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Phase 1 Groundwater Interim Measures Work Plan DuPont Oakley Site

INTRODUCTION

This Phase 1 Groundwater Interim Measures (IM) Work Plan presents the plans and procedures for implementation of a full-scale combined permeable reactive barrier (PRB) – enhanced anaerobic bioremediation (EAB) IM at the former DuPont manufacturing facility in Oakley, California. The PRB/EAB will be installed in the central region of the Plume 1 Upper and Lower Aquifers. A PRB is a zone of reactive material placed in the subsurface that passively intercepts a plume of contaminated groundwater under natural flow conditions. PRBs are typically installed perpendicular to the groundwater flow direction and are constructed of material sufficiently permeable to not alter the ambient flow regime. The reactive material in the PRB degrades the constituents present in the groundwater, and treated water flows out the downgradient side of the barrier. After the groundwater passes through the PRB, the treated water is in a highly reduced state and is enriched with nonhalogenated organic compounds, which enhances natural biodegradation processes downgradient of the PRB. EAB is often used in series with PRB treatment to degrade effluent daughter products.

After ten years of groundwater recovery operations with an on-site pump and treat system, in 1999 DuPont determined that the state-of-the-art in groundwater treatment technologies had sufficiently matured to enable an evaluation of other more effective and energy-efficient methods of groundwater cleanup. In 2000, DuPont completed its technology review and recommended the installation of a PRB in the Plume 1 Lower Aquifer to replace the existing groundwater pump and treat system. The PRB uses zero valent iron (ZVI) to treat carbon tetrachloride (CT), trichloromethane (TCM), trichlorofluoromethane (CFC-11), and 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113). Downgradient of the PRB, EAB will be used to degrade the ZVI treatment end-products and 1,2-dichloroethane (1,2-DCA). With the approval of the Central Valley Regional Water Quality Control Board (CVRWQCB, 2000) DuPont constructed a technology demonstration PRB pilot across the Plume 1 Lower Aquifer in 2000/2001. The approved design included extending the treatment wall to full-scale (the focus of this work plan) once the construction and treatment technology were validated.

1.0 PURPOSE

The purpose of this document is to summarize the field and laboratory work completed by DuPont for evaluating the performance of the Phase 1 PRB pilot program and to recommend a full-scale IM for treatment of COPCs present in the Upper and Lower Aquifers near the center of Plume 1. The proposed IM will be completed as part of the corrective action program at the DuPont Oakley Site and is designed to be compatible with future site redevelopment goals, as well as with inclusion in a final groundwater remedy at the facility. DuPont recommends implementing the full-scale PRB with EAB IM for treating the Plume 1 COPCs.

Integrating Interim Measures with Final Remedies

DuPont has established a remedial objective to reduce mass discharge of site constituents in groundwater as part of the corrective action strategy for the site. Although the RCRA corrective action process will require additional groundwater investigations, DuPont has now determined that certain remedial measures, or Interim Measures, can be installed to reduce groundwater contamination and provide a means for improving conditions in groundwater discharging to the San Joaquin River. For this reason, DuPont is proposing the PRB/EAB remedy as an Interim Measure that is designed to control the migration of contaminants from on-site sources in the former Freon® manufacturing area. As other groundwater investigations are completed in plumes associated with other manufacturing areas, DuPont may recommend other Interim Measures to further improve groundwater quality, or it may be possible to recommend final remedies without the need for additional Interim Measures.

In discussing the purpose of the proposed Interim Measures, it is important to note that DuPont is not planning these measures to address any imminent threat or unacceptable risk to human health or the environment. DuPont's purpose rather is to make a long term positive impact on water quality by substantially reducing the source of continued plume migration to the river. This is proposed because it is the right thing to do and because it is a key element in the overall anticipated final remedy for groundwater at Oakley.

Interim Measures, such as the PRB/EAB remedy proposed herein, are designed to be compatible with final remedies. EPA guidance (Handbook for Groundwater Protection & Cleanup for RCRA Corrective Action, April 2004) recommends that, once they have achieved short-term goals via interim measures, facilities should move toward final cleanup goals in a timeframe commensurate with the technical difficulties and potential risks. For example, because of the diffuse nature of source materials at the Oakley Site, source area removal would not be feasible. However, in the short-term it is possible to implement containment programs, such as the PRB with EAB Interim Measure, that control migration of contaminated groundwater and ultimately reduce the exposure potential for downgradient receptors. When combined with a monitoring program that establishes acceptable concentrations at potential exposure points, a groundwater containment program can become an effective means of controlling risk to receptors.

In addition to interim measures and/or final groundwater remedies for the site, DuPont is conducting an extensive semi-annual surface water monitoring program within the San Joaquin River, Lauritzen Yacht Harbor and Little Break. Development of a final remedy for the site will be a long-term process accompanied by a surface water and groundwater monitoring program that will continue to verify water quality in groundwater and within surface water bodies adjacent to the site.

An advantage of the PRB/EAB interim measures remedy is that it includes elements that will be required in the final Plume 1 groundwater remedy, such as:

- ❑ Source area control: the PRB will be installed downgradient of Plume 1 source areas and will significantly reduce the dissolved phase contaminant concentrations originating from the manufacturing area sources

- ❑ Contaminant mass reduction in the plume interior: on a molar basis, the PRB is designed to significantly reduce overall chlorocarbon mass in the Plume 1 Upper and Lower Aquifers as groundwater passes through the PRB and comes in contact with ZVI

As described above and further detailed in Section 6.8, groundwater and surface water monitoring programs downgradient of the PRB/EAB remedy will determine whether additional treatment of Plume 1 constituents is necessary for further contaminant mass reduction in groundwater before discharge to the San Joaquin River. With regard to groundwater discharges to Lauritzen Yacht Harbor, DuPont is designing a pilot project to test the effectiveness of concentrated plantings of grass, tree, and other deep-rooted species (a process known as phytotechnology) to reduce off-site migration of groundwater in the Plume 1 Surficial Aquifer.

2.0 WORK PLAN ORGANIZATION

This work plan is organized as follows:

- ❑ Section 1 Introduction
- ❑ Section 2 Plume 1 Conceptual Model
- ❑ Section 3 Interim Measure Alternatives Evaluation
- ❑ Section 4 PRB with EAB Technology
- ❑ Section 5 Interim Measure Design Basis
- ❑ Section 6 Interim Measure Construction
- ❑ Section 7 Project Schedule
- ❑ Section 8 References