

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)  
Page 1**

**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:** Former Mobil Manassas Terminal (Current Sunoco)  
**Facility Address:** 10315 Balls Ford Road, Manassas, Virginia 20109  
**Facility EPA ID #:** VAD048565279

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?

  X   If yes - check here and continue with #2 below.

       If no - re-evaluate existing data, or

       If data are not available skip to #6 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).

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 2

2. Is groundwater known or reasonably suspected to be “contaminated”<sup>1</sup> 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?

  X   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):**

Groundwater contamination at the site consists of benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert-butyl ether (MTBE), and some polycyclic aromatic hydrocarbons (PAHs) (primarily naphthalene) from historical sources. RCRA Corrective Action Investigation field activities performed in 2001 and 2002 supplemented previous site investigations allowing for delineation of impacted groundwater. Delineation of dissolved-phase benzene and MTBE in the shallow groundwater indicates elevated concentrations in wells MW-11, MW-18, MW-22, MW-28, MW-30, MW-7, and MW-26. In addition, diesel-range free product with a thickness of approximately 0.01 feet is occasionally measured in well MW-21.

**Footnotes:**

<sup>1</sup>“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).

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 3

3. Has the **migration of contaminated groundwater stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"<sup>2</sup> as defined by the monitoring locations designated at the time of this determination)?

  X   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"<sup>2</sup>).

       If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"<sup>2</sup>) – 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):**

**OFF-SITE WELLS:**

- OSW-1 shows a clear decreasing trend of MTBE impacts to levels below health-based standards (EPA Maximum Contaminant Levels [MCLs] or Region III Tap Water Risk-Based Concentrations [RBCs]).
- OSW-2 also shows a decreasing trend of MTBE impacts and since 2003, MTBE concentrations have ranged between 0.58 and 11.2 µg/L.
- OSW-3, OSW-4 and OSW-5 were installed on July 8, 2004 to further define the horizontal extent of contamination in the southwest area of the Manassas Terminal property. To date, groundwater has not been present in OSW-3 and OSW-4. In OSW-5 between one to three feet of water have been measured. OSW-5 was sampled for the first time in June 2005 and there were no detections of benzene or MTBE.
- The lack of groundwater in two of the new off-site wells indicates that there is no shallow groundwater within the weathered siltstone that extends to a depth of approximately nine feet on the west side of the intermittent stream. Based on monitoring observations, it appears that the water found in OSW-5 is locally perched.

**INTERMITTENT STREAM (on-site, along west boundary of the Manassas Terminal):**

- STREAM-1 (upstream location): Monitored since 1997; MTBE exceedances during the third and fourth quarters of 2003 (4.9 and 5.2 µg/L, respectively).
- STREAM-2 (upstream location): Monitored since 2002; MTBE exceedances during the third and fourth quarters of 2003 (4.6 and 5.2 µg/L, respectively).
- STREAM-3 (downstream location): clear decreasing trend of MTBE concentrations since 1991; no MTBE exceedances since the first quarter of 2004.

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 4

**ON-SITE WELLS:**

- MTBE and benzene concentrations in wells within the plume (e.g., MW-3, MW-4, MW-5, and MW-16) and other facility wells have also steadily decreased since the early 1990s.

The decreasing contaminant concentrations in off-site wells OSW-1 and OSW-2, surface water samples, and wells within the plume provide good evidence that the contaminant plume migration is under control.

To address the historical source mass areas, enhanced fluid recovery (EFR) events via vacuum truck extraction at select wells has been ongoing on a quarterly basis since the first quarter of 2004 per the approved December 2003 Interim Corrective Measures Work Plan. The EFR events are being conducted in MW-11, MW-5, MW-28, MW-30, and MW-31, and in MW-21. Benzene and MTBE concentrations measured after the first two quarterly EFR events were above the levels measured in the previous year, 2003. Subsequently, after the third and fourth quarter 2004 events, the benzene and MTBE concentrations decreased to similar or lower levels than those measured in 2003. Approximately 2.8 pounds of total volatile organic compound mass were recovered through the EFR events conducted in 2004.

ExxonMobil is currently preparing a Corrective Measures pilot test study proposal to be implemented upon EPA approval. The pilot test will consist of installing a passive groundwater oxygen infusion device (in situ submerged oxygen curtain-iSOC™) in monitoring well MW-11 to enhance biodegradation and thereby reduce contaminant concentrations in the center of the plume. Additional wells will also be installed to monitor the effectiveness of the proposed pilot study remedial technology. EFR events will be suspended during the duration of the pilot test study, however, manual bailing of free product >0.01 feet thick encountered in MW-21 will be conducted in a quarterly basis.

<sup>2</sup> “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.

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 5

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

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):**

Site data from 2001 to present indicate that discharge of shallow groundwater to surface water may occur infrequently and only locally along small portions of the on-site intermittent stream located along the west property boundary (unnamed tributary to Bull Run falling under Section 7a, Class III (Non-Tidal Waters Coastal and Piedmont Zones) per Virginia Water Quality Standards 9 VAC 25-260). For example, in September 2001 stream water was only present in the southern profile (STREAM-3) but in September 2002, the stream was completely dry. In June 2002 stream water was observed along several sections of the stream. In 2003 water was flowing in the intermittent stream, however, this can be attributed to the record volumes of rainfall received in 2003 (a storm sewer that drains the northwestern section of the paved area of the facility (away from the Loading Rack) discharges to the stream).

Impacts to the on-site intermittent stream decreased considerably from the initial sampling conducted in 1991. Since approximately 1996, low concentrations of MTBE and benzene have occasionally been detected in the stream. In the most recent (June 2005) sampling event, the only contaminants detected in the stream were:

- STREAM-1: naphthalene (0.226 µg/L)
- STREAM-2: lead (9.5 µg/L)
- STREAM-3: benzene (0.48 µg/L), MTBE (1.3 µg/L), naphthalene (0.308 µg/L), and 1-methylnaphthalene (0.388 µg/L).

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 6

5. Is the discharge of "contaminated" groundwater into surface water likely to be "insignificant" (i.e., the maximum concentration<sup>3</sup> 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)?

  X   If yes –skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> 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 concentration<sup>3</sup> 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 concentrations<sup>3</sup> 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):**

As of the most recent (June 2005) sampling event, benzene and MTBE concentrations in stream-monitoring locations, the two off-site wells adjacent to the stream locations, and onsite wells adjacent to the on-site stream, namely MW-23, MW-24, and MW-31, are less than 10 times the corresponding MCL or RBC (5 µg/L benzene and 2.6 µg/L MTBE). The concentrations are also significantly lower than the applicable Virginia Surface Water Quality Standards found in 9-VAC 25-260 (June 24, 2005), which list a benzene, toluene, and ethylbenzene standard of 710 µg/L, 200,000 µg/L, and 29,000 µg/L, respectively (no standard is provided for xylene or MTBE, refer to 9 VAC 25-260-140). In addition, quarterly groundwater sampling and groundwater level gauging conducted since 1990 show that the dissolved-phase plumes for benzene and MTBE are naturally degrading with minimal and decreasing impacts to off-site receptors. Moreover, a risk assessment report completed by Engineering-Science, Inc.,

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 7

in June 1992 concluded that the potential human risk associated with site contaminants was low and that the risk to the intermittent stream and environmental receptors was minimal as the on-site stream is not used for recreation or drinking water and natural dilution and attenuation reduce the contaminant concentrations to non-detect levels within approximately 500 feet of the property boundary. The risk assessment results were based on (1) evaluation of groundwater, soil, and stream water sample results from 1990 to 1992; (2) evaluation of sources, release mechanisms, transport media, exposure points, receptors and routes of exposure; (3) a groundwater contaminant transport model used to simulate movement of petroleum-contaminated groundwater and estimate the concentration of contaminants as groundwater discharges to the intermittent stream over a 50-year period; and (4) qualitative evaluation of seven chemicals of potential concern. To ensure that the transport model predicted the maximum impact on the stream, it was assumed that the stream is continuously flowing and serves as the discharge area for all groundwater migrating through the site via lateral flow, leakage from the pond, or infiltration of precipitation discharges. Contaminant concentrations have decreased considerably since this risk assessment was conducted in 1992.

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

**Migration of Contaminated Groundwater Under Control  
Environmental Indicator (EI) RCRIS code (CA750)**

Page 8

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 implemented<sup>4</sup>)?

\_\_\_\_\_ 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,<sup>5</sup> 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 – enter “IN” status code in #8.

**Rationale and Reference(s):**

<sup>4</sup> 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.

<sup>5</sup> 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.



**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 9

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):**

Quarterly groundwater sampling and gauging activities at the current on-site and off-site wells will continue until the remediation system is designed and submitted to the EPA with recommendations, approved, and implemented. In addition, the monitored natural attenuation data collected in 2003 will also be evaluated to assess the rate of natural attenuation occurring at the site. ExxonMobil reserves the right to request EPA approval to reduce the list of wells included in the quarterly monitoring and sampling activities.

**Migration of Contaminated Groundwater Under Control**  
**Environmental Indicator (EI) RCRIS code (CA750)**  
Page 10

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control 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).

  X   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 former Mobil Manassas Terminal (current ConocoPhillips) facility, EPA ID # VAD048565279, located at 10315 Balls Ford Road, Manassas, VA 20109. 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 needed to make a determination.

Completed by	(signature) <u><i>Andrew Fan</i></u>	Date <u>JAN 4, 2006</u>
	(print) <u>Andrew Fan</u>	
	(title) <u>Remedial Project Manager</u>	
Supervisor	(signature) _____	Date _____
	(print) <u>Robert E. Greaves</u>	
	(title) <u>Chief, General Operations Branch</u>	
	(EPA Region or State) <u>EPA Region 3</u>	

**Locations where References may be found:**

- Results of Site Investigation Activities and Annual Progress Report, RCRA Facility Lead Corrective Action, Manassas Terminal Facility (#45-070), Manassas, Virginia, USEPA RCRA ID No. VAD048565279, April 2003
- Annual Progress Reports submitted to the EPA.
- Alternate Source Demonstration, October 7, 2003 letter report to the VDEQ.
- Quarterly Groundwater Monitoring Reports submitted to the VDEQ.

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