DM-405F SOURCE MITIGATION WORK PLAN

GE Main Plant
1 River Road
Schenectady, Schenectady County, New York

Submitted to:

GE Corporate Environmental Programs
319 Great Oaks Boulevard
Albany, New York

Prepared by:

CB&I Environmental & Infrastructure, Inc.
13 British American Boulevard
Latham, NY 12110

Project No. 154269
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Acronyms and Abbreviations

Bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CB&I	CB&I Environmental & Infrastructure, Inc.
COCs	Contaminants of Concern
DPT	Direct Push Technology
ft^2	Feet squared
GPR	Ground Penetrating Radar
HASP	Health & Safety Plan
ISB	in situ enhanced bioremediation
µg/l	Micrograms per liter
MNA	Monitored Natural Attenuation
ND	Non-detect
NYSDEC	New York State Department of Environmental Conservation
NYSGWQS	NYSDEC Groundwater Quality Standards
PermeOx	PermeOx® Ultra by PeroxyChem
PPE	Personal Protective Equipment
RAO	Remedial Action Objective
ROD	Record of Decision
SDS	Safety Data Sheet
SITE	GE Main Plant, 1 River Road, Schenectady, New York
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds
ZEBRA	ZEBRA Technical Services

1.0 INTRODUCTION

CB&I Environmental & Infrastructure, Inc. (CB&I) is submitting this Work Plan outlining the proposed targeted remedy that will be employed to treat the observed benzene and chlorobenzene impacts to groundwater at monitoring well DM-405F at the GE Main Plant Site, 1 River Road in Schenectady, New York (Site) (**Figure 1**). The scope of services discussed herein has been prepared based upon discussions with the New York State Department of Environmental Conservation (NYSDEC).

1.1 Background

The Main Plant Facility is located in Schenectady, New York as shown in Figure 1. Chlorobenzene and benzene levels are present in the groundwater at monitoring well DM-405F above the New York State Groundwater Quality Standards (NYSGWQS). The observed concentrations for these compounds are presented as Figure 2.

The Record of Decision (ROD) required, "In-situ aerobic bioremediation of groundwater contamination at select sources areas locations included the DM-405F area". Although monitored natural attenuation was considered for this area the temporal rise in volatile organic compound (VOC) concentrations in DM-405F caused the NYSDEC to request remedial action prior to implementation of the approved remedy in this area.

The goal of this focused treatment will be to address the observed VOCs in the groundwater and to assist with monitored natural attenuation (MNA).

The major components of this remedy include the following:

- Reduce the benzene and chlorobenzene concentrations by injecting a slow release oxygen solution in the target area to enhance the degradation of contaminants of concern (COC) in the groundwater.
- Rely on MNA to reduce the contaminants outside of the target area.
- Performance monitoring until levels fall to or below COC, NYSDEC groundwater standards consistent with the approved ROD.

1.2 Investigation Activities

1.2.1 Groundwater Sampling Results

As outlined within the Revised Remedial Design Work Plan, dissolved BTEX (benzene, toluene, ethylbenzene, xylene) constituents were historically detected above pertinent NYSDEC action levels in the monitoring well 405F Area. The original remedy outlined with the March 2005 Record of Decision anticipated the need for enhanced aerobic bioremediation of groundwater within this area.

The DM-405F monitoring well has been sampled on 15 different occasions since 1999. Limited VOC constitutions have been detected and where detected, are consistently at very low concentrations. Specifically, existing groundwater quality data indicates that the only VOC constituents historically detected are benzene, xylene and chlorobenzene concentrations at monitoring well DM-405F. The detected concentrations of xylene has decreased from 22 micrograms per liter (µg/L) to non-detect (ND) between June of 1999 and July 2014. The detected concentrations of benzene decreased from 35 µg/L to 1.3 µg/L between June of 1999 and November of 2010. An increase in detected benzene and chlorobenzene concentrations was observed in monitoring well DM-405F between the December 2011 and July 2015 sampling events.

Specifically, chlorobenzene was detected at 7.6 µg/L during the April 2014 sampling event and concentrations increased to 1,200 µg/L in July 2014 and remained at that concentration until July 2015 when they started to decrease. The last sampling event in October 2015 showed a decrease in both benzene (91 µg/L) and chlorobenzene (250 µg/L) concentrations. However, GE has elected to address these impacts during the implementation of the RD.

1.2.2 Hydraulic Testing

CB&I conducted two slug tests on May 12, 2015 to determine hydraulic conductivity of the soils in the DM-405F area. Slug test results showed the area has high permeability. Graphs depicting the results are located in **Appendix A**.

1.3 Remedial Action Objective

Remedial Action Objectives (RAOs) are to ensure protection of human health and the environment. The RAO for the site is to reduce contaminant mass and reduce Contaminants of Concern (COCs) within the treatment area to below the NYSGWQS.

The biodegradation of benzene has been extensively studied and occurs under both aerobic and anaerobic conditions (Lovely, 2000). Biodegradation under aerobic conditions is most rapid and broadly applicable. Biodegradation under anaerobic conditions can occur under nitrate-reducing, iron-reducing, sulfate-reducing, and methanogenic conditions. Phenol and benzoates have been detected as short-lived intermediates during anaerobic biodegradation. Carbon dioxide is the most common end product of both aerobic and anaerobic biodegradation. Methane is also formed during methanogenesis.

The biodegradation of chlorobenzene is less widely studied, but also occurs under aerobic conditions, where 3-chlorocatechol is produced as a transient intermediate (Werlen, et al., 1996). This intermediate is further degraded to carbon dioxide and chloride. Chlorobenzene is also reductively dechlorinated to benzene under some conditions (Fung, et al., 2009). The bacteria responsible for this activity has recently been isolated and identified as a Dehalobacter sp (Nelson, et al., 2011).

Because performance is more consistent, aerobic in situ bioremediation (ISB) will be applied in the 405F area of the site. The challenge with aerobic bioremediation is getting enough oxygen into the subsurface due to the low solubility of oxygen in water (8 mg/L at 20oC for oxygen in equilibrium with air). To address this challenge a slow release oxygen amendment will be employed. The oxygen release amendment chosen for this pilot study is Perme-Ox Ultra (manufactured by PeroxyChem), which is a formulation of calcium peroxide that contains greater than 18% oxygen and provides extended release of that oxygen in the subsurface.

The in situ enhanced bioremediation (ISB) component of the selected remedy will reduce the COC concentrations in the target area using groundwater amendments to accelerate the natural attenuation of benezene and chlorobenzene. The effectiveness of the ISB will be monitored for a period of up to 2-years after the initial injection.

2.0 WORK SCOPE

This scope of work is being completed to augment MNA in DM-405F. The primary physical hazards for this project are associated with the installation of injection points. Work activities will require personal protective equipment at modified Level D+ or higher as described in the Health and Safety Plan (HASP). Safety data sheets (SDSs) for amendments proposed for this injection are presented in **Appendix B**.

2.1 Pre-Mobilization Activities

Two permits will also be obtained prior to drilling: 1. GE Site Excavation Permit and 2. United State Environmental Protection Agency (USEPA) Underground Injection Control (UIC) Permit. Injection systems for groundwater treatment typically fall under the underground injection control (UIC) definition of Class V, which is a non-specific category for injection of non-hazardous fluids not covered under Classes I through IV. Injection of materials to any groundwater in the State of New York under a Class V is regulated by the U.S. Environmental Protection Agency (EPA) Region 2. Class V injection wells can be rule authorized, which precludes the need for a permit. Requirements for a rule authorized UIC include:

- Owner/operator submits inventory information to register the injection system.
- No potential to cause further groundwater contamination.
- Owner/operator submits additional information as needed to determine the potential for groundwater contamination.

The inventory information must be submitted prior to construction and operation of a new injection system. When the injection system is no longer in use, the system must be decommissioned or converted. A list of the inventory information required to determine whether a permit is required rather than a rule authorization is presented in the EPA Draft Fact Sheet, Class V Underground Injection Control in **Appendix C**.

The injection locations to be advanced at the site will be located by a survey and flagged or marked in the field.

2.2 Mobilization and Site Preparation

CB&I will mobilize personnel, equipment, and resources necessary to complete the activities as defined in this work plan. After mobilization, site preparation activities will be initiated. These activities include the following:

- Mark off injection area, injection points and well locations
- Identify overhead and underground utilities

Prior to initiating the injection activities, CB&I personnel will mark the areas proposed for intrusive drilling and request utility clearance from the site. Each proposed injection point will be marked. Utility clearance will be obtained from Dig Safely, New York and GE facility personnel. Additionally, CB&I will have a subcontractor conduct a geophysical survey on the area using ground penetrating radar (GPR) to locate any subsurface utilities and anomalies in the area of the proposed injections. Once the underground utilities have been marked in the area where drilling will occur, pilot points will be hand dug to 5-feet or a variance will be obtained if the presence or lack thereof, underground utilities are definitely known

The equipment required for implementing the injection includes a minimum of a 25-gallon mixing tank, direct push technology (DPT) drilling rigs, and an injection system for delivery of the ISEB solution.

2.3 ISB Amendments

CB&I has hired ZEBRA Technical services (ZEBRA) to perform the drilling and injection work. The materials required for implementing the ISEB include PermeOx® Ultra by PeroxyChem (PermeOx), nutrients in the form of diammonium phosphate, and water. PermeOx is an engineered calcium peroxide with > 18% oxygen and will be used to bioremediate the observed COCs in the DM-405F area. It provides extended oxygen release (more than 350 days) for aerobic bioremediation. The PermeOx and nutrients will be delivered to the site in concentrated form, and mixed prior to injection. The make-upwater will be obtained on-site from a nearby fire hydrant and transferred to the tanks via hose. Technical oversight during the injection process will be provided by CB&I.

The PermeOx and nutrients are easily mixed, have low contact hazard levels, provide a stable and easily injected solution to distribute within the aquifer matrix, and promote favorable groundwater conditions for microbial growth. The amendments provide a respiratory substrate for the indigenous microbial community which then uses the benezene and chlorobenzene in groundwater as a carbon source.

2.4 Amendment Mixing and Preparation

The amendments will contain a mixture of water, PermeOx and nutrients. Each batch will be mixed individually in the mixing tank prior to injection and require 18-gallons of water, 60-pounds of PermeOx, and 0.10 pounds of DAP to produce 25 gallons of 30% by weight PermeOx slurry. The components will be mixed together continuously by adding the Perme0x, nutrients, and water to the mix tank in a way that produces a consistent slurry.

2.5 Direct Push Injections

It is anticipated that approximately 1,800 pounds of PermeOx Ultra® will be emplaced at ten injection locations surrounding DM-405F. CB&I and their drilling subcontractor will advance the ten direct injections of PermeOx in the source area using a Geoprobe® rig fitted with a 2 inch rod. The source treatment zone with the direct injection locations is shown on Figure 3. The target treatment area is 625 ft2 (25 x 25 foot square); the target treatment depth will be 9 to 17-feet below ground surface (bgs). PermeOx slurry will be delivered to the subsurface using a piston-type Chem-Grout pump. Injection pressures at the well head are expected to vary from 200-400 pounds per square inch (psi) and may be modified in the field as necessary to achieve target distribution or to prevent surfacing. The injection rate is expected to be approximately 5-gallons per minute. Injections will be performed at 3 foot intervals at 9, 13.5 and 17 feet bgs, equating to three injections per drilling location. The injections will be performed from the top down. During direct injection events, line pressures at the mixing tank and/or injection wellheads and slurry flow rates will be measured periodically or continuously for all injection intervals.

All injection points will be properly abandoned after use by tremie grouting to the ground surface.

2.6 Waste Management

Wastes that would be generated during the installation of the field work are associated with injection and sampling activities. These wastes are mainly purge water, decontamination water, amendment packaging, personal protective equipment (PPE), and general waste.

PPE and other solid waste such as amendment packaging from handling non-hazardous materials will be treated as non-hazardous and be disposed with other solid non-hazardous waste in a Subtitle D facility or in a municipal landfill, depending on the nature of the waste.

2.7 Decontamination and Demobilization

Down-hole drilling equipment used on site, including the drill rig, water tank, probes, rods, samplers, and associated tools will be decontaminated prior to drilling the first borehole, and prior to leaving the site. During the injection activities, the drill rig will be decontaminated on an "as needed" basis. Probes, rods, drill casings, and samplers will also be decontaminated on an "as needed" basis. Decontamination of the drill rig prior to moving to the next boring is at the discretion of the geologist but is not anticipated to be necessary. Potable water used for decontamination will be obtained from a nearby on-site source. After the work is complete, CB&I will demobilize subcontractors, equipment, and personnel.

3.0 POST-INJECTION ACTIVITIES

3.1 Performance Monitoring

Performance monitoring groundwater samples have been collected for baseline conditions prior to the injection. CB&I personnel will continue to collect groundwater samples from monitoring well DM-405F for laboratory analysis of VOCs by USEPA Method 8260 one month after the injection event, three and six months after the injection event, and during the fall (September/October) 2016 annual groundwater sampling event after the injection until active treatment has ceased.

Additionally, the following down-gradient wells are monitored annually: DE-214M, DM-302S and DM-303S. These wells can also serve as performance monitoring wells if necessary.

3.2 Reporting

CB&I will issue letter reports for the duration of the active treatment phase after receiving the groundwater analytical results. The reports will include copies of all field sampling forms, analytical data packages, trend analysis, and an evaluation of the remedy performance.

4.0 SCHEDULE

The proposed schedule is below. The schedule is based on assumptions for durations (in business days) and conditions of key events occurring on critical and non-critical paths. The schedule assumptions are detailed below.

- CB&I will submit the UIC permit application.
- Injection work is expected to be completed in one field day.
- Groundwater samples will be collected one month after the injection event, three and six months after the injection event, and in September/October 2017 to determine the efficacy of the remedial program.
- The schedule for the field investigation is dependent upon all field activities being performed in modified Level D health and safety protection.

5.0 REFERENCES

Fung, J.M., B.P. Weisenstein, E.E. Mack, J.E. Vidumsky, T.A. Ei, S.H. Zinder, Reductive dehalogenation of dichlorobenzenes and monochlorobenzene to benzene in microcosms, Environ. Sci. Technol., 2009, 43:2302-2307.

Lovely, D.R., Anaerobic benzene degradation, *Biodegradation*, 2000, 11:107-116.

Nelson, J.L., J.M. Fung, H. Cadillo-Quiroz, X. Cheng, S.H. Zinder, A role for *Dehalobacter* spp. in the reductive dehalogenation of dichlorobenzens and monochlorobenzenes, *Environ. Sci. Technol.*, 2011, 45:6806-6813.

Werlen, C., H.-P.E. Kohler, J.R. van der Meer, The broad substrate chlorobenzene deoxygenase and cis-chlorobenzene dihydrodiol dehydrogenase of *Pseudomonas* sp. strain P51 are linked evolutionarily to the enzymes for benzene and toluene biodegradation, *J. Biol. Chem.*, 1996, 271:4009-4016.

Figures

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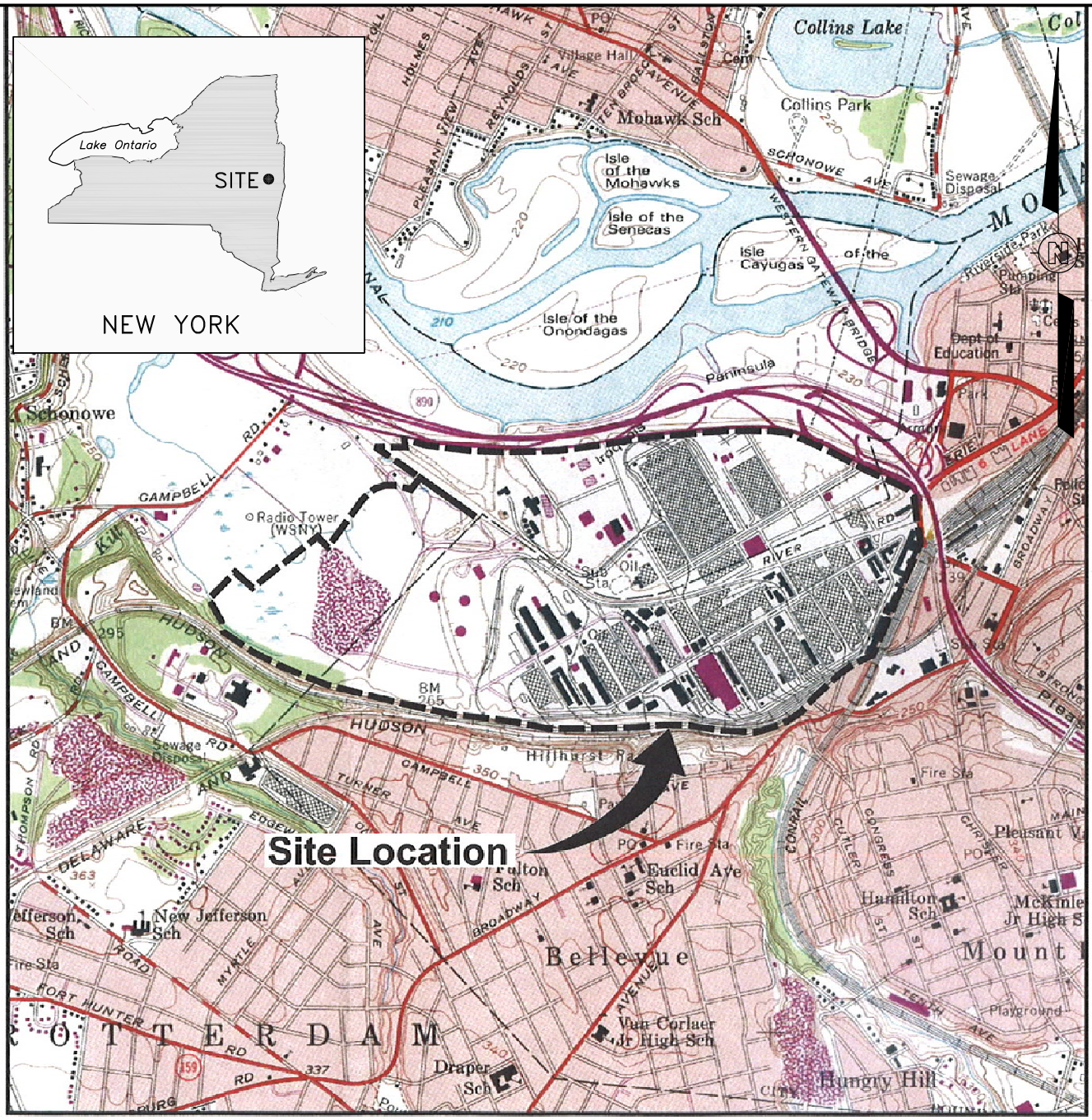

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APPROXIMATE SCALE

0 2000 4000 FEET

REV	DESCRIPTION / ISSUE	DATE	APPROVED
A	REVISED INTERMEDIATE REMEDIAL DESIGN	7/22/13	MJS
B	FINAL REMEDIAL DESIGN	12/9/13	MJS
C	REVISED FINAL REMEDIAL DESIGN	8/14/14	MJS

CB&I ENVIRONMENTAL & INFRASTRUCTURE, INC.

DESIGNED BY: MF	GE POWER & WATER- MAIN PLANT SCHENECTADY, NEW YORK			
DRAWN BY: SSH/MJS	FIGURE 1-1 SITE LOCATION MAP			
CHECKED BY: SJW				
APPROVED BY: MJS	DATE: 08/14/14	SCALE: AS SHOWN	DRAWING NO. 122622A1	FIGURE 1-1

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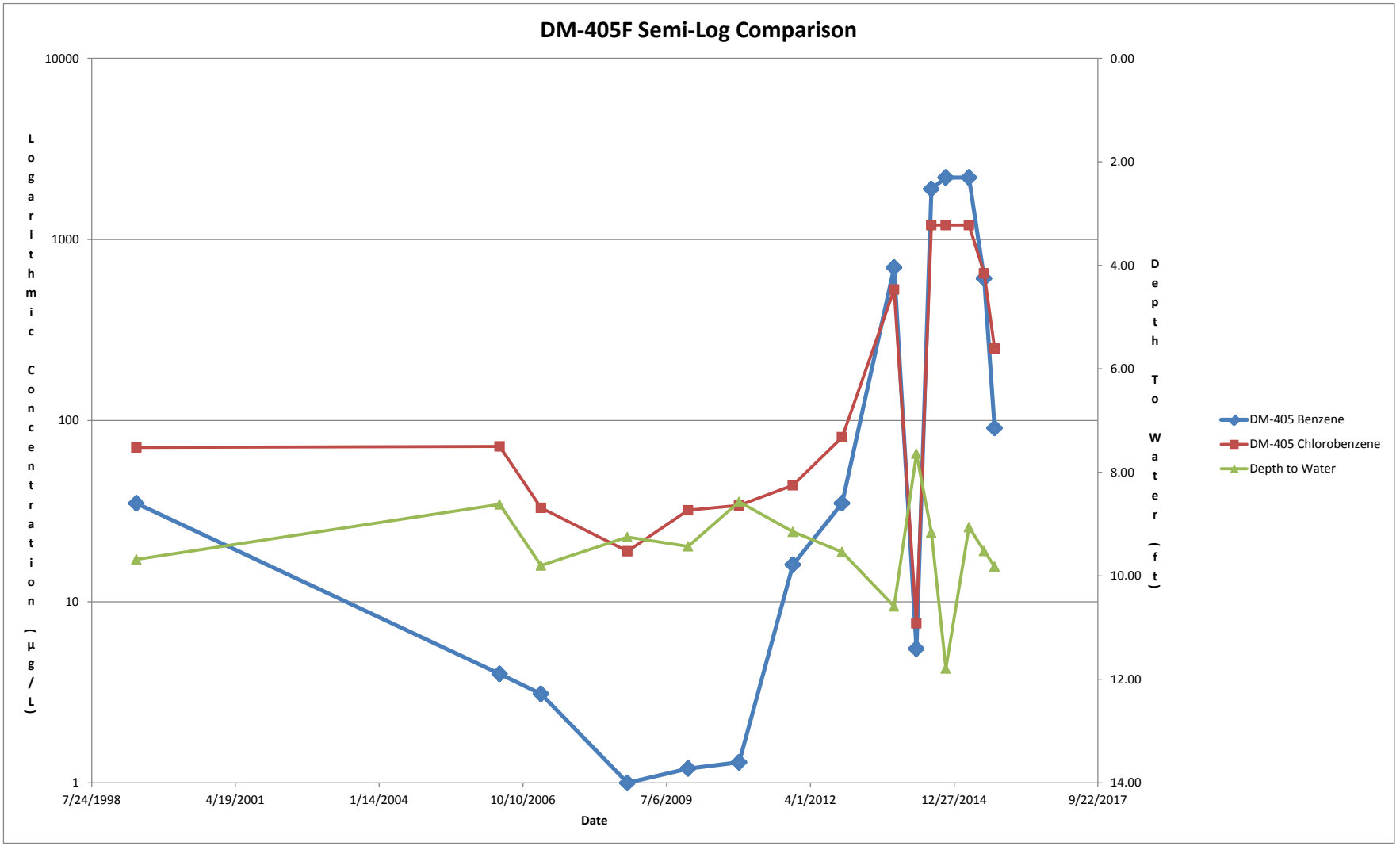
Plotted By: steven.walsh

GE

Figure 2

DM-405F Semi-Log Concentration vs. Time
1999-2015



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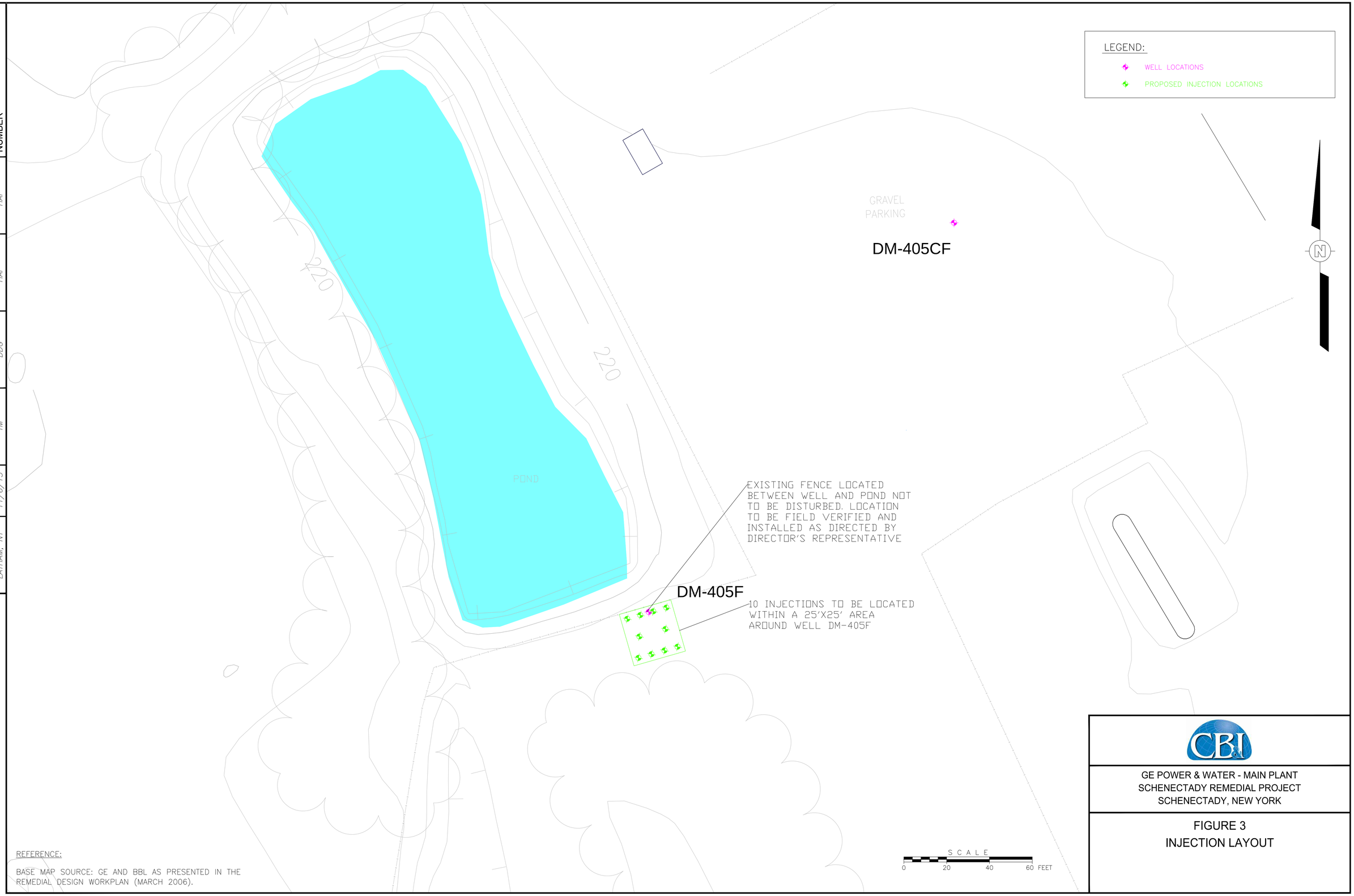
LATHAM, NY	11/6/15



REFERENCE:

BASE MAP SOURCE: GE AND BBL AS PRESENTED IN THE REMEDIAL DESIGN WORKPLAN (MARCH 2006).

GE POWER & WATER - MAIN PLANT
SCHENECTADY REMEDIAL PROJECT
SCHENECTADY, NEW YORK

FIGURE 3
INJECTION LAYOUT

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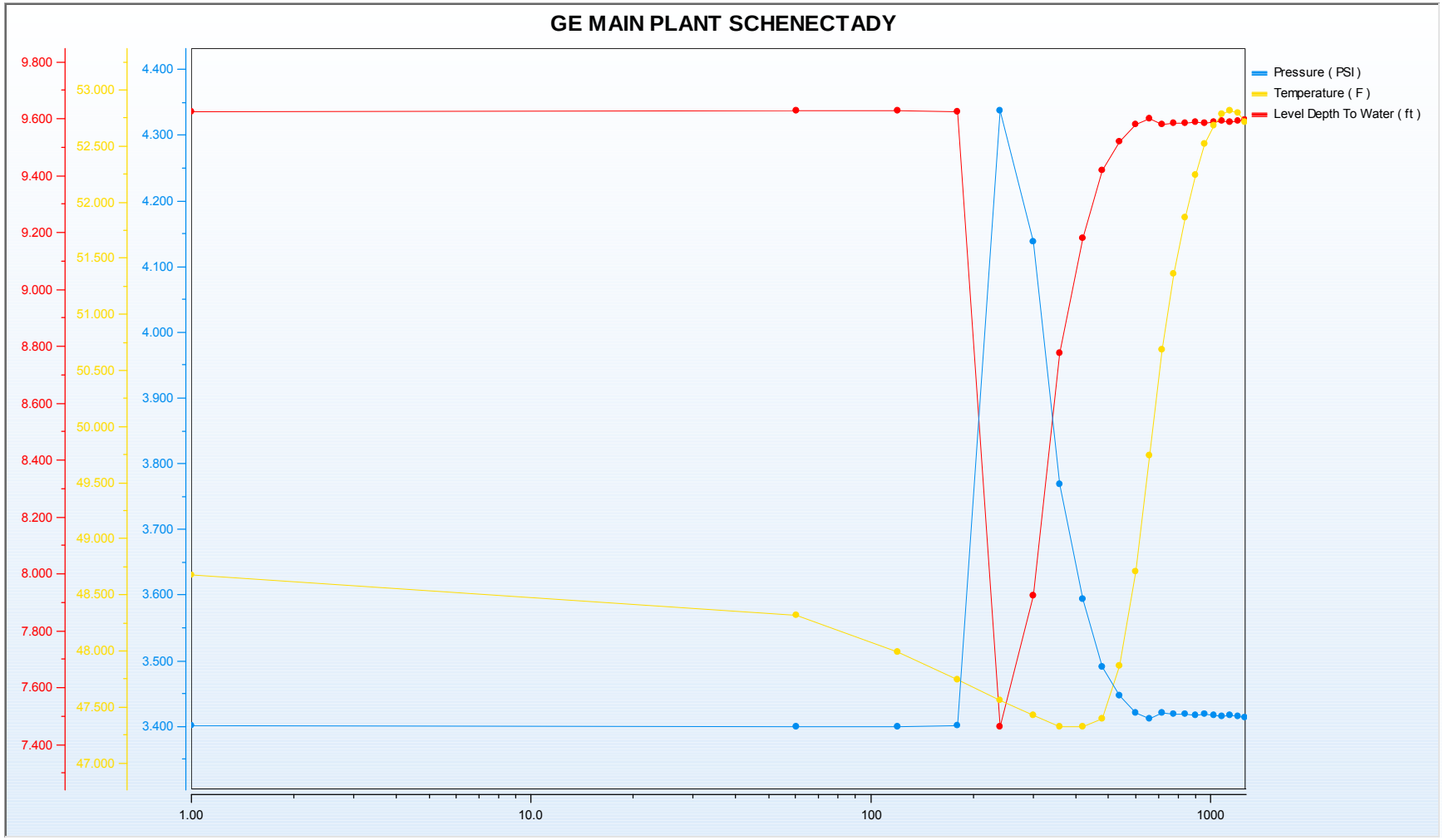
Appendix A

Slug Test Results


GE MAIN PLANT SCHENECTADY
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9.200
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7.600
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4.300
4.200
4.100
4.000
3.900
3.800
3.700
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3.500
3.400
1.00
10.0
100
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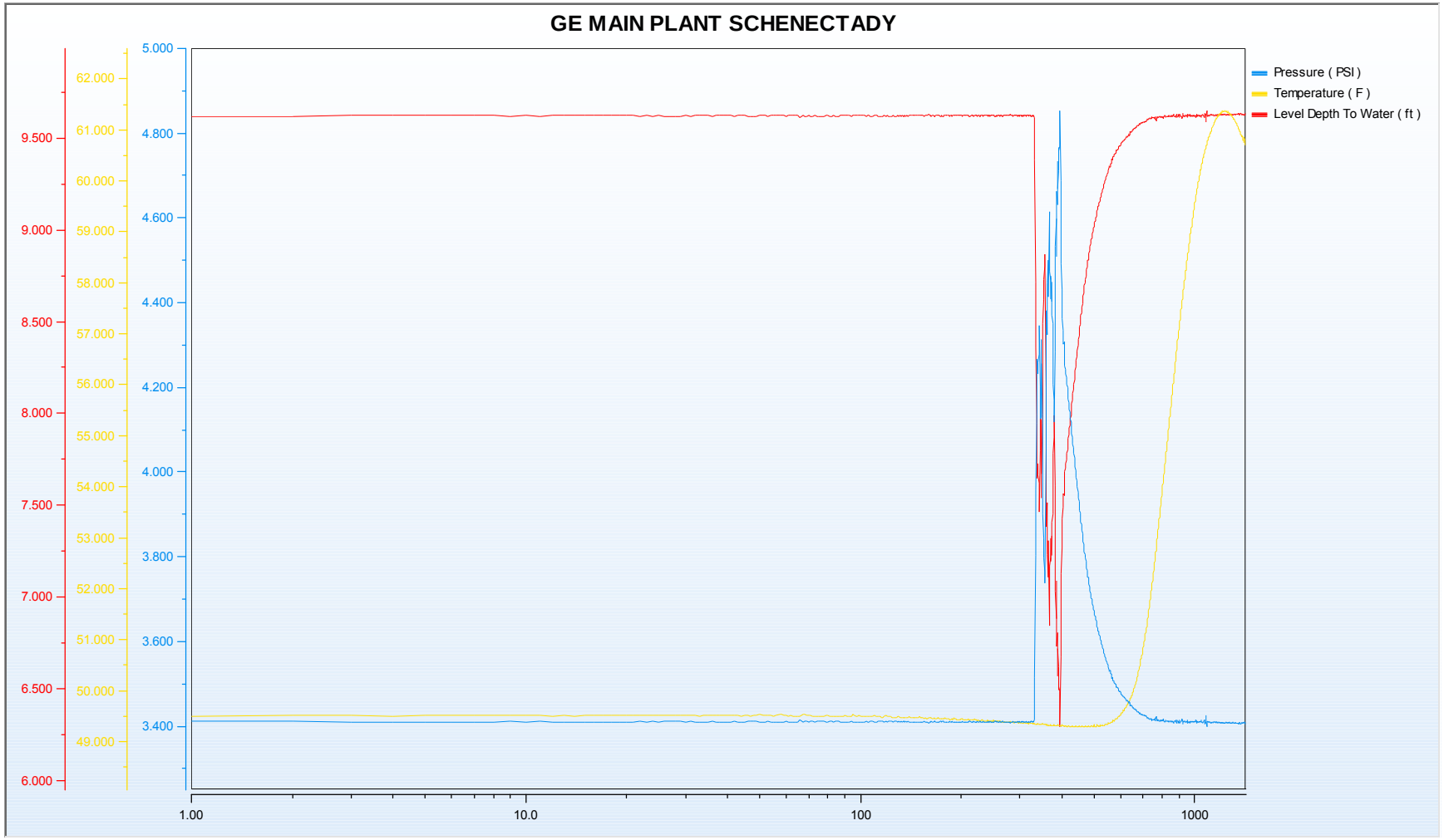
Pressure (PSI)
Temperature (F)
Level Depth To Water (ft)


GE MAIN PLANT SCHENECTADY
Pressure (PSI)
Temperature (F)
Level Depth To Water (ft)
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4.600
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4.000
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3.600
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55.000
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49.000
9.500
9.000
8.500
8.000
7.500
7.000
6.500
6.000
1.00
10.0
100
1000

Appendix B

Safety Data Sheets

SAFETY DATA SHEET
PermeOx® Ultra

SDS # : 1305-79-9-2
Revision date: 2015-04-21
Format: NA
Version 1

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product Name PermeOx® Ultra

Other means of identification

CAS-No 1305-79-9

Recommended use of the chemical and restrictions on use

Recommended Use: Environmental applications

Restrictions on Use: Use as recommended by the label.

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 number

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).

Serious eye damage/eye irritation	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
H318 - Causes serious eye damage

H335 - May cause respiratory irritation
H272 - May intensify fire; oxidizer

Precautionary Statements - Prevention
P280 - Wear eye protection/ face protection
P261 - Avoid breathing dust.
P271 - Use only outdoors or in a well-ventilated area
P210 - Keep away from heat
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
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P312 - 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 - Store in a well-ventilated place

Precautionary Statements - Disposal
P501 - Dispose of contents/ container to an approved waste disposal plant

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

Other Information
Reacts with moisture to liberate oxygen

Unknown acute toxicity
0% of the mixture consists of ingredient(s) of unknown toxicity

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS-No	Weight %
Calcium Peroxide	1305-79-9	>75
Calcium Hydroxide	1305-62-0	<25

Synonyms are provided in Section 1.

4. FIRST AID MEASURES

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids intermittently. Consult a physician.

Skin Contact Wash off with soap and water. Get medical attention if irritation develops and persists.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial

respiration. If breathing difficulty or discomfort occurs and persists, obtain medical attention.

Ingestion — Rinse mouth with water and afterwards drink plenty of water or milk. Do not induce vomiting or give anything by mouth to an unconscious person. Call a poison control center or doctor immediately for treatment advice. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed — Corneal lesions and irreversible damage if contact with the eyes

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

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media — Flood with water.

Unsuitable extinguishing media — Dry chemical. Foam.

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. Move containers from fire area if you can do it without risk.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions — Avoid contact with the skin and the eyes. Avoid dust formation. Ensure adequate ventilation. For personal protection see Section 8.

Other — For further clean-up instructions, call PeroxyChem Emergency Hotline number listed in Section 1 "Product and Company Identification" above.

Environmental Precautions — Prevent material from entering into soil, ditches, sewers, waterways, and/or groundwater. See Section 12, Ecological Information for more detailed information.

Methods for Containment — Vacuum or shovel waste into a drum and label contents for disposal. Do not return product to the original storage container/tank due to risk of decomposition. Keep combustibles (wood, paper, oil, etc) away from spilled material.

Methods for cleaning up — After cleaning, flush away traces with water. Do not flush powdered material to sewer; Runoff to sewer may create fire or explosion hazard.

7. HANDLING AND STORAGE

Handling — Avoid contact with skin and eyes. Ensure adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment if release of airborne dust is expected. If compounded with organics or combustible materials be sure to exclude moisture.

Storage — Keep tightly closed in a dry and cool place. Keep away from heat and sources of ignition i.e., steam pipes, radiant heaters, hot air vents or welding sparks. Reacts with moisture. Keep container tightly closed.

Incompatible products — Heavy metals. Combustible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines .

Chemical name	ACGIH TLV	OSHA PEL	NIOSH	Mexico
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**
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 For dust, splash, mist or spray exposure, wear chemical protective goggles.

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

Hand Protection Rubber/latex/neoprene or other suitable chemical resistant gloves. Wash the outside of gloves with soap and water prior to removal. Inspect regularly for leaks.

Respiratory Protection For dust, splash, mist or spray exposures wear a filtering mask.

Hygiene measures Clean water, preferably an eyewash station and a safety shower, should be available for washing in case of eye or skin contamination. Handle in accordance with good industrial hygiene and safety practice.

General information If the product is used in mixtures, it is recommended that you contact the appropriate protective equipment suppliers. These recommendations apply to the product as supplied.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Granules
Physical State	Solid
Color	White to off white
Odor	odorless
Odor threshold	Not applicable
pH	(1% solution) 10.5 - 11.8 @ 25 °C
Melting point/freezing point	Decomposes on heating @ ~275 °C
Boiling Point/Range	No information available
Flash point	Not flammable
Evaporation Rate	No information available
Flammability (solid, gas)	Substance does not burn but will support combustion
Flammability Limit in Air	Not applicable
Upper flammability limit:	
Lower flammability limit:	
Vapor pressure	No information available
Vapor density	No information available
Density	2.92 g/cm³
Specific gravity	2.92
Water solubility	slightly soluble
Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	Product is not self-ignitable.
Decomposition temperature	275 °C
Viscosity, kinematic	No information available (Solid)
Viscosity, dynamic	No information available
Explosive properties	No information available

Oxidizing properties	Strong oxidizer
Molecular weight	72.8 (CaO2)
Bulk density	45 lb/cu ft (loose)

10. STABILITY AND REACTIVITY

Reactivity Strong oxidizer.

Chemical Stability Stable under recommended storage conditions. Decomposition can occur on exposure to heat or moisture.

Possibility of Hazardous Reactions Oxidizable material can be ignited by grinding and may become explosive.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid Heat (decomposes at 275 °C). Humid air. Grinding with organics.

Incompatible materials Heavy metals. Combustible materials.

Hazardous Decomposition Products Oxygen which supports combustion. Calcium oxides.

11. TOXICOLOGICAL INFORMATION

Product Information

Unknown acute toxicity	0% of the mixture consists of ingredient(s) of unknown toxicity
LD50 Oral	> 5 g/kg (rat)
LD50 Dermal	> 10 g/kg (rat)
LC50 Inhalation	> 17 mg/L 1 hr (rat)
Serious eye damage/eye irritation	Corrosive. Risk of serious damage to eyes.
Skin corrosion/irritation	Non-irritating (rabbit). May cause skin irritation in susceptible persons.

Sensitization No information available.

Information on toxicological effects

Symptoms Dust is irritating eyes, nose, throat, and lungs.

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

Chronic toxicity No known effect.

Carcinogenicity There are no known carcinogenic chemicals in this product.

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.

Aspiration hazard No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects The environmental impact of this product has not been fully investigated

Persistence and degradability Biodegradability does not pertain to inorganic substances.

Bioaccumulation Does not bioaccumulate.

Mobility No information available.

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). Dispose of in accordance with local regulations.

US EPA Waste Number D001

Contaminated Packaging Empty remaining contents. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

DOT

UN/ID no	1457
Proper Shipping Name	CALCIUM PEROXIDE MIXTURE
Hazard class	5.1
Packing Group	II

TDG

UN/ID no	1457
Proper Shipping Name	CALCIUM PEROXIDE MIXTURE
Hazard class	5.1
Packing Group	II

ICAO/IATA Oxidizers are prohibited from aircraft.

IMDG/IMO

UN/ID no	1457
Proper Shipping Name	CALCIUM PEROXIDE MIXTURE
Hazard class	5.1
Packing Group	II

ADR/RID

UN/ID no	UN 1457
Proper Shipping Name	OXIDIZING SOLID, n.o.s. (Calcium Peroxide)
Hazard class	5.1
Packing Group	II

OTHER INFORMATION This material is shipped in 25 lb. plastic pails, and 30 lb. and 100 lb. fiber drums.

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

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

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

International Inventories

Component	TSCA (United States)	DSL (Canada)	EINECS/ELINCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)	NZIoC (New Zealand)
Calcium Peroxide 1305-79-9 (>75)	X	X	X	X	X	X	X	X	X
Calcium Hydroxide 1305-62-0 (<25)	X	X	X	X	X	X	X	X	X

CANADA

WHMIS Hazard Class

C - Oxidizing materials
E - Corrosive material

16. OTHER INFORMATION

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

NFPA/HMIS Ratings Legend

Special Hazards: OX = Oxidizer
Protection=J (Safety goggles, gloves, apron, combination dust and vapor respirator)

Revision date: 2015-04-21
Revision note Initial Release

Disclaimer

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Prepared By:

PeroxyChem

End of Safety Data Sheet

Appendix C

UIC Fact Sheet

EPA Site Information Request Fact Sheet
Class V Underground Injection Control

The Underground Injection Control (UIC) Program, created under the authority of the Safe Drinking Water Act (SDWA), is a preventative program aimed at protecting existing and future underground sources of drinking water (USDWs). Shallow wells or disposal systems that discharge fluids into the subsurface are known as Class V wells and can be authorized to inject by rule or permit. Class V wells that have the potential for ground water contamination or degradation are usually permitted. Those that do not have a potential to contribute to contamination or degradation of ground water are usually rule authorized, once inventory information has been submitted according to the requirements of 40 CFR 144.26.

The following information may be needed to evaluate the impact a surface drainage system/well will have on the local hydrogeologic system, potential for USDW contamination, and whether a **permit** for this operation, rather than a **rule authorization**, should be required.

Please provide the following information:

- ☐ Property owner of facility including a physical and mailing address; phone and fax numbers.
- ☐ Operator of facility including a physical an mailing address; phone and fax numbers.
- ☐ Responsible party for the operation, maintenance, and closure of the injection system including a physical and mailing address; phone and fax numbers.
- ☐ Name of the facility

- ☐ Map of the site & well location.
- ☐ Is this a proposed or existing system?
- ☐ Will the disposal system will be handling only sanitary waste? If yes, what is the capacity of the septic tank? [Usually no further information is needed for systems handling ***only sanitary waste***.]

- ☐ Chemical analysis of the water from the receiving formation (if already available).
- ☐ Type & description of proposed injection well. (example: septic system, drainage well, infiltration gallery, etc.)
- ☐ Chemical analysis or ☐ Description of the proposed injectate.
- ☐ Description of hydrogeologic conditions at injection site, description, depth, and current use (if any) of the receiving formations; depth and direction of flow of ground water,
- ☐ Location of existing monitoring wells (if any) and the location of any proposed monitoring wells.
- ☐ If injection is into an alluvial aquifer, provide locations of surface water bodies, i.e. rivers, streams, and lakes, within one mile of injection site (may substitute topographic map).
- ☐ Provide location and description of any drinking water wells within 1/4 mile and how they may be impacted by the proposed injection.
- ☐ Will injectate meet current drinking water standards? If not, what exceedences are expected?
- ☐ Describe effect of injectate on groundwater.
- ☐ If applicable, a specific closure plan for the removal, closure, or plugging of the injection system, including an estimate of closing costs.