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## 2008 Annual Groundwater Monitoring Report for DuPont Oakley Site

### EXECUTIVE SUMMARY

E. I. du Pont de Nemours and Company (DuPont) has prepared this 2008 Annual Groundwater Monitoring Report in accordance with the Oakley Site Groundwater Monitoring Plan (GWMP, DuPont Corporate Remediation Group [DuPont CRG], 2003a). The GWMP was submitted to the Department of Toxic Substances Control (DTSC), after revisions, on September 25, 2003, as part of the Corrective Action Consent Agreement (CACA; AN-3; DTSC, 2003) between DTSC and DuPont. Groundwater sampling is conducted to fulfill the sitewide corrective action, Article 6 evaluation, and Permeable Reactive Barrier (PRB) evaluation groundwater monitoring programs.

This annual report describes the groundwater monitoring activities conducted during 2008 to fulfill the requirements of these groundwater monitoring programs as specified in the GWMP. However, data collected during the first and second quarter sampling events (i.e., 1Q2008 and 2Q2008, respectively) were previously submitted to the DTSC in the 2008 Semiannual Groundwater Monitoring Report (December 16, 2008; DuPont CRG, 2008a) and are therefore not discussed in detail in this report. Eleven temporary piezometers were installed in 2008 to evaluate groundwater quality in future site development areas (e.g., Development Focus Area 1 [DFA1]).

The 2008 Annual Groundwater Monitoring Report includes the following highlights:

- Groundwater wells, analytes, and sampling frequencies are identified in Attachment 7 to the CACA. Copies of correspondence between DuPont and DTSC related to the 2008 Groundwater Monitoring Program are provided in Appendix A. The 2008 groundwater monitoring program was conducted in accordance with the last two revisions to Attachment 7:
  - DuPont submitted Revision 5 to DTSC on October 24, 2007. The submission accepted and included comments and recommendations from DTSC correspondence dated October 19, 2007. Revision 5 was approved by DTSC on November 8, 2007. Some of the updates were based on built-in time-based changes that redefine wells sampled for more than eight quarters as no longer being new wells. As a result, the sampling frequency for some parameters was reduced. Additional updates included changing the frequency of sampling for the PRB Monitoring Program wells from quarterly to semiannually. The purge and sample method for three wells was also updated. The 1Q2008 and 2Q2008 quarterly groundwater monitoring events and the 1Q2008 PRB performance monitoring event were completed according to this version of Attachment 7.
  - Revision 6 to Attachment 7 was submitted to DTSC on July 16, 2008. The submission was revised to incorporate DTSC comments and was resubmitted on

- August 15, 2008. The final version of Revision 6 to Attachment 7 was approved by DTSC on August 18, 2008. Revision 6 included updates to the monitoring program to reflect changes in the site monitoring well network due to the decommissioning of 11 wells. The monitored constituent of concern (COC) parameters for the Article 6 monitoring program were modified to analyze only for organic and inorganic constituents associated with the regulated Basins and Ponds Waste Management Areas (WMAs). The Article 6 wells will also be sampled for a series of sitewide monitoring program parameters on a semiannual basis.
- ❑ Four quarterly groundwater sampling events occurred in 2008. Two additional monitoring events (two semiannual) were completed concurrently with two of the quarterly groundwater monitoring events (1Q2008 and 3Q2008) to allow evaluation of the effectiveness of the PRB.
  - ❑ The 1Q2008 groundwater sampling event occurred over a five-day period from February 11 through 15, 2008, and consisted of collecting groundwater samples at 128 wells, with eight duplicate groundwater samples, nine equipment (rinse) blank samples, and six trip blank samples for laboratory analysis. A total of 7,160 analytical results were obtained from the groundwater samples collected, of which the majority were for volatile organic compounds (VOCs; 6,116 analyses; 85.4%), dissolved metals (404 analyses; 5.6%), and sulfate (217 analyses; 3.5%). The remaining analyses were completed for organolead, fluoride, and selected monitored natural attenuation (MNA) parameters. Water level elevations were recorded at 197 wells and at one surface water gauge station over a period of two hours on February 15, 2008.
  - ❑ The 1Q2008 PRB monitoring well groundwater sampling event was conducted on February 11, 2008. A total of 2,319 analytical results were obtained from groundwater samples collected from 28 wells.
  - ❑ The 2Q2008 groundwater sampling event occurred on May 12, 2008, and consisted of collecting groundwater samples at eight wells, with one duplicate groundwater sample, one equipment (rinse) blank sample, and one trip blank sample for laboratory analysis. A total of 500 analytical results were obtained from the groundwater samples collected, of which the majority were for VOCs (484 analyses; 96.8%), followed by dissolved metals (10 analyses; 2%), and fluoride (six analyses; 1.2%). Water level elevations were recorded at 81 wells and one surface water gauge station over a period of nearly two hours on May 13, 2008.
  - ❑ The 3Q2008 groundwater sampling event occurred over an eight-day period from August 11 through 18, 2008, and consisted of collecting groundwater samples at 145 wells, with 21 duplicate groundwater samples, six equipment (rinse) blank samples, and six trip blank samples for laboratory analysis. A total of 15,561 analytical results were obtained from the groundwater samples collected, of which the majority were for VOCs (8,080 analyses; 51.9%), followed by semi-volatile organic compounds (SVOCs; 3321 analyses; 21.3%), metals (1499 analyses; 9.6%), dioxins and furans (550 analyses; 3.5%), dissolved gases (440 analyses; 2.8%), and sulfate (336 analyses; 2.2%). Water level elevations were recorded at 190 wells and one surface water gauge station over a period of slightly less than two hours on August 18, 2008.

- ❑ The 3Q2008 PRB monitoring event was conducted on August 11, 2008. A total of 2,318 analytical results were obtained from the groundwater samples collected from 28 wells.
- ❑ The 4Q2008 groundwater sampling event occurred on November 10, 2008, and consisted of collecting groundwater samples at eight wells, with one duplicate groundwater sample, one equipment (rinse) blank samples, and one trip blank sample for laboratory analysis. A total of 500 analytical results were obtained from the groundwater samples collected, of which the majority were for VOCs (484 analyses; 96.8%). Water level elevations were recorded at 81 wells and at one surface water gauge station over a period of slightly less than two hours on November 11, 2008.
- ❑ The rate and direction of groundwater flow is consistent with historical ranges. Groundwater gradients were generally slightly higher in the wet season and beginning of the dry season (1Q2008 and 2Q2008) compared to the dry season and beginning of the wet season (3Q2008 and 4Q2008).
- ❑ A comparison of the concentration isopleths and lateral plume extents from 2006 through 2008 indicates that constituent concentrations and plume extents are generally stable. Some downgradient migration of chlorofluorocarbons (CFCs) in the northwest portion of the site may be occurring in the Surficial and/or Upper Aquifers. Surface water concentrations of all site constituents of potential concern (COPCs) are lower than their water quality objectives (WQOs). In several cases, COPC plume outlines are smaller in 2008 when compared with 2007 isoconcentration maps due to reductions in COPC concentrations and through the utilization of data from the Phase 2 Groundwater RFI Report to refine plume boundaries. The historic groundwater concentration trends and chemical and geochemical data collected during 2008 indicate Plumes 2 and 3 and parts of Plume 1 may be attenuating on site.
- ❑ Results for VOCs and other monitoring parameters in 1Q2008 through 4Q2008 were within historical ranges.
- ❑ A total of 41 wells in the Article 6 sampling program were sampled for various parameters yielding a total of 5,198 well-parameter combinations in the third quarter of 2008. A statistical trend test was completed on 2,695 well-parameter combinations where statistical evaluation could be completed. Trend analyses could not be completed on the remaining well-parameter combinations, since they did not meet the minimum criteria for statistical analysis.
- ❑ Based on the data collected through the 4Q2008 monitoring event, the majority of well-parameter combinations (2,562 or 95.1%) did not show a statistically significant trend. This indicates the concentrations of the constituents are stable, whether they are detected or non-detect values.
- ❑ A total of 133 well-parameter combinations exhibit increasing statistical trends (46 or 1.7%) or decreasing statistical trends (87 or 3.2%). Of these, nine new upward trends and 17 new downward trends were identified based on data collected during the second half of 2008.

- ❑ All but two of the analytical results reported by the testing laboratories from the 1Q2008, 2Q2008, 3Q2008, 4Q2008, and two semiannual PRB groundwater sampling events are useable for project purposes, taking into account the qualifiers applied and the limitations of the data as described in the Envista DuPont Data Review (DDR) Narrative Report (see Appendix B). The rejected non-detect results for 3,3-dichlorobenzidine from samples collected from wells LF-07 and MW-151 during 3Q2008 do not affect the overall evaluation of the site.
- ❑ Of the 28,358 analytical results reported for all groundwater sampling programs completed during 2008, 89 results were qualified as “B” (blank contamination) for various constituents including fluoride (38 analyses), octachlorodibenzo-p-dioxin (OCDD; 12 analyses), total organic carbon (TOC; 10 analyses), nitrate-nitrite (seven analyses), ethylene glycol (six analyses), 1,1,2-trichloro-1,2,2-trifluoroethane (five analyses), iron (five analyses), acetone (four analyses), and chloride (two analyses).
- ❑ Data collected for evaluation of natural attenuation indicate that conditions are generally unchanged from earlier evaluations. Site groundwater quality data suggest that geochemical conditions are generally conducive to natural attenuation and biodegradation processes.
- ❑ The data available from the three monitoring well transects in the vicinity of the PRB indicate that carbon tetrachloride (CT) is being effectively removed from the system. A conservative calculation was completed that indicates that approximately 894 kilograms (Kg) of CT have been degraded to one of several daughter products by the PRB. It is likely that a greater mass of CT has been degraded by the PRB, and that back-diffusion of CT in the area between the PRB and the downgradient monitoring wells is affecting the measurement of CT degradation.
- ❑ Future activities for the Oakley groundwater monitoring program include:
  - Continued implementation of the Groundwater Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process initiated by the Phase 1 Groundwater RFI Work Plan (DuPont CRG, 2003b)
  - Continued evaluation of the monitoring well network including identifying and scheduling the decommissioning of wells that are no longer part of the site groundwater monitoring program
  - Continued monitoring of the results of groundwater sampling conducted for wells in the immediate vicinity of the Upper and Lower PRB walls
  - Revision of the Article 6 groundwater monitoring plan in conjunction with the Post-closure Permit for the ponds and basins