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1.0 INTRODUCTION

1.1 Purpose

The following report presents the design elements, installation plan and maintenance of the approved soil vapor extraction (SVE) remediation system for the Greer site (#3-14-088), (approved by Tanya Reinhard, NYSDEC; site visit during soil excavation activities). The site is situated along Route 9, in the Town of Wappingers Falls, New York (Figure 1). This Remedial Design/Remedial Action Work Plan outlines the framework for the design, construction, maintenance and monitoring of the remedial system. TCC will assess the effectiveness of the system following start-up. This work has been mandated by NYSDEC per the recently formalized New York State Department of Environmental Conservation (NYSDEC) Order on Consent, which was executed on December 23, 2002, and became effective on January 2, 2003. This document provides a list of NYSDEC requirements to guide the remedial process, and is outlined in Exhibit "J" of the Consent Order.

1.2 Site Description

The site is currently owned by Greer Automotive, Ltd., however the property is leased to an independent automobile dealership, known as Wappingers Falls Toyota/Subaru. The site is situated along Route 9, in the Town of Wappingers Falls, New York (Figure 1). The site lies east of the Hudson River and approximately 5 miles south of downtown Poughkeepsie.

1.3 Site History

This site is a listed Class II Inactive Hazardous Waste Site:

- Site Number #3-14-088: In 1992, the presence of chlorinated solvents was detected in two water supply wells located downhill from the Greer site, prompting the NYSDEC to issue a spill number for the site.

The New York State Department of Environmental Conservation (NYSDEC) and the Dutchess County Department of Health (NYSDOH) initiated an assessment of the area, which included sampling of an oil/water separator at the Greer site. Chlorinated solvents similar to those found in the wells adjacent to the Greer property were detected in the oil/water separator. The oil/water separator was attached to the maintenance shop via a floor drain. The oil/water separator drained into a concrete diffuser system located approximately 50 feet to the north of the maintenance garage area. The diffuser system also managed sanitary wastes as

well as the water draining from the oil/water separator. The diffuser system was designed to temporarily retain wastewater before it infiltrates into the subsurface. The system is currently designed to retain between approximately 9,000 and 11,000 gallons of wastewater on average. The facility has historically operated with between 25 and 40 employees, so approximately 375 to 600 gallons of wastewater were generated Monday through Saturday during operation. Currently less than 3600 gallons of sanitary effluent is estimated to be generated on a weekly basis. The system likely generates substantially less effluent since low flow fixtures are in use. Infiltration into the subsurface is slow, so the system is usually fully recharged.

The daily wastewater volume (~375-600 gallons per day (gpd)) generated at the facility would have exceeded the contribution from the oil/water separator (~1-2 gpd) to the diffuser system by a substantial margin under normal operating conditions. It is estimated that no more than 10 to 20 gallons a week was contributed to the diffuser system through the oil/water separator except during the winter months when the contribution could have increased due to snow melting off of cars in the service area. However, the diffusers would have been the destination for floor sweepings from the shop area and those fluids may have contained unknown quantities of regulated material. Discussions with former Greer employees indicate that intentional dumping did not occur and reasonable efforts commonly used in the automotive industry were employed to collect waste oil and fluids generated during the repair process.

The oil/water separator and floor drains were sealed and the oil/water separator abandoned when it was discovered that chlorinated hydrocarbons were present at elevated levels in 1992. Recent inspection of the floor drain system indicates that the drains are still effectively sealed. Shop management personnel indicated that the floor drain system has to be periodically evacuated by hand. The solids and liquids removed from the floor drain pit are disposed of as waste oil impacted material. Recent testing in the diffuser area suggests that the diffuser area is no longer a potential source of the CVOCs observed in the down-gradient wells.

As previously mentioned, chlorinated solvents were found in a sample taken from the oil/water separator in 1992 and similar chlorinated solvents were detected in two down-gradient water supply wells. The NYSDEC suspected that Greer site was a potential source of the chlorinated solvents based on the samples obtained from the oil/water separator. Two water supply wells located down-gradient from the Greer site have been impacted by, and continue to be impacted by low levels of chlorinated hydrocarbons. Water from both wells is treated via carbon filtration systems. Groundwater samples are collected from these two water supply wells and data are regularly provided to the Dutchess County Department of Health

(DCDOH). The risk of ingesting impacted groundwater is mitigated through the use of the carbon filtration systems.

Private and publicly owned wells were identified within a one-mile radius of the Greer Toyota site using information obtained from the DCDOH, and were summarized in the 2001 RI/FS. Quarterly private well sampling and water treatment systems at the Halpin and Optimum Window Properties are managed by Greer. Each property is identified on Figure 2 in green outline. The business or residences with water supply wells were identified through publicly available DCDOH records. Locations of businesses and residences with public water supply and residential wells were located within a one-mile radius of the site (shaded in red, Figures 2). The homes with private wells were located using tax parcel locations that correspond to the accompanying tax ID list provided by the DCDOH search. It should be noted that wells installed prior to 1985 are not included on the Figures since this information was not readily available. However, it is reasonable to assume that houses built in areas without public water supply rely on groundwater drinking wells for their potable water. This rationale was used to identify the private water supply wells located in possible down-gradient locations to the Greer site.

Dutchess County Department of Health (DCDOH) initiated a well sampling program in 1992 down-gradient from the fuel spill at the '7-11' site located adjacent to the Greer site on the east side of Route 9. The results of that evaluation indicated that gasoline range compounds were widespread in the area, however, chlorinated solvents were detected in a few of the wells adjacent to the Greer site. The DCDOH concluded in 1992 that additional investigation was warranted to determine the source. The DCDOH listed several potential sources including the Greer site, the former Cavo Appliances building (for cleaning appliances), Napa Auto Parts (for the cleaning of auto parts), and the Halpin residence (for auto repair work). Upon discovery of the chlorinated solvents in the oil/water separator sample, the focus shifted to Greer. No samples were taken in 1992 from the diffuser system area to verify that Greer was actually the source of the chlorinated solvents and none of the other potential source areas were investigated.

Recent testing indicates that the likely source of the CVOCs was a failed waste oil tank. CVOC compounds were found at elevated levels in the sludge inside the tank, and soil surrounding the tank. Impacts were noted below the waste oil tank up to the bedrock surface. The impacted soils were removed, and the area is currently passively vented.

The chlorinated solvents in groundwater were similar to those encountered in the Greer oil/water separator. The chlorinated solvents were thought to have been

introduced to groundwater through the site's diffuser system. The oil/water separator was cleaned and sealed; however, the diffusers were not abandoned since they were and still are used to manage sanitary wastewater.

1.4 Hydrogeology

Regional groundwater flow was found to be west northwestward, in the direction of an unnamed tributary to the Wappingers Creek. Hydrogeologic investigations conducted by the NYSDEC at another spill site nearby indicate that groundwater flow in the vicinity of the site is generally westward. Bedrock wells installed on the property confirm the flow direction.

Saturated conditions were not encountered in any of the preliminary soil borings installed during the initial assessment performed in April 1998. Borings installed in the vicinity of the diffuser system in June 1999 reached saturated conditions at approximately 3 feet below grade. Groundwater was encountered in the borings installed immediately adjacent to the diffuser system; however, the crushed stone surrounding the diffuser system was fully saturated from approximately one foot below ground surface (bgs) to boring termination at refusal. The fluids surrounding the diffuser system were clearly "gray water" and had a strong septic odor.

Groundwater was not encountered in appreciable quantities until the bedrock surface was encountered during the tank removal activities. Borings installed during the investigation in August 2001 around the tank graves revealed unsaturated conditions over bedrock. From each of these investigations, it is probable that groundwater is occasionally present just above the overburden/bedrock interface during periods of high water, referred to as "perched" conditions. Unsaturated conditions shown in the Spring 1998 borings were installed during the time of the year that groundwater levels should be highest. Therefore, it is unlikely that the bedrock water table rises to the bedrock/overburden interface.

Overburden soils consisting of various materials (gravels through silts) are underlain by a gray silt layer lying in contact with the bedrock surface. Any precipitation recharging these soils or water discharged through the diffuser system may saturate the overburden and remain perched above the confining silt unit. Groundwater may then slowly drain to the bedrock aquifer below. This process could result in shallow groundwater levels followed by completely dry soils at different times throughout the year.

To enhance the understanding of the groundwater quality and groundwater flow characteristics in the bedrock aquifer below the site, six new groundwater wells

penetrating 50-100' below the subsurface were installed between 8/14/01 and 8/16/01 (Figure 3). A well was placed at each corner of the property and a shallow/deep couplet was placed in the source area for a determination of the local hydraulic gradient. A groundwater flow contour map was generated based on data collected on September 21, 2001, and showed that groundwater residing within the bedrock aquifer under the site contains a strong northwestern flow component. Recharge occurs along the eastern property boundary, while groundwater discharges along the northwestern edge of the property.

Groundwater depth below grade varies across the site between approximately 12 feet in the southernmost well (MW-1), to greater than 20 feet in the northern most well (MW-4).

2.0 WORK PLAN

2.1 Statement of Purpose

The purpose of the RD/RA Work Plan is to establish an outline for the design, construction and implementation of the NYSDEC approved remedy for the Greer Site. Details of the system and design process are summarized below.

2.2 Description of Remedial Objectives

2.2.1 Construction and Operation of Structures

The SVE system will consist of a minimum 100 cubic feet per minute (cfm), positive displacement type, explosion-proof blower. The blower will be housed within a small shed at the northwest corner of the maintenance garage (Figure 4). The secure shed will house both the blower and electric controls, which will be powered from within the garage.

During the excavation of the impacted material around the diffuser system, it was evident that there would be some benefits to creating a means of either injecting chemicals into the impacted zone or extracting air from the impacted areas, depending on the NYSDEC selected remedy(s) for the site. Two perforated pipes were installed just above the bedrock surface in the source area excavation, for use during future possible remediation events (Line A and D, Figure 5). Potential injection line A lies in the saturated zone just above the bedrock surface, and will be used for injection of bioremediation enhancement agents, if necessary. Line A will not be used for SVE, because the pipe becomes seasonally submerged below the water table. Extraction line D was installed in the crushed stone backfill to facilitate removal of vapors in geologic horizons C and D along the eastern wall of the excavation (Figures 4 and 5). This SVE line was installed crushed stone backfill, which was then covered with an impermeable geo-membrane.

Some residual impacted material could not be removed due to proximity to the building foundation. There was an area of stained soils that remains on the south side of the investigation. A perforated pipe was installed vertically, and immediately adjacent to the stained soils, to facilitate soil vapor extraction (Line B, Figure 4 and 5). Another perforated pipe (Line C) was installed along the eastern excavation wall at an elevation that corresponds to the sandy horizon (Unit B, Figure 5). This pipe will be used as the third and final soil vapor extraction line.

The lower regions of the excavation were backfilled with permeable crushed stone. The crushed stone was brought to a level that corresponds to the top of the silt-clay layer. The crushed stone was covered with an impermeable membrane, which, in turn, was covered with clean fill (bank run). The fill material was placed in 9-inch lifts and compacted using a vibratory compactor to limit the potential for settling.

The buried four-inch diameter SVE pipes that surface at the northwest corner of the garage will be used to extract vapor-phase contaminants from the source area. Each pipe will have independent ball-valves prior to a sample port, to allow for independent air monitoring within each pipe. The electric panel will have an emergency surge shut-off, in case of electric failure, and a warning light will be installed outside of the shed to inform a site contact when the system is non-operational. A telemetered cellular account will be established to ensure that the system remains fully operational at all times. Each SVE line will be tied into an exhaust manifold, and then through a single blower, prior to being discharged to the atmosphere via a vent pipe exposed at the elevation of the garage roof (Figure 5). VOC emissions will be monitoring monthly in order to determine volume of contaminant removal for a period of one year, and quarterly thereafter. The system will be managed and maintained by TCC until it is determined that continued operation is no longer necessary.

If groundwater quality worsens, then additional SVE extraction wells and/or in-situ Hydrogen/Oxygen Release (HRC/ORC) treatments will be considered for the site, as mandated in the NYSDEC's Record of Decision. HRC/ORC treatments are delivered to contaminated soil and groundwater reserves via injection wells, and generally destroy any contaminants through biological degradation. Action beyond the current phase of SVE treatment will only occur if the SVE treatments are found to be ineffective. A monitoring plan will rate changes in groundwater quality resulting from SVE activities, and will establish whether additional remedial technologies will be needed at this site.

Repaving of the source region area will occur under the selected remedy. Repaving will occur once the SVE system is operational. If no further vapor extraction wells are necessary for this site, and the existing system is deemed acceptable, then the former source areas will be repaved to reduce surface infiltration into the former source region.

2.2.2 Handling of Hazardous Waste Products

Hazardous waste products encountered during the design, construction, or operation of this SVE system will be collected and sent to proper disposable facilities. No reportable quantities of hazardous materials are anticipated during

this design and installation of the SVE system. The bulk of the underground systems have already been installed.

2.2.3 Handling of Contaminated Remediation By-products

Contaminated air that is extracted from the SVE system will be discharged to the atmosphere at the elevation of the garage roof. Initial monitoring of contaminant air concentrations will be performed using both a photo-ionization detector and confirmatory laboratory analyses. If the concentrations exceed the limit for the compounds of concern listed in Air Guide #1, the discharged will be vented through carbon. Contaminated groundwater or leachate will not be collected through this system, and is not considered herein.

2.2.4 Physical Security of the Site

The remediation shed will be secured with pad-locks. Access keys for the system will be held by Cynthia Greer, TCC, and one site contact for use in case of emergency. TCC and NYSDEC contact information (including phone and address) will be posted on the outside of the shed for emergency reference in case the system shuts down.

2.2.5 Quality Control during Implementation of the Remedial Construction

System construction and installation will be performed by a TCC sub-contractor. NYSDEC will be notified 7 days prior to start of site work. TCC will observe and document the system installation, pilot testing, and will perform routine sampling and maintenance. TCC will generate an Operation & Maintenance Manual (O&M Manual), in accordance with Exhibit "K" of the Order on Consent.

2.2.6 Site Monitoring during Implementation of the Remedial Construction

Air and groundwater monitoring will not occur during the installation process, as no threat exists from either. Air quality will be monitored via the SVE system sample port, prior to system initiation, to ensure that discharge concentrations are below NYSDEC guidelines. Monthly air monitoring will occur through the first year of operation, in order to ensure that the remedial system does not present any adverse health risks to humans or the environment in the surrounding community.

2.3 Time Schedule for System Implementation

A summary of the anticipated time schedule for implementation of this plan is presented in Table 1. TCC anticipates system construction to begin within two

weeks of NYSDEC approval of the work plan, or on approximately April 1, 2003. Subsequent deadlines are dependant on this anticipated initial start date, and so, the actual time of completion may vary, if the starting deadline is moved.

2.4 Determination of System Effectiveness

The radial capture capacity of the existing vapor extraction wells will be determined by conducting a pilot test. Eight monitoring points will be installed in four directions around the extraction area at distances of five and ten feet from the of former excavation boundary (Figure 4). Air pressure differentials will be measured in each monitoring well, prior to and during system operation. A zone of influence map will be included within a brief report summarizing system effectiveness. Upon termination of the pilot test, the remedial system will resume under continuous operational status.

Monthly air emissions monitoring will be conducted in order to assess the system effectiveness throughout the first year of operation. Changes in groundwater quality will be monitored via existing onsite groundwater monitoring wells during that same period.

2.5 Length of Operation, Maintenance and Monitoring Activities

The SVE system will be maintained and operated by TCC until one half the drinking water standards are met for four consecutive quarterly sampling events. If groundwater quality worsens, then additional SVE wells or HRC/ORC treatment will be considered.

Maintenance and monitoring of existing treatment systems on impacted private supply wells will occur until one half the drinking water standards are met for four consecutive quarterly sampling events.

2.6 Contingency Plan

A Contingency Plan developed for this site is provided in Appendix A.

2.7 Health and Safety Plan

A Health and Safety Plan (HASP) developed for this site is provided in Appendix B.

2.8 Citizen Participation Plan

A Citizen Participation meeting to discuss the Proposed Remedial Action Plan (PRAP) for the Greer site, was held in March 2002 at the Wappingers Town Hall. A Citizen Participation Plan was drafted by TCC in early 2002, and submitted to NYSDEC on January 14, 2002. A copy of the text document is attached as Appendix C.

3.0 SUMMARY

This RD/RA Work Plan proposes components of a remedial system designed to mitigate soil and groundwater impacts to on-site and off-site bedrock aquifers, and to assess effectiveness of the system through its operation.

Specific details of the proposed RD/RA work plan are summarized below:

1. Installation of a SVE blower, secure housing, electric controls and proper venting.

2. Monitoring of air emissions will occur on a monthly basis through the first year of operation, and will occur quarterly thereafter. Monitoring of groundwater via three existing onsite bedrock monitoring wells will occur on a quarterly basis.

3. A pilot test will be performed to establish the system's radius of influence, and determine if additional extraction wells and/or HRC/ORC treatment is required to achieve site clean-up goals. Paving over the source area will occur following favorable results from pilot testing.

4. Quarterly progress reports which include air emission and groundwater sampling results will be submitted to NYSDEC, Region 3.