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Mr. Jack Aversa, P.E.
Section Chief - Remedial Bureau B
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7010

Ms. Bridget Callaghan
Bureau of Environmental Exposure Assessment
NYS Department of Health
547 River Street
Troy, NY 12180

Re: Home Depot Woodhaven Blvd., Rego Park, NY
Site #V00095

Dear Mr. Aversa and Ms. Callaghan:

We are submitting, attached, the Work Plan for the use of chemical oxidation to reduce the mass of tetrachloroethene at the Home Depot site in Queens. Please call me at 646-388-9526 or e-mail at arudko@akrf.com if you have any questions or comments.

Sincerely,
AKRF, Inc.

Andrew D. Rudko
Senior Vice President

cc: Sadique Ahmed, NYSDEC
Kevin Carpenter, NYSDEC
John Patton, Greg Beesch, Home Depot
James Scott, Celia Peressini, Home Depot
Mark Chertok, Jennifer Coghlan, Sive Paget & Riesel
Michael Lesser, Esq., NYSDEC

Home Depot - Rego Park

REGO PARK, NY

Chemical Oxidation Work Plan

AKRF Project Number: 03399

Prepared for:

The Home Depot
3096 Hamilton Blvd
South Plainfield, NJ 07080

Prepared by:

AKRF, Inc.
440 Park Avenue South
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1.0 INTRODUCTION

Chemical oxidation will be employed to reduce the mass of contaminant in the area under the western portion of the main Home Depot building. Monitored levels of tetrachloroethene (PCE) in the two monitoring wells in this area, AMW-3 and AMW-4 (see attached Figure), have been variable, but it has not been possible to reduce them below the 1-4 parts per million range.

RegenOx™, a proprietary oxidizing agent, would be injected into the subsurface using the existing sparging wells under the building. RegenOx is an alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. Its action is similar to Fenton's reagent, but without the danger of a violent exothermic reaction. The active oxidizing agent, hydrogen peroxide, is released gradually from the carbonate ion over a period of one to three weeks. This permits both an initial oxidation and the continued oxidation of contaminant desorbing from the soil matrix. The final products of oxidation of PCE by RegenOx are sodium chloride, carbon dioxide, and water. Intermediates which may be formed in the oxidation process are chloroform, methylene chloride, chloral, and di- and trichloroacetic acid.

The oxidant will be injected using the five sparging wells in the treatment area (see Figure). The sparging wells are 2-inch diameter schedule 40 PVC with 5-foot screens (0.010-inch slot) set 10 feet below the groundwater surface. The piping for the wells is accessible at a manifold on the walkway between the loading dock and the south wall of the building. The check valves at this location can be unscrewed to permit the oxidant solution to be pumped directly into each well.

2.0 OXIDANT INJECTION

2.1 Estimated Quantity of Contaminant

The area to be treated is approximately 160 feet long (north-south) by approximately 80 feet wide (east-west). Based on the downgradient sampling performed as part of the Supplemental Groundwater Study, PCE contamination is concentrated in the top 10 feet of the groundwater. The volume to be treated is therefore 80 feet by 160 feet by 10 feet, or 128,000 cubic feet (3,625,000 L).

To estimate the quantity of PCE present, we have made the following assumptions, based on the groundwater monitoring data and the soil boring logs:

Soil porosity = 0.4
Average PCE concentration in groundwater = 4 mg/L
Soil bulk density = 1.76 g/cm^3 (110 lb/ft^3)
Soil organic carbon fraction (f_{oc}) = 0.003
Soil partition coefficient for PCE (K_{oc}) = 371 L/kg

For the PCE mass in the dissolved phase, this gives:

Pore volume = 128,000 ft^3 X 0.4 = 51,200 ft^3 or 1,450,000 L
Total PCE mass in the dissolved phase = 4 mg/L X 1,450,000 L = 5800 g or 12.8 lbs.

For the PCE mass in the sorbed phase, this gives:

Sorbed PCE concentration in soil = 4 mg/L X 0.003 X 371 L/kg = 4.45 mg/kg
Total PCE mass in the sorbed phase = 4.45 mg/kg X 1.76 kg/L X 3,625,000 L = 28,400 g or 62.6 lbs

The total mass of PCE in the treatment area is thus 34.2 kg or about 75 pounds.

2.2 Amount of Oxidant to be Injected

The theoretical stoichiometric oxidant demand is 1.3 pounds of oxidant per pound of PCE. A factor of 1.7 is used to account for potential product impurities. This gives a total oxidant requirement of about 130 pounds. As a safety factor, three times this dosage, or 390 pounds, is used. This accounts for oxidant consumed by reaction with natural organic matter in the soil, and oxidant which does not make contact with the contaminant.

2.3 Injection Methodology

There will be three applications of RegenOx at two-week intervals. The RegenOx is supplied in two parts: the oxidant complex (Part A) and the activator complex (Part B). The manufacturer recommends that for applications using existing fixed wells the two parts be injected separately, with the activator injected first, the well then flushed with water to clear the piping and increase dispersion, and the oxidant injected last. Since the activator is not used up in the reaction, it is only injected in the first two applications. The first two applications will proceed as follows:

1. Inject 195 pounds of activator (Part B), 39 pounds in each of the five sparging wells. The activator will be injected as 150 gallons of a 3% solution in each well.
2. Flush each well with 50 gallons of water.
3. Inject 390 pounds of oxidant (Part A), 78 pounds in each of the five sparging wells. The oxidant will be injected as 300 gallons of a 3% oxidant solution.
4. Flush each well with 50 gallons of water.

The third application will comprise only steps 3 and 4.

All injections will utilize a double-diaphragm pump capable of 150 to 200 psi. A pressure gauge will be used to monitor the actual injection pressure. The desired injection rate is about 6 gallons per minute.

3.0 MONITORING OF OXIDATION

The progress of the chemical oxidation will be monitored by sampling groundwater from monitoring wells AMW-3 and AMW-4. AMW-3 is about 30 feet to the east of the nearest sparging well. AMW-4 is downgradient about 60 feet to the southeast of the nearest sparging well. Longer term effects will be monitored by quarterly sampling at the downgradient wells P-2 and P-3. Groundwater testing is summarized in the table below:

Analyte	pH dissolved oxygen (DO), oxidation/reduction potential (ORP) temperature conductivity alkalinity	Oxidant (as hydrogen peroxide)	Volatile organic compounds
Method	Meter reading in flow-through cell	Chemetrics test kit	8260
Baseline	X	X	X
Two weeks after each injection	X	X	
Four weeks after final injection	X	X	X