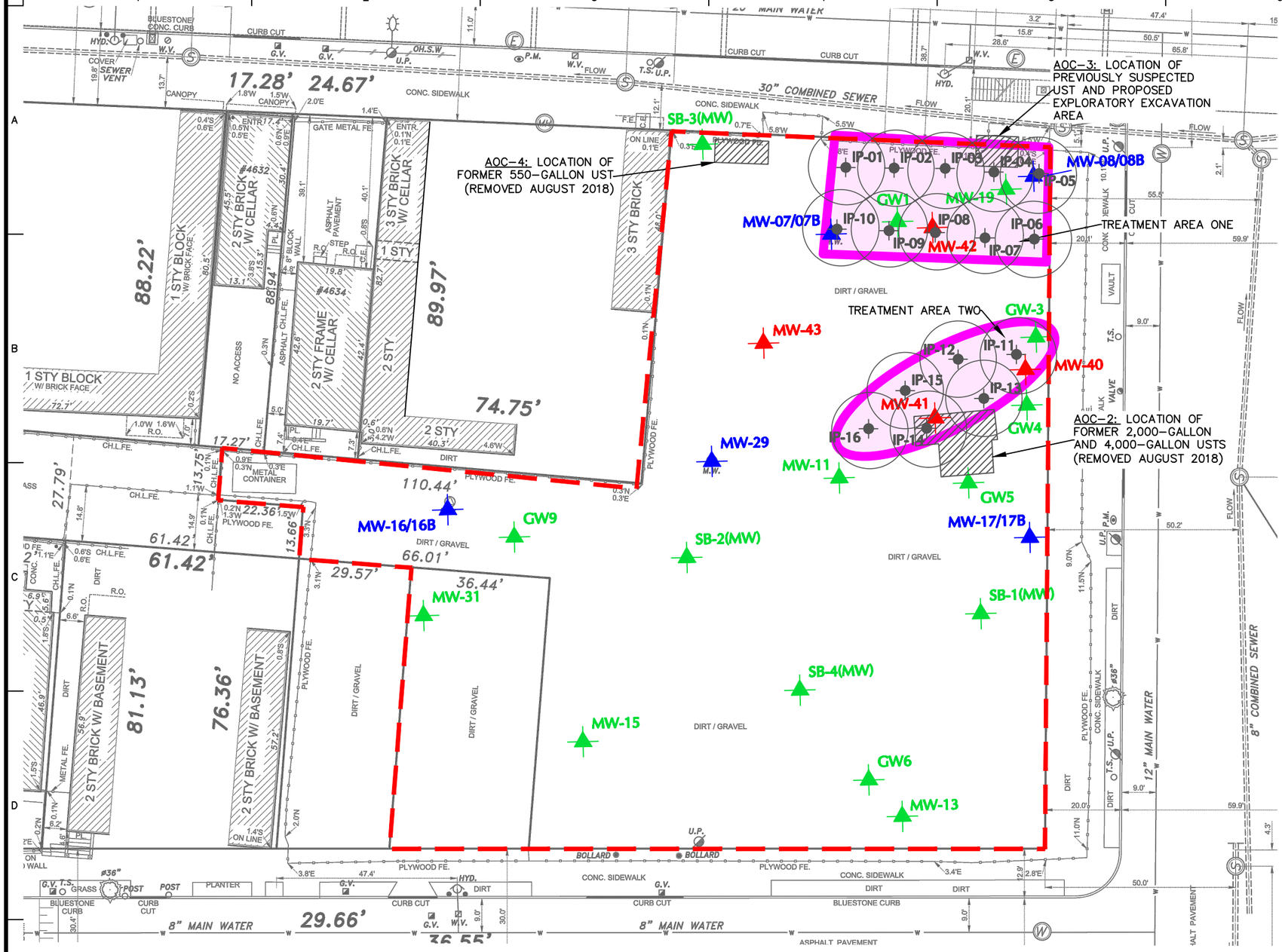
Project: ENCLAVE ON 241ST STREET DEVELOPMENT
NEW YORK
BRONX NEW YORK

Drawing Title: PROPOSED ISCO TREATMENT AREAS

Project No. 140115301
Date NOVEMBER 2019
Drawn By JRF
Checked By RJW

Drawing No. 2
Sheet 2 of 3

Filename: \\langan.com\data\NHV\data3\140115301\Cadd Data - 140115301\SheetFiles\2019.11 Proposed Treatment Areas\140115301-GI001-0101_ISCO.dwg Date: 12/20/2019 Time: 14:30 User: eschwendy Style Table: Langan.stb Layout: ANSIB-BL



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- SITE BOUNDARY
- EXISTING GROUNDWATER MONITORING WELL
- HISTORICAL GROUNDWATER MONITORING WELL (REMOVED)
- PROPOSED GROUNDWATER MONITORING WELL LOCATION
- APPROXIMATE EXTENTS OF TARGET TREATMENT AREA
- APPROXIMATE LOCATION OF PROPOSED INJECTION POINT WITH ASSUMED RADIUS OF INFLUENCE

30 0 15 30
SCALE IN FEET

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555 Long Wharf Drive
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project
ENCLAVE ON 241ST STREET DEVELOPMENT
NEW YORK
BRONX NEW YORK

Drawing Title
PROPOSED INJECTION LOCATIONS AND RADIUS OF INFLUENCE

Project No. 140115301
Date NOVEMBER 2019
Drawn By JRF
Checked By RJW

Drawing No. 3
Sheet 3 of 3

Filename: \\langan.com\data\NH\data3\140115301\Cadd Data - 140115301\SheetFiles\2019.11 Proposed Treatment Areas\140115301-GI001-0101_IP.dwg Date: 12/16/2019 Time: 18:01 User: eschwendy Style Table: Langan.stb Layout: ANSIB-BL

APPENDIX A

June 2018 Groundwater Sampling Data Table

LANGAN

June 2018 Groundwater Results Summary Table
Enclave on 241st Street Development
Bronx, New York
Langan Project No. 140115301

Sample ID Sampling Date	NYSDEC TOGS Standards and Guidance Values - GA	MW07B 6/18/2018 2:25:00 PM	2018.06.18-GWDUP01 (from MW07B) 6/18/2018 12:00:00 AM	MW08B 6/19/2018 8:25	MW16B 6/18/2018 10:20:00 AM	MW17B 6/18/2018 6:30:00 PM	MW31 6/19/2018 10:40:00 AM	2018.06.19-GWEB01 6/19/2018 12:00:00 PM	2018.06.19-GWTB01 6/19/2018 12:00:00 AM
Compound		Result	Result		Result	Result	Result	Result	Result
VOCs (µg/L)									
Dilution Factor		1	1	20	1	1	1	1	1
1,2,4-Trimethylbenzene	5	ND<0.2	ND<0.2	**930 D**	**1.2**	**1.7**	**0.31 J**	ND<0.2	ND<0.2
1,3,5-Trimethylbenzene	5	ND<0.2	ND<0.2	**220 D**	ND<0.2	**0.48 J**	ND<0.2	ND<0.2	ND<0.2
2-Butanone	50	ND<0.2	ND<0.2	**8.2 D**	**1.5**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Acetone	50	ND<1	**1 J**	**13 D**	**2.9**	ND<1	ND<1	**1.2 J**	ND<1
Acrolein	~	**2.3**	ND<0.2	ND<0.4	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Benzene	1	ND<0.2	ND<0.2	ND<0.4	**0.79**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Chloroform	7	**2**	**1.9**	**2.8 D**	ND<0.2	ND<0.2	**0.31 J**	ND<0.2	ND<0.2
cis-1,2-Dichloroethylene	5	ND<0.2	ND<0.2	ND<0.4	**1.6**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Cyclohexane	~	**0.36 J**	**0.36 J**	**90 D**	**3.5**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Ethyl Benzene	5	ND<0.2	ND<0.2	**520 D**	ND<0.2	**2**	ND<0.2	ND<0.2	ND<0.2
Isopropylbenzene	5	ND<0.2	ND<0.2	**62 D**	**1.9**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Methyl tert-butyl ether (MTBE)	10	ND<0.2	ND<0.2	ND<0.4	**110**	**3**	ND<0.2	ND<0.2	ND<0.2
Methylcyclohexane	~	ND<0.2	ND<0.2	**60 D**	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2
n-Butylbenzene	5	ND<0.2	ND<0.2	**23 D**	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2
n-Propylbenzene	5	ND<0.2	ND<0.2	**120 D**	ND<0.2	**0.23 J**	ND<0.2	ND<0.2	ND<0.2
o-Xylene	5	ND<0.2	ND<0.2	**180 D**	ND<0.2	**1.1**	ND<0.2	ND<0.2	ND<0.2
p- & m- Xylenes	5	ND<0.5	ND<0.5	**600 D**	ND<0.5	**5**	ND<0.5	ND<0.5	ND<0.5
p-Isopropyltoluene	5	ND<0.2	ND<0.2	**4.3 D**	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2
sec-Butylbenzene	5	ND<0.2	ND<0.2	ND<0.4	**0.9**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
tert-Butyl alcohol (TBA)	~	ND<0.5	ND<0.5	1	ND<0.5	ND<0.5	ND<0.5	**1.1**	ND<0.5
Tetrachloroethylene	5	**1.5**	**1.5**	ND<0.4	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Toluene	5	ND<0.2	ND<0.2	**1.7 D**	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Trichloroethylene	5	ND<0.2	ND<0.2	ND<0.4	**1.1**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Vinyl Chloride	2	ND<0.2	ND<0.2	ND<0.4	**0.58**	ND<0.2	ND<0.2	ND<0.2	ND<0.2
Xylenes, Total	5	ND<0.6	ND<0.6	**780 D**	ND<0.6	**6.6**	ND<0.6	ND<0.6	ND<0.6
SVOCs (µg/L)		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	
Dilution Factor		1	1	1	1	1	1	1	
1,4-Dioxane	~	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2	ND<0.2	NT
Metals (µg/L)									
Dilution Factor		1	1	1	1	1	1	ND<1	
Arsenic	25	ND<4	ND<4	**8**	**6**	ND<4	**9**	ND<4	NT
Barium	1000	**33**	**34**	**29**	**123**	**152**	**121**	ND<11	NT
Manganese	300	**1,030**	**1,030**	**611**	**1,110**	**8,070**	**25**	ND<6	NT
Nickel	100	ND<6	ND<6	ND<6	ND<6	**6**	ND<6	ND<6	NT
Selenium	10	**31**	**23**	**20**	**53**	**43**	**54**	**12**	NT
Mercury (µg/L)									
Dilution Factor		1	1	1	1	1	1	1	
Mercury	0.7	ND<0.2	ND<0.2	**0.310**	ND<0.2	ND<0.2	ND<0.2	ND<0.2	NT
PFAS (ng/L)									
Dilution Factor		1	1	1	1	1	1	1	1
Perfluorobutanoic acid (PFBA)	~	**5.2 B**	**3.1 B**	**21 B**	**21 B**	**13 B**	**4.8 B**	ND<1.8	NT
Perfluoropentanoic acid (PFPeA)	~	**9**	**10**	**2.9**	**16**	**13**	**7**	**1.1 J**	NT
Perfluorohexanoic acid (PFHxA)	~	**6.5**	**7.5**	**1.4 J**	**5**	**7.8**	**11**	**0.25 J**	NT
Perfluoroheptanoic acid (PFHpA)	~	**4.7 B**	**4.8 B**	**1.2 J B**	**4.1 B**	**6 B**	**5.5 B**	**0.47 J B**	NT
Perfluorooctanoic acid (PFOA)	~	**11 B**	**11 B**	**2.4 B**	**15 B**	**13 B**	**11 B**	**0.6 J B**	NT
Perfluorononanoic acid (PFNA)	~	**0.3 J**	**0.34 J**	**1.4 J**	**3.3**	**4.1**	ND<1.6	ND<1.8	NT
Perfluorodecanoic acid (PFDA)	~	ND<1.5	**0.34 J**	ND<1.6	**0.48**	**0.8 J**	ND<1.6	ND<1.8	NT
Perfluoroundecanoic acid (PFUdA)	~	ND<1.5	ND<1.5	ND<1.6	ND<1.6	**0.4 J B**	ND<1.6	ND<1.8	NT
Perfluorotetradecanoic acid (PFTeDA)	~	ND<1.5	ND<1.5	ND<1.6	ND<1.6	ND<1.5	ND<1.6	ND<1.8	NT
Perfluorobutanesulfonic acid (PFBS)	~	**5.2 B**	**6.1 B**	**0.88 J B**	**5.7 B**	**4.8 B**	**56 B**	**0.41 J B**	NT
Perfluorohexanesulfonic acid (PFHxS)	~	**2.5 B**	**2.8 B**	**0.84 J B**	**3.7 B**	**5.2 B**	**11 B**	**0.33 J B**	NT
Perfluoroheptanesulfonic Acid (PFHpS)	~	ND<1.5	**0.63 J**	ND<1.6	**1 J**	**0.9 J**	ND<1.6	ND<1.8	NT
Perfluorooctanesulfonic acid (PFOS)	~	**12 B**	**12 B**	**6.5 B**	**27 B**	**59 B**	**4.2 B**	**0.71 J B**	NT
Perfluorooctane Sulfonamide (FOSA)	~	ND<1.5	ND<1.5	ND<1.6	ND<1.6	**0.9 J**	ND<1.6	ND<1.8	NT
N-ethyl perfluorooctane sulfonamidoacetic acid (N-EtFOSAA)	~	ND<1.5	ND<1.5	ND<1.6	**0.87 J B**	ND<1.5	ND<1.6	ND<1.8	NT
8:2 Fluorotelomer sulfonate (FTS)	~	ND<1.5	ND<1.5	**0.7 J**	**0.94 J F2**	**0.76 J**	ND<1.6	ND<1.8	NT

Notes:
Only analytes with detections are presented on this table
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
PFAS = Per- and polyfluoroalkyl substances
µg/L = microgram per liter
ng/L = nanogram per liter
ND = Not detected
NA = Not analyzed
B = Compound was found in the blank and sample
D = Sample required a dilution
F2 = MS/MSD RPD exceeds control limits
J = Detected below the Reporting Limit but greater than or equal to the
Indicates a detection above reporting limits
Indicates an exceedance of NYSDEC TOGS Standards and Guidance Values - GA

APPENDIX B

Safety Data Sheet for Klozur®CR

LANGAN

SAFETY DATA SHEET
KLOZUR® CR

SDS # : 7775-27-1-2
Revision date: 2018-04-10
Format: NA
Version 1.02

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product Name KLOZUR® CR

Synonyms Sodium Peroxydisulfate; Disodium Peroxydisulfate; Peroxydisulfuric acid, disodium salt; Peroxydisulfuric acid, sodium salt; Calcium Peroxide.

Alternate Commercial Name KLOZUR® CR 2018

Recommended use of the chemical and restrictions on use

Recommended Use: In situ and ex situ chemical oxidation of contaminants and compounds of concern for environmental remediation applications

Restrictions on Use No uses to be advised against were identified.

Manufacturer/Supplier

PeroxyChem LLC
2005 Market Street
Suite 3200
Philadelphia, PA 19103
Phone: +1 267/ 422-2400 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone numbers

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

2. HAZARDS IDENTIFICATION

Classification

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

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Specific target organ toxicity (single exposure)	Category 3
Oxidizing Solids	Category 2

GHS Label elements, including precautionary statements

EMERGENCY OVERVIEW

Danger

Hazard Statements
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H318 - Causes serious eye damage
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H302 - Harmful if swallowed
H272 - May intensify fire; oxidizer

Precautionary Statements - Prevention
P261 - Avoid breathing dust.
P271 - Use only outdoors or in a well-ventilated area
P285 - In case of inadequate ventilation wear respiratory protection
P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
P270 - Do not eat, drink or smoke when using this product
P264 - Wash face, hands and any exposed skin thoroughly after handling
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P220 - Keep/Store away from clothing/combustible materials
P221 - Take any precaution to avoid mixing with combustibles

Precautionary Statements - Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P310 - Immediately call a POISON CENTER or doctor
P302 + P352 - IF ON SKIN: Wash with plenty of water and soap
P333 + P313 - If skin irritation or rash occurs: Get medical advice/ attention
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell
P370 + P378 - In case of fire: Use water spray for extinction

Precautionary Statements - Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

Hazards not otherwise classified (HNOC)
No hazards not otherwise classified were identified.

Other Information Risk of decomposition by heat or by contact with incompatible materials

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS-No	Weight %
Sodium Persulfate	7775-27-1	40-60
Calcium Peroxide	1305-79-9	40-60
Calcium Hydroxide	1305-62-0	8 - 12

4. FIRST AID MEASURES

General Advice Remove from exposure, lie down. Show this material safety data sheet to the doctor in attendance.

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids intermittently. Consult a physician. In case of contact, immediately flush eyes with plenty of water. If symptoms persist, call a physician.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation develops and persists.

Inhalation Remove from exposure, lie down. If breathing is irregular or stopped, administer artificial respiration. Call a physician immediately.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately. Rinse mouth. Drink 1 or 2 glasses of water.

Most important symptoms and effects, both acute and delayed Itching; Redness; Coughing and/ or wheezing.

Indication of immediate medical attention and special treatment needed, if necessary Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media Water. Cool containers with flooding quantities of water until well after fire is out.

Unsuitable extinguishing media Do not use carbon dioxide or other gas filled fire extinguishers; they will have little effect on decomposing persulfate.

Specific Hazards Arising from the Chemical Decomposes under fire conditions to release oxygen that intensifies the fire.

Explosion data
Sensitivity to Mechanical Impact Not sensitive.
Sensitivity to Static Discharge Not sensitive.

Protective equipment and precautions for firefighters As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Keep off any unprotected persons. Avoid contact with the skin and the eyes. Avoid breathing dust. Wear personal protective equipment.

Other Never add other substances or combustible waste to product residues. Containers of contaminated waste material should be monitored for signs of decomposition (fuming or smoking).

Environmental Precautions Knock down dust with water spray. Recover the product in solid form, if possible. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment Do not return product to the original storage container/tank due to risk of decomposition. Vacuum, shovel or pump waste into a drum and label contents for disposal. Store in closed container. Do not allow material to enter storm or sanitary sewer system.

Methods for cleaning up Clean up spill area and treat as special waste.

7. HANDLING AND STORAGE

Handling Wear personal protective equipment. Use only in area provided with appropriate exhaust ventilation. Avoid dust formation. Handle product only in closed system or provide appropriate exhaust ventilation at machinery. Avoid contact with skin and eyes. Avoid breathing dust. Remove and wash contaminated clothing before re-use. Reference to other sections.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat. Do not store near combustible materials. Avoid contamination of opened product. Keep away from food, drink and animal feedingstuffs. Avoid formation and deposition of dust.

Incompatible products Acids, Bases, Halides, Oxidizing agents, Strong reducing agents, Combustible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines .

Chemical name	ACGIH TLV	OSHA PEL	NIOSH	Mexico
Sodium Persulfate 7775-27-1	TWA: 0.1 mg/m³	-	-	-
Calcium Hydroxide 1305-62-0	TWA: 5 mg/m³	TWA: 15 mg/m³ TWA: 5 mg/m³	TWA: 5 mg/m³	Mexico: TWA 5 mg/m³

Chemical name	British Columbia	Quebec	Ontario TWAEV	Alberta
Sodium Persulfate 7775-27-1	TWA: 0.1 mg/m³	-	TWA: 0.1 mg/m³	TWA: 0.1 mg/m³
Calcium Hydroxide 1305-62-0	TWA: 5 mg/m³	TWA: 5 mg/m³	TWA: 5 mg/m³	TWA: 5 mg/m³

Appropriate engineering controls

Engineering measures Ensure adequate ventilation.

Individual protection measures, such as personal protective equipment

Eye/Face Protection Eye protection recommended: Tightly fitting safety goggles.

Skin and Body Protection Wear suitable protective clothing. Protective shoes or boots.

Hand Protection Protective gloves: Neoprene gloves, Polyvinylchloride, Natural Rubber

Respiratory Protection Use only with adequate ventilation. Respirator must be worn if exposed to dust.

Hygiene measures Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Wash hands before breaks and after shifts. Keep work clothes separate, remove contaminated clothing - launder after open handling of product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Fine granules
Physical State	Solid
Color	Off-white
Odor	odorless
Odor threshold	Not applicable
pH	11.2 (1% solution)
Melting point/freezing point	Decomposes
Boiling Point/Range	Not applicable
Flash point	No information available
Evaporation Rate	No information available
Flammability (solid, gas)	Not flammable
Flammability Limit in Air	Not applicable
Upper flammability limit:	No information available
Lower flammability limit:	No information available
Vapor pressure	No information available
Vapor density	No information available
Density	No information available
Specific gravity	1.0 - 1.19 (5 to 30% slurries)
Water solubility	slightly soluble
Solubility in other solvents	No information available
Partition coefficient	No information available (inorganic)
Autoignition temperature	Product is not self-ignitable.
Decomposition temperature	> 100 °C (assume)
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	Not explosive
Oxidizing properties	oxidizer
Molecular weight	No information available
Bulk density	51.8 lb/cu ft (loose)

10. STABILITY AND REACTIVITY

Reactivity Strong oxidizer. Oxidizer. Contact with other material may cause fire

Chemical Stability Stable under recommended storage conditions.

Possibility of Hazardous Reactions Contains a strong oxidizer and will react violently with flammable or reducing agents. Oxidizable material can be ignited by grinding and may become explosive.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid Heat. (decomposes at temperatures >100 °C); Moisture.

Incompatible materials Acids, Bases, Halides, Oxidizing agents, Strong reducing agents, Combustible materials.

Hazardous Decomposition Products Incomplete combustion and thermolysis produces potentially toxic gases such as carbon monoxide and carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Product Information

Calcium peroxide and calcium hydroxide are not classified for acute toxicity.

LD50 Oral No data available for the formulation. 895 mg/kg (rat) Sodium Persulfate
LD50 Dermal No data available for the formulation. > 10,000 mg/kg (rabbit) Sodium Persulfate
LC50 Inhalation No data available for the formulation. = > 5.1 mg/L (4-hr) (rat) Sodium Persulfate

Serious eye damage/eye irritation Severely irritating to the eyes.
Skin corrosion/irritation Irritating to skin.

Sensitization Sensitizing to skin and respiratory system. Positive in a local lymph node assay. (based on components).

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation	NOAEL Oral Value
Sodium Persulfate (7775-27-1)	895 mg/kg (Rat)	> 10000 mg/kg (Rabbit)	> 21.6 mg/L (Rat) 4 h	
Calcium Hydroxide (1305-62-0)	7340 mg/kg (Rat)			

Information on toxicological effects

Symptoms Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain, or flushing.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Corrosive to eyes. Irritating to respiratory system and skin.
corrosivity Risk of serious damage to eyes.

Carcinogenicity Not recognized as carcinogenic by Research Agencies (IARC, NTP, OSHA, ACGIH).

Mutagenicity This product is not recognized as mutagenic by Research Agencies

Reproductive toxicity This product is not recognized as reprotox by Research Agencies.

STOT - single exposure May cause respiratory irritation.
STOT - repeated exposure No information available.

Target organ effects Eyes, Skin, Respiratory System.

Aspiration hazard No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects

Sodium Persulfate (7775-27-1)				
Active Ingredient(s)	Duration	Species	Value	Units
Sodium Persulfate	96 h LC50	Rainbow trout	163	mg/L
Sodium Persulfate	48 h LC50	Daphnia magna	133	mg/L
Sodium Persulfate	96 h LC50	Grass shrimp	519	mg/L
Sodium Persulfate	72 h EC50	Algae Selenastrum capricornutum	116	mg/L

Chemical name	Toxicity to algae	Toxicity to fish	Toxicity to Microorganisms	Toxicity to daphnia and other aquatic invertebrates
Calcium Hydroxide		96 h LC50: = 160 mg/L (Gambusia affinis) static		

Persistence and degradability Biodegradability does not pertain to inorganic substances.

Bioaccumulation Does not bioaccumulate.

Mobility Dissociates into ions.

Other Adverse Effects None known.

13. DISPOSAL CONSIDERATIONS

Waste disposal methods This material, as supplied, is a hazardous waste according to federal regulations (40 CFR 261). It must undergo special treatment, e.g. at suitable disposal site, to comply with local regulations. Containers of contaminated waste material should be monitored for signs of decomposition (fuming or smoking).

US EPA Waste Number D001.

Contaminated Packaging Empty remaining contents. Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT

UN/ID no UN 1479
Proper Shipping Name OXIDIZING SOLID N.O.S.
Hazard class 5.1
Packing Group II
Reportable Quantity (RQ) not applicable

TDG

UN/ID no UN 1479
Proper Shipping Name OXIDIZING SOLID N.O.S.
Hazard class 5.1
Packing Group II

ICAO/IATA

UN/ID no	UN 1479
Proper Shipping Name	OXIDIZING SOLID N.O.S.
Hazard class	5.1
Packing Group	II

IMDG/IMO

UN/ID no	UN 1479
Proper Shipping Name	OXIDIZING SOLID N.O.S.
Hazard class	5.1
Packing Group	II

ADR/RID

UN/ID no	UN 1479
Proper Shipping Name	OXIDIZING SOLID N.O.S.
Hazard class	5.1
Packing Group	II

15. REGULATORY INFORMATION

U.S. Federal Regulations

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

SARA 311/312 Hazard Categories
This product has the following hazards that are reportable under The Emergency Planning and Community Right-to-Know rule (EPCRA Tier II):

- Oxidizer
- Serious eye damage/eye irritation
- Skin corrosion/irritation
- Respiratory/skin sensitization
- Specific Target Organ Toxicity (STOT) - Single Exposure

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)

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

US State Regulations

U.S. State Right-to-Know Regulations
This product contains the following substances regulated under state Right-to-Know laws:

Chemical name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sodium Persulfate		X			
Calcium Peroxide		X			
Calcium Hydroxide	X	X	X		X

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

CANADA

Environmental Emergencies
This product contains no substances listed under Canada's Environmental Emergency regulations.

Canadian National Pollutant Release Inventory
This product contains no substances reportable under Canada's National Pollutant Release Inventory regulations.

International Inventories

Component	TSCA (United States)	DSL (Canada)	EINECS/ELINCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)	NZIoC (New Zealand)
Sodium Persulfate 7775-27-1 (40-60)	X	X	X	X	X	X	X	X	X

Trade secret (40-60)	X	X	X	X	X	X	X	X	X
Calcium Hydroxide 1305-62-0 (8 - 12)	X	X	X	X	X	X	X	X	X

Mexico

Mexico - Grade Moderate risk, Grade 2

16. OTHER INFORMATION

NFPA	**Health Hazards** 2	**Flammability** 0	**Stability** 1	**Special Hazards** OX
HMIS	**Health Hazards** 2	**Flammability** 0	**Physical hazard** 1	**Special precautions** J

NFPA/HMIS Ratings Legend Severe = 4; Serious = 3; Moderate = 2; Slight = 1; Minimal = 0
Protection=J (Safety goggles, gloves, apron, combination dust and vapor respirator)

Revision date: 2018-04-10
Revision note SDS sections updated: 1, 15
Issuing Date: 2015-07-20

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Prepared By:

PeroxyChem

End of Safety Data Sheet