DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION Interim Final 2/5/99

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA750) Migration of Contaminated Groundwater Under Control

| Facility Name: | DuPont Corpus Christi Plant |
|--------------------|------------------------------|
| Facility Address: | Highway 361 Ingleside, Texas |
| Facility EPA ID #: | TXD063101794 |

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

 $\sqrt{}$ If yes - check here and continue with #2 below.

If no - re-evaluate existing data, or

If data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

- 2. Is **groundwater** known or reasonably suspected to be **"contaminated"**¹ above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?
 - \checkmark If yes continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.
 - If no skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."
 - If unknown skip to #8 and enter "IN" status code.

Rationale and Reference(s):

For groundwater management purposes, the plant is divided into five areas (see Figure 1). These areas, with corresponding constituents of concern (COC), are summarized from the most recent annual groundwater monitoring report for the site, *Groundwater Remediation 2003 Annual Report for DuPont Corpus Christi Plant*.

- **Brine Pond Area (BPA)** The COCs in the plume are chloride, and total dissolved solids (TDS), or salinity.
- □ Former Miscellaneous Landfill Area (MLA) COCs in the MLA include fluoride, arsenic, tetrachloroethene (PCE), 1,1,2 –trichloro-1,2,2-trifluoroethane (CFC 113), and carbon tetrachloride. Degradation products of these constituents are also present at low levels (< 1 mg/L).
- □ Former Chlorocarbons Manufacturing Area (CMA) Carbon tetrachloride was produced in this area and is the major site-related constituent present in groundwater. PCE, CFC-113, and degradation products are also present.
- □ Intermediates Manufacturing Area (IMA) The primary site-related constituent is CFC-113 with lesser concentrations of PCE.
- □ Bulk Storage and Rail Loading Area (BS/RLA) COCs in the BS/RLA include carbon tetrachloride, chloroform and 1,2-dichlroethane.

¹ "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

References (Location of Data Set Used for EI Evaluation):

BPA

- DuPont Environmental Remediation Services. (DERS, 1995). *Remedial Investigation and Baseline Risk Assessment Brine Pond Area*. DuPont Corpus Christi, April 26, 1995.
- DuPont (DuPont, 2003). Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi, March 2004.

<u>MLA</u>

- DuPont Environmental Remediation Services. (DERS, 1998a). Baseline Risk Assessment Risk Reduction Standard No. 3 Former Miscellaneous Landfill Area. DuPont Corpus Christi, November 26, 1998.
- DuPont (DuPont, 2001b). Response to Notice of Deficiency to Baseline Risk Assessment Standard No. 3 Former Miscellaneous Landfill Area. DuPont Corpus Christi, October 30, 2001.
- □ DuPont (DuPont, 2002a). *Response to Notice of Deficiency to Baseline Risk Assessment Standard No. 3 Former Miscellaneous Landfill Area.* DuPont Corpus Christi, February 12, 2002.
- DuPont (DuPont, 2002b). *Response Action Plan Former Miscellaneous Landfill Area*. DuPont Corpus Christi, November 11, 2002.
- DuPont (DuPont, 2003). Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi, March 2004.

CMA and IMA

DuPont (DuPont, 2003). Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi, March 2004.

BS/RLA

- □ DuPont Environmental Remediation Services. (DERS, 1998). *Baseline Risk Assessment Risk Reduction Standard No. 3 Bulk Storage and Rail Loading Area.* DuPont Corpus Christi, August 31, 1998.
- DuPont Environmental Remediation Services. (DERS, 1999). Response Action Plan Bulk Storage and Rail Loading Area. DuPont Corpus Christi, August 27, 1999.
- DuPont Environmental Remediation Services. (DERS, 2001a). *Final Air Monitoring and Groundwater Monitoring Status Report Bulk Storage/Rail Loading Area*. DuPont Corpus Christi, March 15, 2001.
- DuPont (DuPont, 2003). Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi, March 2004.

- 3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"² as defined by the monitoring locations designated at the time of this determination)?
 - ✓ If yes continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"²).
 - If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"²) skip to #8 and enter "NO" status code, after providing an explanation.
 - If unknown skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Groundwater remediation has been conducted in the BPA and the BS/RLA. Remediation is ongoing in the MLA and CMA areas, through the use of two active interceptor trenches: the chlorocarbons interceptor trench (CCIT) and the fenceline interceptor trench (FLIT). These trenches recover contaminated groundwater from the B Sand (uppermost water-bearing zone) in the CMA and MLA areas, respectively. A total of 70.6 pounds of VOCs were captured by the extraction system from the MLA groundwater plume in 2003. A total of 697 pounds were captured by the extraction system from the CMA groundwater plume in 2003. The plume from IMA is also migrating south-southeast towards the CCIT. DuPont continues to monitor the groundwater semiannually in each of the five areas. Constituent concentrations have remained stable or decreased at each of the five areas as supported by maps and trend charts presented in the Annual Groundwater Monitoring Reports.

References:

DuPont, 2003. Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi Plant, March 2004.

² "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

 $\sqrt{}$ If yes - continue after identifying potentially affected surface water bodies.

If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The stratigraphy underlying the plant consists of six major stratigraphic units in the upper 100 feet (see Figure 2-1 of DuPont, 2003). These units are referred to (in descending order) as Units A, B, C, D, E, and F. Generally, Units A, C, and E are clays; and Units B, D, and F are silty sands and sands. Within these units are subunits, such as the B2 Sand and the silty lenses that separate the three sands of Unit D.

Unit B is the uppermost water-bearing zone. Figure 2 shows the potentiometric surface of the B Sand for April 2003. In the MLA, groundwater in Unit B moves in a southeast direction, towards the drainage channel on the Navy property, and is also affected by the groundwater recovery system in that area (DuPont, 2003). To the north in the BPA, groundwater in Unit B discharges to a stormwater ditch. Groundwater across the rest of the plant generally flows southward. La Quinta Channel, where the Navy Drainage Ditch discharges, is a contiguous water body to the Corpus Christi Bay and does not have a unique stream segment classification. The Texas Surface Water Quality Standards (TSWQS) classify the Corpus Christi Bay as "contact recreational" (stream segment 2481).

The B2 Sand is hydraulically connected to the overlying B Sand in several areas of the plant. Figures 3 and 4 display the potentiometric surface data for the MLA (April 2003) and BS/RLA (April 2003) areas. Groundwater continues to flow toward La Quinta Channel. The potentiometric surface for the D Sand is shown for April 2003 in Figure 5. Groundwater flow direction is to the southwest across most of the site. Flow direction appears to shift to the southeast on the eastern side of the site. Near the BS/RLA, the gradient increases and indicates flow toward La Quinta Channel. Figure 6 displays the potentiometric surface data for the F Sand in April 2003. It appears that the approximate flow pattern in the Unit F is to the southwest, towards Corpus Christi Bay.

The two shallowest water-bearing units (B and D Sands) contain groundwater with high concentrations of TDS as demonstrated by chloride concentrations in the groundwater and specific conductivity measurements. It is presumed that groundwater in the F Sand is also brackish.

An interceptor trench system, FLIT, extracts B Sand groundwater and effectively controls the groundwater contaminant plume in the MLA. The FLIT consists of two trench sections. The first section parallels the east property boundary between the DuPont/Oxy site and the Navy property, and another trench runs laterally onto the Navy property (see Figure 2). The two trenches join at the Navy sump and drain groundwater to a common underground sump at the south end (FLIT sump). Groundwater from both the Navy and FLIT sumps are pumped to a liquid phase carbon adsorption groundwater treatment system. The CCIT was installed in 1990 and has been successful in containing and capturing contaminants in the CMA, as evidenced by the large area of influence around it (see Figure 2). As a result of these extraction systems, groundwater from the MLA and CMA will not migrate off-site and thus will not discharge to surface water. The IMA plume is migrating south-southeast toward CCIT and as a result will also not migrate off-site (thus will not discharge to surface water) under current conditions.

References:

DuPont, 2003. Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi Plant, March 2004.

- 5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?
 - ✓ If yes skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting:
 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.
 - If no (the discharge of "contaminated" groundwater into surface water is potentially significant) continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Groundwater discharge to surface water was evaluated for each of the following groundwater management areas:

- □ BPA In the RI/BLRA for the Brine Pond Area the concentration of discharge to Corpus Christi Bay was estimated using the groundwater flow model MODFLOW, the solute model MT3D and a simple mixing model. The model calculations showed that the modeled plume is estimated to raise the salinity in the bay mixing zone from 36 parts per thousand to 36.18 parts per thousand, an increase that would not make a notable impact on ecological receptors in the bay mixing zone. As noted in the risk assessment, there are no human receptors of the brine plume, because the groundwater in the B Sand is naturally brackish and non-potable (DuPont, 2003).
- MLA –As previously discussed, the FLIT controls off-site migration of groundwater in the MLA. In addition, as part of the Remedial Action Plan (RAP) for the MLA, four sentinel wells are sampled to monitor groundwater quality in the B, B2 and D Sand (OW 26B, OW 46B2, OW 47D, and OW 48B2). These four monitoring wells are on Navy property and are reflective of groundwater quality that is near the Navy drainage ditch, a relatively deep and wide drainage feature that intersects the B Sand that is believed to be the discharge point for groundwater in the absence of groundwater extraction. During the 2003 2004 sampling period, trigger limits established in the RAP were not exceeded at any of the locations. In addition, surface water samples collected from the Navy Drainage Ditch in 2004 did not detect site COCs above protective target receptor concentrations (human or ecological receptors).
- **CMA** As previously discussed, the CCIT controls off-site migration of groundwater in the CMA. As a result, groundwater does not discharge to surface water.

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

- **IMA** The IMA plume is migrating south-southeast toward CCIT and as a result will also not migrate off-site (thus will not discharge to surface water) under current conditions.
- □ BS/RLA The BLRA conducted for the area demonstrated that off-site receptors of groundwater discharging from the area (recreational users of the Bay and ecological receptors) met target protective concentration levels (PCL) (DERS, 1998).

References:

DuPont Environmental Remediation Services. (DERS, 1998). *Baseline Risk Assessment Risk Reduction Standard* No. 3 Bulk Storage and Rail Loading Area. DuPont Corpus Christi, August 31, 1998.

DuPont, 2003. Groundwater Remediation 2003 Annual Report. DuPont Corpus Christi Plant, March 2004.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

- 7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"
 - ✓ If yes continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."
 - _____ If no enter "NO" status code in #8.
 - If unknown enter "IN" status code in #8.

Rationale and Reference(s):

Current monitoring activities conducted in accordance with the site-wide Groundwater Monitoring Program and RAPs established for the MLA and BS/RLA will continue in the future:

- Continued operation of groundwater containment programs.
- Development of trend charts for evaluation of groundwater action levels identified for each groundwater management area.
- Development of semi-annual groundwater contour maps for the B, B2, D and F units.
- Semi-annual groundwater monitoring of 87 wells.

The 2004 semi-annual sampling events were completed in June 2004 and November 2004, respectively.

Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control 8. EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

| \checkmark | YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. |
|--------------|---|
| | Based on a review of the information contained in this EI determination, it has been |
| | determined that the "Migration of Contaminated Groundwater" is "Under Control" at the |
| | DuPont Corpus Christi Plant, EPA ID # TXD063101794, located at Highway 361, |
| | Ingleside, Texas. Specifically, this determination indicates that the migration of |
| | "contaminated" groundwater is under control, and that monitoring will be conducted to |
| | confirm that contaminated groundwater remains within the "existing area of contaminated |
| | groundwater" This determination will be re-evaluated when the Agency becomes aware of |
| | significant changes at the facility. |

NO - Unacceptable migration of contaminated groundwater is observed or expected.

| IN - More information is nee | ded to make a | determination |
|------------------------------|---------------|---------------|
|------------------------------|---------------|---------------|

| Completed by | (signature) | Date 3/9/05 |
|--------------|---|-------------|
| | (print) Sue Rogers | |
| | Project Manager | |
| Supervisor | (signature) | Date 3/9/05 |
| | (print) Jason Wang | |
| | (title) Supervisor | |
| | Texas Commission on Environmental Quality | |
| Locatio | ans where References may be found: | |

Locations where References may be found:

| TCEQ Central Records | , Austin, Texas |
|----------------------|-----------------|
|----------------------|-----------------|

Contact telephone and e-mail numbers

| (name) | Project manager listed above |
|-----------|------------------------------|
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Attachments

Tables2004 Groundwater and Surface Water Monitoring Data – MLA Area

Figures











