



*The miracles of science™*

## Phase 2 Membrane Interface Probe Investigation Report DuPont Oakley Site

### EXECUTIVE SUMMARY

This report summarizes the field activities during and results of the Phase 2 Membrane Interface Probe (MIP) Investigation conducted at the E. I. du Pont de Nemours and Company (DuPont) site in Oakley, California. The Phase 2 MIP Investigation was conducted as part of the Phase 2 Groundwater Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the Oakley Site. The investigation was directed toward the three designated groundwater plumes in which constituents of potential concern (COPCs) have been detected (Plumes 1, 2 and 3). The plume designations are based on differences in apparent source areas, transport pathways, areal distribution and, to some degree, differences in plume COPCs and constituents of interest (COIs). Subsurface conditions at the site consist of approximately 120 feet of unconsolidated alluvial/fluvial sediment, underlain by a 200- to 300-foot-thick silty clay marine deposit referred to as the Montezuma Formation. The unconsolidated alluvial unit at the site is divided into three local units denoted as the Surficial, Upper, and Lower Aquifers. The Lower Aquifer has been further separated into an upper zone (L1 and L2 units) and a lower zone (L3) based on differences in permeability within and in some cases between zones. Subsurface conditions and plume designations are further described in Section 2.0.

Previous MIP work (Phase 1) was conducted at the site in November 2002 (DuPont Corporate Remediation Group [CRG], 2002a) to characterize the western and central portions of one of the three plumes (Plume 1). The Phase 1 MIP results will be presented in the Phase 1 Groundwater RFI Report to be submitted in the first quarter of 2006. The Phase 2 MIP Investigation was developed and completed on an expedited basis to provide key data to guide placement of groundwater monitoring wells in time for the fourth quarter 2004 groundwater sampling event.

The overall goal of the Phase 2 MIP Investigation was to provide the data necessary for subsequent phases of the Oakley Site monitoring and corrective action programs. Goals were developed based on data gaps identified in the Current Conditions Report (CCR Report, CRG, 2003b) and Table 1 (revision 1) of the Phase 1 Groundwater RFI Work Plan (CRG, 2004c)(see Table 1-1). In summary, the objectives of the Phase 2 MIP Investigation were to:

- Delineate the lateral and vertical extent of groundwater COPCs within Plumes 2 and 3, and the eastern portion of Plume 1 (1,2-dichloroethane [1,2-DCA]).
- Provide information to facilitate selecting appropriate locations and depths for additional monitoring well installations to augment the groundwater monitoring and corrective action programs
- Provide information to focus subsequent investigations where data gaps remain before future groundwater mitigation strategies are developed

Between August 2 and September 16, 2004, continuous lithologic and relative chemical intensity profiles were collected at 42 locations using a cone penetrometer test (CPT) rig equipped with a

cone penetrometer and a MIP. Additionally, semi-quantitative analysis (off-line gas chromatograph [GC]) was conducted over discrete

intervals to identify key individual volatile organics (VOCs) detected. Combining both CPT and MIP techniques at a single direct-push location made detailed evaluation of hydrogeologic controls on plume distribution and migration possible.

A series of tables, figures, and transects comprising different data available for each MIP/CPT location was generated to refine the lateral and vertical extent and distribution of COPCs in groundwater, as well as the overall trajectory for Plume 2, Plume 3, and the eastern portion of Plume 1. After evaluating the information generated during this investigation, 24 new monitoring wells were successfully installed in November 2004 in time for the fourth quarter 2004 sampling event (see Figure 1-1). A summary of the findings and recommendations for each plume is provided in the following paragraphs.

### **Plume 1 (eastern portion)**

- The MIP data collected in the suspected source area (Table 1-1, Item 15) does not indicate the presence of significant levels of target constituents in the Surficial Aquifer. The highest contaminant levels were detected in the Upper Aquifer, Upper/Lower Aquitard and the Lower Aquifer extending into the bottom of the L3 zone of the Lower Aquifer at one location. Downgradient from the suspected source area, elevated levels occur primarily in the Lower Aquifer at locations near the central portion of Plume 1.
- In November 2004, after evaluation of Phase 1 and Phase 2 MIP data, several monitoring wells were installed within the footprint of Plume 1:
  - Eight new monitoring wells (MW-148 through MW-155) were installed downgradient of the Emergency and the East and West Basins (the basins) in order to augment the Article 6 monitoring program for the basins waste management area (WMA).
  - Two additional monitoring wells (MW-168 and MW-169) were installed at the most available downgradient location for Plume 1 to replace decommissioned wells in the Sitewide Corrective Action monitoring program.
  - Two additional wells (MW-146 and MW-147) were installed at the western boundary of Plume 1 to monitor water quality at the border of the Western Development Area (WDA).

### **Plume 2**

- Tetrachloroethylene (PCE) was detected across the entire transect west of the ponds, along the former titanium dioxide (TiO<sub>2</sub>) Trench System. The vertical distribution of PCE in this area was defined by high detections in the Upper and Lower Aquifers. In November 2004, new monitoring well MW-161 was installed in the L1 zone of the Lower Aquifer to monitor groundwater conditions in the area.

- The lateral extent and vertical distribution of COPCs in the ponds was delineated by MIP responses and trap sample results that extend from Pond B, southward approximately 200 feet beyond the TiO<sub>2</sub> South Retention Pond (Plume 3). These detections occur primarily in the Upper Aquifer, through the Upper/Lower Aquitard, and extend into the L3 zone of the Lower Aquifer at locations adjacent to the former ponds. Based on real-time MIP results in the ponds area, a discrete groundwater sample was collected from the L3 zone of the Lower Aquifer/Montezuma Formation. The groundwater sample was collected using the Hydropunch® method and submitted to the laboratory for VOCs and organolead analyses. After evaluation of this data, five new monitoring wells (MW-156 through MW-160) were installed in this area to augment the Article 6 monitoring program for the ponds WMA.
- Downgradient of the ponds, COPC concentrations were located in the Upper Aquifer, decreasing in intensity into the Lower Aquifer. The overall plume trajectory appears to trend downgradient towards Little Break. Based on the MIP response and trap sample results collected in the suspected plume centerline, one new monitoring well (MW-162) was installed in this area to augment the Article 6 monitoring program for the ponds WMA.

### Plume 3

- The MIP data collected in the suspected source area for the eastern portion of Plume 3 shows that PCE detections occur primarily in the Upper Aquifer and the Upper/Lower Aquitard.
- Marshy soils prevented rig access in several areas downgradient of Plume 3 suspected source areas. Therefore, the lateral extent and vertical distribution of PCE downgradient (to the northeast) of the suspected source area were defined as much as possible by detections recorded across the most accessible downgradient locations. Elevated PCE levels were recorded across the Upper and Lower Aquifers. In order to monitor the groundwater conditions in this area, three new monitoring wells (MW-163, MW-164, and MW-165) were installed in November 2004 in the Surficial, Upper, and Lower (L1 zone) Aquifers, respectively.
- Two additional monitoring wells (MW-166 and MW-167) were installed at the eastern boundary of Plume 3 to monitor groundwater quality immediately upgradient of the Eastern Development Area (EDA).

The data collected during the Phase 2 MIPs Investigation will also be used to focus subsequent investigations where data gaps remain to be filled before future groundwater mitigation strategies are developed.