

REMEDIAL ENGINEERING, P.C.
ENVIRONMENTAL ENGINEERS

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November 24, 2015

Ms. Sondra Martinkat
New York State Department of Environmental Conservation
Division of Environmental Remediation
47-40 21st Street
Long Island City, New York 11101

Re: Design Report
Paragon Paint and Varnish Corp. (Site)
5-49 46th Avenue
Long Island City, New York 11101
NYSDEC Site No. C241108

Dear Ms. Martinkat:

Roux Associates, Inc. (Roux Associates) and Remedial Engineering, P.C. (herein collectively referred to as Roux Associates) on behalf of Vernon 4540 Realty, LLC (Vernon 4540) are submitting this design report as part of the Revised Remedial Action Work Plan (Revised RAWP), prepared by Roux Associates dated October 7, 2015, for the Paragon Paint and Varnish Corporation at 5-43 to 5-49 46th Avenue and 45-38 to 45-40 Vernon Boulevard (Tax Block 26, Lot 4) in Long Island City, New York (Site). The Site was accepted into the Brownfield Cleanup Program (BCP) as a Volunteer, and the BCA was signed on September 4, 2008 and Site Number C241108 was assigned.

The Revised RAWP proposes a Track 4 cleanup with the closure of any remaining underground storage tanks (USTs), the excavation and disposal of subsurface piping and the excavation and off-Site disposal of grossly contaminated soil in the courtyard. The purpose of this design report is to provide more detail of the following proposed remedies:

- *In situ* chemical oxidation (ISCO) injection for treatment of volatile organic compounds (VOCs) in soil and groundwater underneath the Warehouse; and
- Installation of five automatic product-only recovery pumps in five proposed recovery wells to address any light non-aqueous phase liquid (LNAPL) following excavation activities.

The ISCO injections and LNAPL recovery system installation will be performed following completion of the UST closure and excavation activities to achieve compliance with the Remedial Action Objectives (RAOs) for the Site as outlined in the Revised RAWP. The groundwater RAOs would be met with the ISCO injections underneath the

Warehouse through the treatment of VOCs in soil and groundwater to meet the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs) for Class GA groundwater for benzene, ethylbenzene, isopropylbenzene and xylenes. Residual LNAPL will be addressed with the LNAPL recovery system.

***In Situ* ISCO Injections**

As described in the Revised RAWP, an *in situ* chemical oxidation injection program will be performed to address contaminated soil and groundwater beneath the Warehouse. The chemical oxidant that will be used is RegenOx™ manufactured by Regenesis, Inc. Specifications for RegenOx™ are included in Attachment 1. A total of 20 injection points (IP-1 to IP-20) spaced approximately 15 feet apart will be used to inject the chemical oxidant as shown on Drawing 1. The proposed spacing of the injection points is based on our experience on previous projects in New York City with similar soil conditions. As the oxidant is dissolved in water, it creates an alkaline and oxidative environment. The radius of influence of the injection points will be verified during the injections by monitoring field parameters (i.e., pH and dissolved oxygen) at any adjacent monitoring wells. The spacing of the injection points will be adjusted, if necessary, based on the field parameter readings.

Injection Material and Procedures

RegenOx™ is a solid alkaline oxidant that consists of two parts: Part A is a sodium percarbonate complex (oxidant complex); and, Part B is a multi-part catalytic formula (micro-scale ferrous salt in a catalyst gel). The two parts are combined and mixed with water to produce an effective oxidant that is then injected into groundwater.

The amount of oxidant needed to effectively remediate the VOCs in the soil and groundwater is a function of the following:

- The stoichiometric demand of the contaminants in soil and groundwater; and
- The natural and non-target organic compound oxidant demand.

The highest VOC concentration detected in groundwater in the Warehouse was isopropylbenzene. The stoichiometric demand of RegenOx™ with isopropylbenzene is 20.9:1. Therefore, 20.9 pounds of RegenOx™ is needed for every pound of isopropylbenzene oxidized. The highest detection of VOCs in the Warehouse soil was ethylbenzene which has a stoichiometric demand of 20.7:1. Since natural and non-target organic compounds (e.g., residual LNAPL in soil) will be oxidized along with the VOCs, an additional amount of RegenOx™ will be injected to overcome this additional oxidant demand. The additional amount of RegenOx™ was estimated using one pound of oxidant per 1,000 pounds of soil. Based on the above demand requirements, the calculated total quantity of RegenOx™ is approximately 2,240 pounds. The oxidant demand calculations are provided in Attachment 1.

In consideration of the logistic constraints associated with the Warehouse and to ensure that the appropriate amount of oxidant is distributed into the subsurface below the Warehouse, the injections will also be performed in the driveway area adjacent to the

Warehouse as shown on Plate 1. Due to the low ceiling in the Warehouse basement and shallow water table, the injection points in the Warehouse will be installed by hand to a depth of approximately 5 feet below the concrete floor and use gravity to inject the RegenOx™ solution. The temporary points outside the Warehouse will be much more readily accessible and installed using a Geoprobe™ drill rig. The injection points outside of the Warehouse will be installed to a depth of approximately 14 ft below grade. The RegenOx™ solution will be injected approximately 3 to 7 feet into the water table.

The RegenOx™ will be delivered to the subsurface at a controlled rate as a 5 percent (by weight) solution. For the injection event, 2,240 pounds of Part A and Part B will need a total of approximately 4,400 gallons of water to prepare the chemical oxidant injection solution. In consideration of the logistical constraints with the injections within the Warehouse, the proposed injections will proceed as follows:

- The 16 proposed injection points within the Warehouse will receive one bucket each of Part A and B mixed with 115 gallons of water; and
- The 4 proposed injection points outside and adjacent to the Warehouse will receive each three buckets of Part A and B mixed with 380 gallons of water.

For the temporary points outside and adjacent to the Warehouse, the oxidant and activator will be injected using an injection pump at a flow rate of 5 gallons per minute (gpm). During the injection process, the injection pump pressure will be maintained below 20 psi to allow the aquifer to naturally dissipate any hydrostatic pressure build up.

Personnel working with or in areas with potential contact with the RegenOx™ will be using personal protective equipment consisting of eye protection, dust respirator, neoprene gloves and long sleeve shirts and long pant legs.

In Situ ISCO Groundwater Monitoring

To assess the performance of the ISCO injections, a groundwater monitoring program will be implemented that will initially be completed as part of the remedy and continue as part of the implementation of the Site Management Plan (SMP). The groundwater monitoring program will include two components: baseline sampling and performance monitoring. The sampling, sample handling, decontamination, and field instrument calibration procedures will be performed in accordance with established procedures (Roux Associates' Quality Assurance Project Plan, dated October 21, 2011) for the Site.

Baseline Groundwater Sampling

Baseline groundwater samples will be collected from existing monitoring wells MW-2R, MW-7R, MW-19, MW-33, MW-34, MW-37 and MW-38. The baseline groundwater samples will be analyzed for the following:

- TCL VOCs by USEPA Method 8260; and
- Field groundwater quality parameters: pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), temperature, and conductivity.

Performance Groundwater Monitoring

Following the completion of the ISCO injections, performance monitoring groundwater samples will be collected from existing monitoring wells MW-2R, MW-7R, MW-19, MW-33, MW-34, MW-37 and MW-38. The wells will be sampled for the same set of analytical parameters that were analyzed during the baseline sampling round.

Data Evaluation and Reporting

After the injection and the initial performance groundwater monitoring event have been completed, Remedial Engineering, P.C. and Roux Associates will evaluate the results of the injection round to determine the effectiveness of the oxidant at reducing the residual benzene, ethylbenzene, isopropylbenzene, and xylenes concentrations in groundwater. The evaluation and recommended course of action will be summarized in a report to NYSDEC, and as necessary, any additional rounds of injections will be conducted as part of the SMP. It is anticipated that continued monitoring of groundwater will be performed as part of the SMP regardless if additional injections are required or not.

LNAPL Recovery System

The proposed recovery wells will be installed to a depth of approximately 14 feet below grade utilizing 10 feet of Schedule 40 polyvinyl chloride (PVC) 20-slot screen and approximately four feet of PVC casing. A gravel pack consisting of No. 2 Morie sand will be placed around the screened interval of each recovery well to approximately 6 inches above the top of each screen. The remainder of the well annulus will be sealed with bentonite grout. Each recovery well will then be completed with a 36-inch diameter, flush-mount, metal manhole. The Spill Buster™ recovery well locations (RW-01 to RW-05) are shown on Drawing 2. The exact location of the recovery wells may vary based on field conditions encountered during excavation activities.

LNAPL recovery using automatic product only pumps will be performed to collect mobile LNAPL remaining after excavation has been completed. The proposed pump is the Mangum Spill Buster™ (Spill Buster™) manufactured by Clean Earth Technologies, Inc. The Spill Buster™ pump is rated for approximately 0.62 gpm at 25 psi discharge pressure head. The Spill Buster™ system consists of a motorized auto-seeking reel assembly, electric powered LNAPL recovery pump, and controller. The auto-seeking device allows the pump intake to automatically follow the elevation of the oil/water interface as it fluctuates. The controller will be used to adjust the pump cycle duration to set the average pump flow rate to a recovery rate that is less than the observed recharge rate of LNAPL into the well. In addition, the controller will adjust the electrical current to the auto-seeking reel assembly, as necessary, to overcome the discharge pressure head on the pump. Technical information is provided in Attachment 2.

The Spill Buster™ control panels, and electric disconnect switches will be installed within the existing Warehouse or existing building as shown on Drawing 2 with signs with emergency contact information. The product transfer tubing from the product discharge connection of the auto-seeking reel assembly to the product storage drum will consist of 3/8-inch diameter nylon tubing (inside diameter of 1/4-inch) contained within a secondary containment pipe. The secondary containment pipe will be constructed of 2-inch

diameter Schedule 40 PVC pipe. The 2-inch diameter PVC pipe and a 2-inch diameter PVC control wiring conduit will be placed in a common trench connecting one or two recovery wells to the proposed control panel and product storage locations. The product storage will be 55-gallon drums installed within secondary containment pallets. Each 55-gallon drum will have a high level sensor and the secondary containment pallet will have spill leak detection. In the event of a leak detection or high level detection, the Spill BusterTM system will automatically shut down.

Schedule

The baseline groundwater samples will be collected on November 24, 2015. The *in situ* ISCO injections will begin on November 30, 2015 at which time an assessment of the injection point spacing will be performed based on field measurements. Additional injection points will be added if deemed necessary. The initial performance groundwater samples will be collected on December 11, 2015.

Installation of the LNAPL recovery wells will commence the week of December 7, 2015.

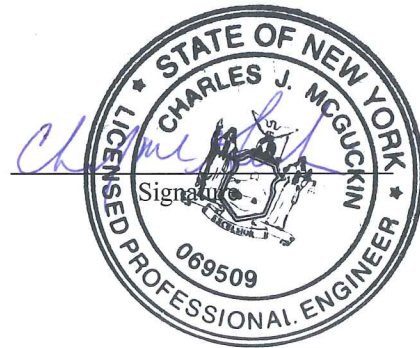
Should you have any questions or require any additional information, please do not hesitate to contact me at (631) 232-2600.

Sincerely,

REMEDIAL ENGINEERING, P.C.

Charles J. McGuckin, P.E.
NYS Professional Engineer #069509

November 24, 2015
Date



Attachment

cc: Jane O'Connell, NYSDEC
Richard Maxwell, Roux Associates, Inc.
Glen Netuschil, P.E., Remedial Engineering, P.C.
Omar Ramotar, P.E., Remedial Engineering, P.C.
Brent Carrier, Vernon 4540 Realty, LLC

RegenOxTM Calculations and Technical Information

RegenOx™ Calculations
Paragon Paint and Varnish Corp.
Long Island City, NY

Assumptions:

1. The maximum VOC concentrations detected from RI were used to design the injections.
2. The saturation thickness is approximately 4.5 feet.
3. Soil porosity (effective) = 0.35 "Sandy Silt"
4. Soil density = 100 pounds/cubic foot or 1,605 kg/m³
5. Assume additional natural oxidant demand (NOD) of one pound per 1,000 pounds of soil
6. Treatment Area is 7150 square feet

Treatment Area	
Length [ft]	110
Width [ft]	65
Surface area [SF]	7150

Calculate total treatment Volume

depth [ft]	4.5
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Ground water Treatment Volume

Volume [CF]	11261.25
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Soil Treatment Volume

Volume [CF]	20913.75
Mass [lb]	2091375

Ground water Treatment Mass

Compound	Isopropylbenzene
Concentration [ug/L]	42
Mass [lb]	0.029

Soil Treatment Mass

Compound	Ethylbenzene
Concentration [mg/Kg]	3.3
Mass [lb]	6.902

RegenOx Mass Ratio Calculations

Mass ratio [lbCont./lbOx]	20.9
RegenOx Mass [lb]	0.62

Mass ratio [lbCont./lbOx]	20.7
NOD demand [lbOx]	2091.375
RegenOx Mass [lb]	142.86

Total mass [lbOx]	2235
Total buckets needed	56

RegenOx® – Part A (Oxidizer Complex)

Material Safety Data Sheet (MSDS)

Last Revised: June 24, 2010

Section 1 – Supplier Information and Material Identification

Supplier:



REGENESIS

1011 Calle Sombra

San Clemente, CA 92673

Telephone: 949.366.8000

Fax: 949.366.8090

E-mail: info@regenesis.com

Chemical Description: A mixture of sodium percarbonate [$2\text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.

Chemical Family: Inorganic Chemicals

Trade Name: RegenOx® – Part A (Oxidizer Complex)

Product Use: Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Chemical Information/Other Designations

<u>CAS No.</u>	<u>Chemical</u>	<u>Percentage</u>
15630-89-4	Sodium Percarbonate	60 -100 %
5968-11-6	Sodium Carbonate Monohydrate	10 – 30 %
7699-11-6	Silicic Acid	< 1 %
63231-67-4	Silica Gel	< 1 %

Section 3 – Physical Data

Form: Powder

Color: White

Odor: Odorless

Melting Point: NA

Boiling Point: NA

Section 3 – Physical Data (cont)

Flammability/Flash Point:	NA
Vapor Pressure:	NA
Bulk Density:	0.9 – 1.2 g/cm ³
Solubility:	Min 14.5g/100g water @ 20 °C
Viscosity:	NA
pH (3% solution):	≈ 10.5
Decomposition Temperature:	Self-accelerating decomposition with oxygen release starts at 50 °C.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions
Conditions to Avoid/Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances
Hazardous Decomposition Products:	Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.

Section 5 – Regulations

TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	<i>No</i>
Unlisted Substance:	<i>Yes</i>
SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	No
WHMIS Classification:	C, D2B
Canadian Domestic Substance List:	Appears

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

- Storage:** Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.
- Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.
- Protect from moisture. Do not store near combustible materials. Keep containers well sealed.
- Store separately from reducing materials. Avoid contamination which may lead to decomposition.
- Handling:** Avoid contact with eyes, skin and clothing. Use with adequate ventilation.
- Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.
- Label containers and keep them tightly closed when not in use.
- Wash hands thoroughly after handling.

Personal Protective Equipment (PPE)

- Engineering Controls:** General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis.
- Respiratory Protection:** For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.
- Hand Protection:** Wear chemical resistant gloves (neoprene, rubber, or PVC).

Section 6 – Protective Measures, Storage and Handling (cont)

Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
Other:	Eye wash station.
Protection Against Fire & Explosion:	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes slight irritation.
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.
Extinguishing Media:	Water
First Aid	
Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. <u>Do Not</u> induce vomiting.

Section 8 – Measures in Case of Accidents and Fire (cont)

Skin Contact: Wash affected areas with soap and a mild detergent and large amounts of water.

Section 9 – Accidental Release Measures

Precautions:

Cleanup Methods: Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Section 10 – Information on Toxicology

Toxicity Data

LD50 Oral (rat): 2,400 mg/kg
LD50 Dermal (rabbit): Min 2,000 mg/kg
LD50 Inhalation (rat): Min 4,580 mg/kg

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information: NA

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment: Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.

Package (Pail) Treatment: The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate $[2\text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}_2]$, sodium carbonate $[\text{Na}_2\text{CO}_3]$, sodium silicate and silica gel.]
UN Number:	1479
Hazard Class:	5.1
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS[®] Rating	Health – 1 (slight)	Reactivity – 1 (slight)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat

HMIS[®] is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

RegenOx® – Part B (Activator Complex)

Material Safety Data Sheet (MSDS)

Last Revised: June 4, 2010

Section 1 – Supplier Information and Material Identification

Supplier:



REGENESIS

1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium silicate solution, silica gel and ferrous sulfate
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part B (Activator Complex)
Product Use:	Used for environmental remediation of contaminated soils and groundwater

Section 2 – Chemical Information/Other Designations

<u>CAS No.</u>	<u>Chemical</u>
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
63231-67-4	Silica Gel
7720-78-7	Ferrous Sulfate
7732-18-5	Water

Section 3 – Physical Data

Form:	Liquid
Color:	Blue/Green
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	NA
Vapor Pressure:	NA

Section 3 – Physical Data (cont)

Specific Gravity	1.39 g/cm ³
Solubility:	Miscible
Viscosity:	NA
pH (3% solution):	11
Hazardous Decomposition Products:	Oxides of carbon and silicon may be formed when heated to decomposition.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions.
Conditions to Avoid:	None.
Incompatibility:	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 5 – Regulations

TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	No
Unlisted Substance:	Yes
SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification	
Extremely Hazardous Substance:	No
SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know	
Hazard Category:	Acute
SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	No

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage: Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.

Handling: Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation.
Do not use product if it is brownish-yellow in color.

Personal Protective Equipment (PPE)

Engineering Controls: General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.

Respiratory Protection: Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.

Hand Protection: Wear chemical resistant gloves.

Eye Protection: Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.

Skin Protection: Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.

Other:

Protection Against Fire & Explosion: Product is non-explosive and non-combustible.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes irritation. Symptoms include redness, itching and pain.
Ingestion:	May cause irritation to mouth, esophagus, and stomach.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage (small):	Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.
After Spillage/Leakage (large):	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.
Extinguishing Media:	Material is compatible with all extinguishing media.
Further Information:	
First Aid	
Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. <u>DO NOT</u> induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.

Section 9 – Accidental Release Measures

Precautions:

PPE: Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).

Environmental Hazards: Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.

Cleanup Methods: Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 10 – Information on Toxicology

Toxicity Data

Sodium Silicate: When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist.

The acute oral toxicity of this product has not been tested.

Ferrous Sulfate: LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:

Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:

Neutralize and landfill solids in an approved waste facility operated by an authorized contractor in compliance with local regulations.

Package (Pail) Treatment:

The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T.

This product is not regulated as a hazardous material so there are no restrictions.

Section 14 – Other Information

HMIS[®] Rating

Health – 2 (moderate)	Reactivity – 0 (none)
Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat
Contact – 1 (slight)	

HMIS[®] is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.



CHEMICAL OXIDATION REDEFINED...

RegenOx™ is an advanced in situ chemical oxidation technology designed to treat organic contaminants including high concentration source areas in the saturated and vadose zones*

PRODUCT FEATURES:

- Rapid and sustained oxidation of target compounds
- Easily applied with readily available equipment
- Destroys a broad range of contaminants
- More efficient than other solid oxidants
- Enhances subsequent bioremediation
- Avoids detrimental impacts to groundwater aquifers



RegenOx product application

HOW IT WORKS:

RegenOx maximizes in situ performance using a solid alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. The product is delivered as two parts that are combined and injected into the subsurface using common drilling or direct-push equipment. Once in the subsurface, the combined product produces an effective oxidation reaction comparable to that of Fenton's Reagent without a violent exothermic reaction. RegenOx safely, effectively and rapidly destroys a wide range of contaminants in both soil and groundwater (Table 1).

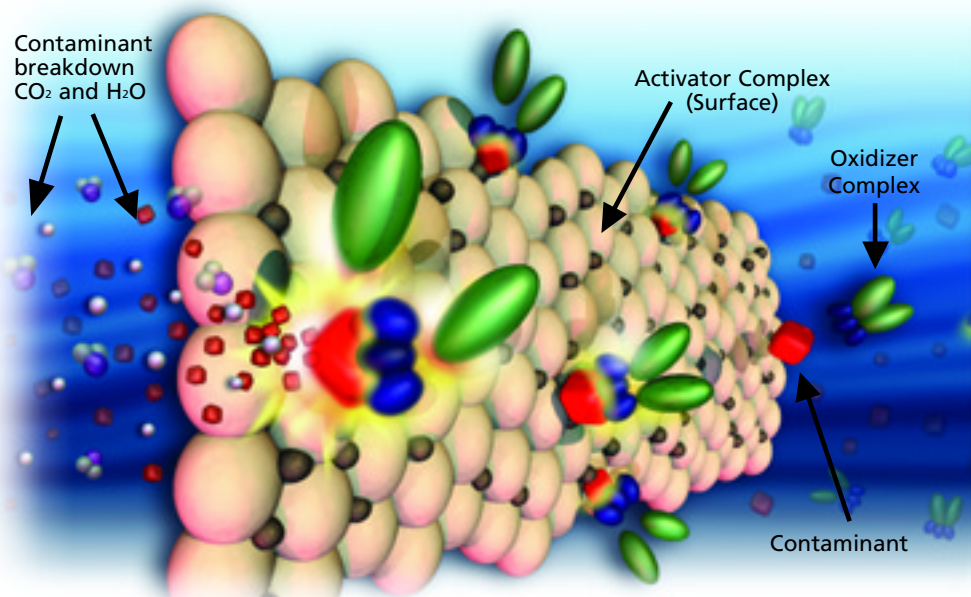
ACHIEVES RAPID OXIDATION VIA A NUMBER OF MECHANISMS

RegenOx directly oxidizes contaminants while its unique catalytic complex generates a suite of highly charged, oxidative free radicals that are responsible for the rapid destruction of contaminants. The mechanisms by which RegenOx operates are:

- **Surface- Mediated Oxidation:** (see Figure 1 and description below)
- **Direct Oxidation:** $\text{C}_2\text{Cl}_4 + 2 \text{Na}_2\text{CO}_3 + 3 \text{H}_2\text{O}_2 + 2 \text{H}_2\text{O} \leftrightarrow 2\text{CO}_2 + 4 \text{NaCl} + 4 \text{H}_2\text{O} + 2 \text{H}_2\text{CO}_3$
- **Free Radical Oxidation:**
 - Perhydroxyl Radical ($\text{HO}_2\bullet$)
 - Hydroxyl Radical ($\text{OH}\bullet$)
 - Superoxide Radical ($\text{O}_2\bullet$)

Figure 1. Surface-Mediated Oxidation is responsible for the majority of RegenOx contaminant destruction. This process takes place in two stages. First, the RegenOx activator complex coats the subsurface. Second, the oxidizer complex and contaminant react with the activator complex surface destroying the contaminant.

Figure 1. RegenOx™ Surface-Mediated Oxidation



* Patent applied for



From Mass Reduction to Bioremediation:

RegenOx™ is an effective and rapid contaminant mass reduction technology. A single injection will remove significant amounts of target contaminants from the subsurface. Strategies employing multiple Regenox injections coupled with follow-on accelerated bioremediation can be used to treat highly contaminated sites to regulatory closure. In fact, RegenOx was designed specifically to allow for a seamless transition to low-cost accelerated bioremediation using any of Regenesi controlled release compounds.

Significant Longevity:

RegenOx has been shown to destroy contaminants for periods of up to one month.

Product Application Made Safe and Easy:

RegenOx produces minimal heat and as with all oxidants proper health and safety procedures must be followed. The necessary safety guidance accompanies all shipments of RegenOx and additional resources are available on request. Through the use of readily available, highly mobile, direct-push equipment and an array of pumps, RegenOx has been designed to be as easy to install as other Regenesi products like ORC® and HRC®.

Effective on a Wide Range of Contaminants:

RegenOx has been rigorously tested in both the laboratory and the field on petroleum hydrocarbons (aliphatics and aromatics), gasoline oxygenates (e.g., MTBE and TAME), polyaromatic hydrocarbons (e.g., naphthalene and phenanthrene) and chlorinated hydrocarbons (e.g., PCE, TCE, TCA).

Oxidant Effectiveness vs. Contaminant Type:

Table 1						
Contaminant	RegenOx™	Fenton's Reagent	Permanganate	Persulfate	Activated Persulfate	Ozone
Petroleum Hydrocarbons	A	A	B	B	B	A
Benzene	A	A	D	B	B	A
MTBE	A	B	B	C	B	B
Phenols	A	A	B	C	B	A
Chlorinated Ethenes (PCE, TCE, DCE, VC)	A	A	A	B	A	A
Chlorinated Ethanes (TCA, DCA)	A	B	C	D	C	B
Polycyclic Aromatic Hydrocarbons (PAHs)	A	A	B	B	A	A
Polychlorinated Biphenyls (PCBs)	B	C	D	D	D	B
Explosives (RDX, HMX)	A	A	A	A	A	A

Based on laboratory kinetic data, thermodynamic calculations, and literature reports.

Oxidant Effectiveness Key:

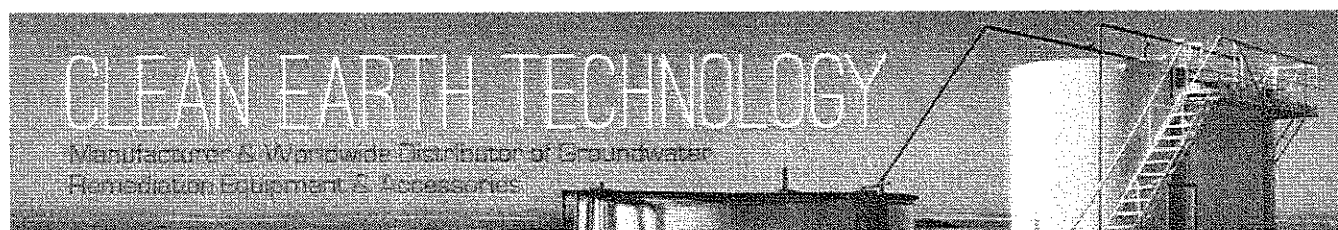
- A = Short half life, low free energy (most energetically favored), most complete
- B = Intermediate half life, low free energy, intermediate degree of completion
- C = Intermediate half life, intermediate free energy, low degree of completion
- D = Long half life, high free energy (least favored), very low degree of completion



Advanced Technologies for Groundwater Resources

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Magnum Spill Buster Technical Information



System Specifications

Magnum Spill Buster

System Specifications

Complete Magnum Spill Buster™ System includes: Magnum Spill Buster™ Control Box, Magnum Spill Buster™ Probe with 50' down well cable, Auto Seeker with 30' cable, and Product Tank Shutoff Probe with 30' cable, and 50 ft. Nylon Product Discharge Tubing.

Input Power: 115vac or 230vac, 100 watts max. or 24vdc, 75 watts max. with optional battery cable and deep discharge batteries. A 5 amp AC circuit breaker is built into the System Power switch.

Operating Temperature Range:

Ambient air temperature of -40F to +140F (-40C to 60C).

Pumping Rate:

Up to 46 gal/hr (175 liter/hr) @ 0 psi (zero depth & no discharge back pressure), or up to 37 gal/hr (140 liter/hr) @ 25 psi discharge back pressure.

Product Viscosity:

Products with viscosity of less than 10 Cp at 70 degrees F. Examples: gasoline, diesel fuel, #2 heating oil, JP-4, JP-5, paint thinners.

Well Diameter:

2 inch minimum for product recovery only.

Standard Well Depth:

50 ft.(15.2m.) max

Maximum Well Depth:

150 ft (45.7 m) on special order with 150 ft (45.7m) down-well cable.

Probe

The Probe is certified compliant with NEC2011 specifications for use in Class 1, Div 1 locations. DC power for the pump is supplied using a conductor pair that has an over woven metal shield along with a Tefzel overcoat. The signal wires also have a separate over woven metal shield. The two cable bundles, along with the discharge tubing, are contained in a tough woven plastic protective scuff jacket.

Probe Dimensions:

1.93" (4.9cm) dia. x 15.25" (38.7cm) long [cable size including the discharge tube is 5/8" thickness x 1 1/2' width].

Standard Probe cable length is 50 ft. (15.2m)

Control Box

Certified IS barriers are wired into the Probe and Override circuits in the Control Box in order to make them compliant with NEC2011 specifications.

Dimensions & Weight:

14" (36cm) wide x 23" (59cm) high x 6" (15.4cm) deep. An additional 10" is required below for cable exit and an additional 14" is required in front and to the left for door swing. Weight: 25 lbs. (11.34 kg)

Standard Auto Seeker

The Standard Auto Seeker is not rated for use in hazardous locations.

Dimensions & Weight (with 50' probe attached): 14" (36cm) wide and deep; 20" tall (15.8cm). Weight: 32 lbs. (14.51 kg)

Optional Explosion Proof Auto Seeker

The Explosion Proof Auto Seeker is certified compliant with NEC2011 specifications for use in Class 1 Div 1 locations. Connections to all cabling now have positive threaded Mil-Spec circular connectors.

Dimensions & Weight (with 50' probe attached): 52 lbs. (23.59 kg)

Minimum Well Head Clearance for EXPLOSION PROOF AUTO SEEKER: 28"x24"x24" Deep (71 cm x 61 cm x 61 cm deep). (Does not apply to Standard Auto Seeker, which must be mounted outside of any classified hazardous areas)

Optional Explosion Proof Enclosure for the Control Box

The Explosion Proof enclosure is certified compliant with NEC2011 specifications for use in Class 1 Div 1 locations. Comes with the control box mounted in a certified XP enclosure and includes three XP cable feed through fittings with Chico® seals.

Dimensions & Weight: 29" (73.66cm) tall; 11" (27.9cm) deep; 18" (45.7cm) wide, with an additional 18" required in front and to the left for door swing and an additional 10" (25.4cm) required below for cable exit. Weight (with Control Box mounted inside): 210 lbs. (95.25 kg)

Optional Explosion Proof Enclosure AC Power Switch

This feature provides a convenient AC power switch mounted directly to the XP control box enclosure to enable the Spill Buster to be turned on and off at the box instead of back at the AC main power panel.

Standard Extension Cable length: 30 ft (9.1m) from Control Box to well head.

Override Product Tank Probe: Threads into a standard 2" barrel bung. Standard cable length is 30 ft (9.1m)

Total System Shipping Weight

Complete Standard Magnum System –approx. 68 lbs. (30.84 kg)

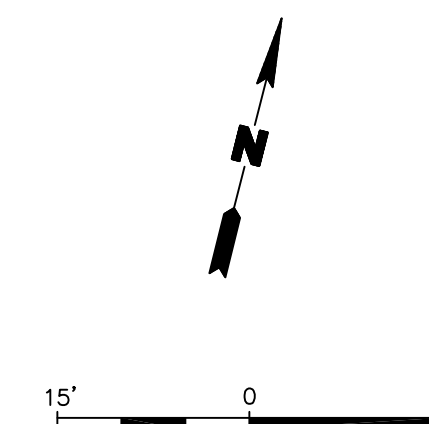
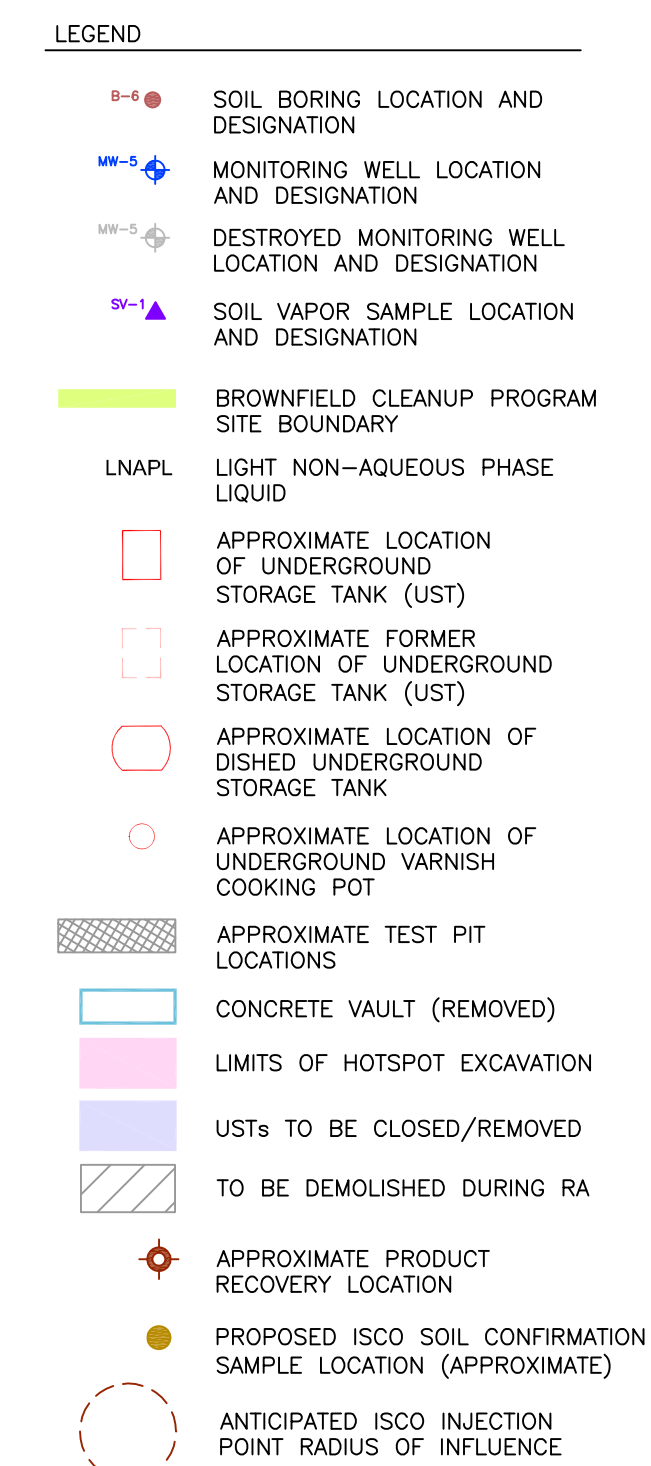
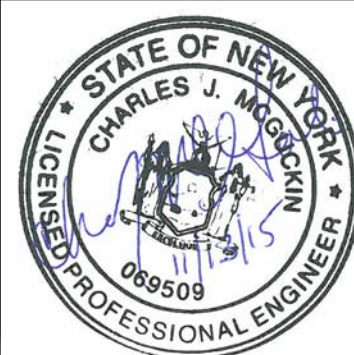
Complete Magnum System with Explosion Proof Auto Seeker- approx. 92 lbs. (41.73 kg)

Complete Explosion Proof Magnum System- approx. 277 lbs. (125.65 kg) (includes Exp. Enclosure for Control Box)

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- 1. ISCO Injection Layout Network**
- 2. Recovery Well System Design**

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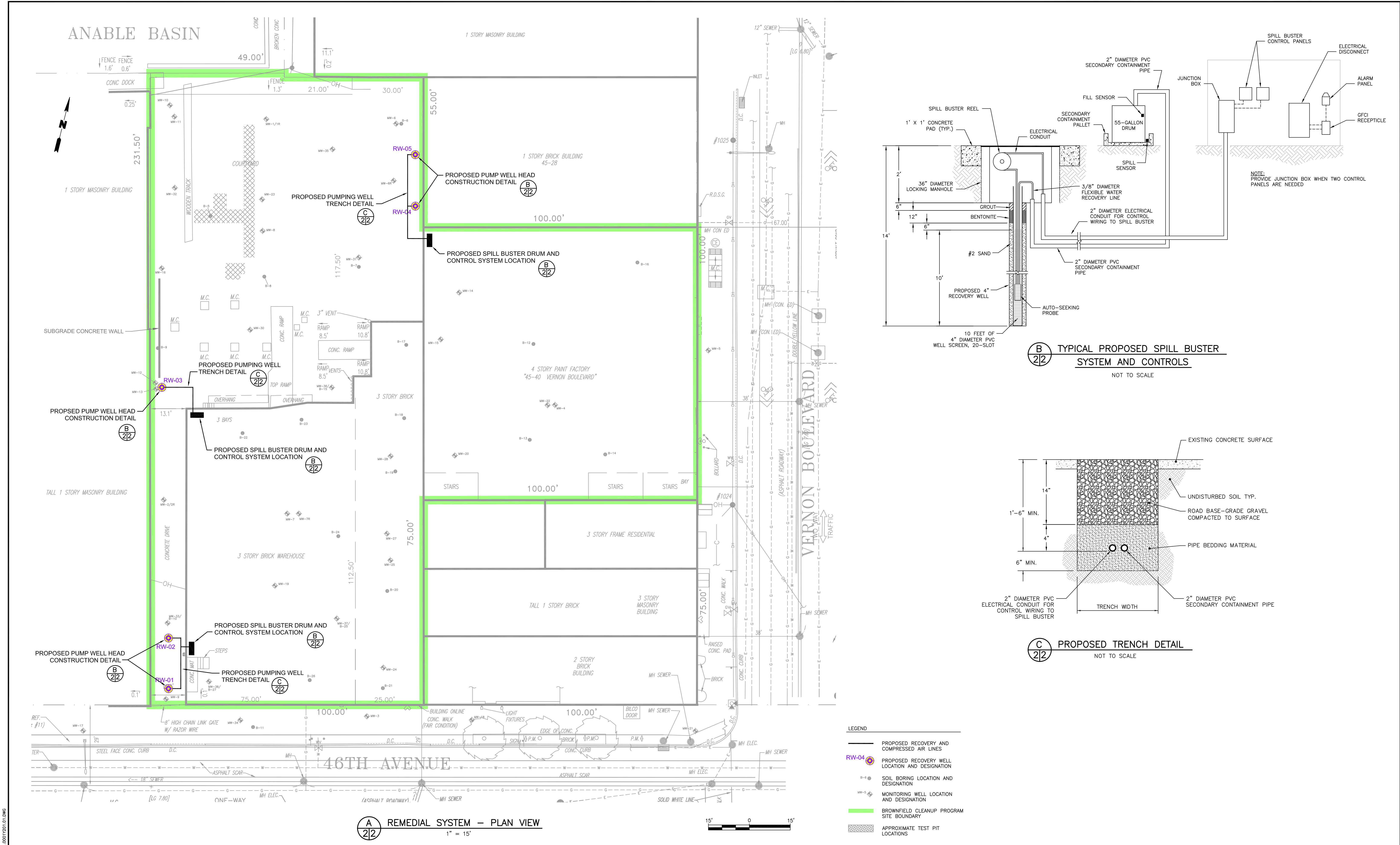
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