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: Motiva Enterprises LLC/Shell Chemical LP, Norco East Site
Facility Address: 15536 River Road, Norco, LA 70079
Facility EPA ID #: LAD 008 186 579

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 #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?

__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):

Perimeter Groundwater Assessment. In September 1997, as part of the Phase I data evaluation of the Perimeter Groundwater Assessment at the Norco East Site (Figure 1 of Appendix A), Norco performed a review of known soil and/or groundwater impacts (PSI, 1997a). The review included data from 69 environmental site assessments and groundwater monitoring data from various on-going monitoring systems, including the Area 12 Perimeter System, the Refinery Wastewater Treatment System, the Old Landfill System, the New Landfill System and the Refinery Effluent Conveyance System. Additionally, a review of historic aerial photographs and facility maps was performed. The goal of the data review was to evaluate the potential for impacts to the site perimeter. Two areas of concern were identified near the site perimeter, West Pond Separator and the GATX tank car cleaning area (OL-5 unit). Following the Phase I data evaluation, in 1998 and 1999, a Phase II subsurface investigation was performed at the Norco East Site perimeter (PSI, 1998; PSI, 1999). Results from the Perimeter Groundwater Assessment indicated that the MO-1 GW_{3NDW} RECAP standard was exceeded for tetrahydrothiophene at well No. 150. It was also determined that shallow groundwater in the vicinity of well No. 150 discharges to the refinery wastewater conveyance and treatment system.

Groundwater Monitoring Systems. The following monitoring systems are in place at the Norco East Site and are located on Figure 2 of Appendix A:

- Closed Solid Waste Landfill (Quarterly)
- New Solid Waste Landfill (Semi-annual)
- Refinery Wastewater Treatment System (Semi-annual)
- South Property Monitoring System (Quarterly)
- West Pond Separator Monitoring System (Annual)

Groundwater quality is monitored at each of these locations at the specified frequency, and reported to LDEQ in periodic reports. For all of these groundwater monitoring systems, no COCs exceeded the risk-based limits.

Recent Site Investigations. Since completing the investigations associated with the Perimeter Groundwater Assessment, several additional subsurface investigations of shallow groundwater have been performed at the Norco East Site. Findings associated with each investigation have been submitted to LDEQ for review (see References). Recent investigations have been performed in the following specific areas:

- West Pond Separator (Rail Yard Area)
- Airline Highway North Property Frontage
- SU2000 Area & South Property Benzene Investigations
- OL-5 Assessment
- Groundwater Certification Assessments

West Pond Separator

The West Pond Separator (WPS) area was historically used to treat stormwater and process wastewaters, with the last separator being closed in 1986. Several site investigations had been performed in this area during 1989-1992 and an annual groundwater-monitoring program commenced in 1993. Nine years of results for VOCs and SVOCs show no recent exceedances of MO-1 GW_{3NDW} RECAP standards. An additional groundwater investigation was completed in the WPS area in 1996 (PSI, 1996) and in 1999 as part of the Perimeter Groundwater Assessment (PSI, 1999). Exceedances of the MO-1 GW_{3NDW} RECAP standards for TPH and benzene were documented for one direct-push groundwater sample (WPS-2) collected from the West Pond Separator area in 1996.

SU2000 Area & South Property Benzene Investigations

In 2001, Norco conducted a subsurface investigation to delineate an existing MTBE plume associated with an SU2000 gasoline spill at the Norco East Site South Property (PSI, 2001). During the course of this investigation, which resulted in an NFA-ATT for MTBE, a separate benzene plume with concentrations above the MO-1 GW_{3NDW} RECAP standard was identified. Additional subsurface investigation was performed to characterize and delineate the plume (PSI, 2002). A network of monitoring wells was installed in October 2002 and quarterly sampling commenced in January 2003. Additional ongoing activities include an evaluation of the potential need for corrective action.

OL-5 Assessment

In 1997, Norco performed an assessment at the Olefins 5 unit (OL-5) following a release of gas oil. During these assessment activities, historic contamination, most likely associated with the former rail car cleaning facility that pre-dated construction of OL-5 Unit, was identified by the presence of SVOCs (PSI, 1997b).

Groundwater Certification Assessments

Numerous Groundwater Certification assessments have been performed historically at the Norco East Site. These soil and groundwater investigations are required by the LDEQ for issuance of a Groundwater Certification and are most commonly performed prior to initiation of construction at the facility. As each groundwater certification assessment is performed a summary report is completed and submitted to LDEQ for approval. Groundwater Certification assessments performed for the Low Sulfur Gas, Olefins Debottleneck, Flare Gas Recovery and CSO Vacuum Stripper projects have identified limited exceedances of the MO-1 GW_{3NDW} RECAP standard for several VOCs and SVOCs.

Chemicals of concern exceeding MO-1 GW_{3NDW} RECAP standards are summarized in the following table. Locations of these exceedances are identified on Figure 3 of Appendix A.

Chemical	CAS No.	RECAP Standard	[illegible] (ug/L)
Chrysene	218-01-9	GW3NDW	2.00E-04
2-Methylnaphthalene	91-57-6	GW3NDW	1.78E-01
Benzene	71-43-2	GW3NDW	1.25E-02
Benzo(a)anthracene	56-55-3	GW3NDW	2.00E-04
Bis(2-ethylhexyl)phthalate	117-81-7	GW3NDW	1.00E-02
Dibenzofuran	132-64-9	GW3NDW	1.52E-02
Fluorene	86-73-7	GW3NDW	7.76E-02
Naphthalene	91-20-3	GW3NDW	2.23E-01
Phenanthrene	85-01-8	GW3NDW	8.78E-02
Tetrahydrothiophene	110-01-0	GW3NDW	1.81E+00
TPH		GW3NDW	2.36E+01
TPH-D		GW3NDW	2.36E+01

References:

- ERM, 2001. Source Characterization Summary – Rail Yard Area Site Assessment. Motiva Enterprises LLC.
- ERM, 2001. Airline Highway North Property Frontage Assessment. Shell Chemical Company/Motiva Enterprises LLC Norco Manufacturing Complex.
- Motiva Enterprises LLC, 2003. 2002 Annual Groundwater Monitoring Report, West Pond Separator Monitoring System, Norco Refinery, Motiva Enterprises LLC, AI #1406 (January 8, 2003).
- Motiva Enterprises LLC, 2002. Quarterly Groundwater Monitoring Report—October 2002 Sampling Event and Fourth Quarter 2002 Assessment Plan Status Report, Closed Solid Waste Landfill, Permit Number P-0114-A1, AI #1406, Motiva Enterprises LLC, Norco Refinery (November 21, 2002).
- Motiva Enterprises LLC, 2002. Semi-annual Groundwater Monitoring Report and Request for No Further Action, South Property Monitoring System, Motiva Enterprises LLC, Norco Refinery, Norco, Louisiana (November 1, 2002).
- Motiva Enterprises LLC, 2002. Groundwater Sampling Event—August 2002, Solid Waste Landfill, GD-089-0359/P-0310, Motiva Enterprises LLC—Norco Refinery, AI #1406 (October 21, 2002).
- Motiva Enterprises LLC, 2002. Semiannual Groundwater Monitoring Report, Refinery Wastewater Treatment System, Permit Number P-0268, AI #1406, Norco Refinery, Motiva Enterprises LLC (September 10, 2002).
- PSI, 2002. South Property Benzene Investigation. Shell Chemical LP, Norco East Site, Norco, Louisiana.
- PSI, 2001. Investigation of the SU2000 Area for RCRIS Submittal at the Motiva Enterprises Norco Refinery, Norco, Louisiana.
- PSI, 2000. East Site Perimeter Monitoring Plan for the Motiva Enterprises Norco Refinery and Shell Chemical Company – East Site, Norco, Louisiana.
- PSI, 1999. Round 2 of the Phase II Investigation. Perimeter Groundwater Assessment at the Motiva Enterprises Norco Refinery and Shell Chemical Company – East Site, Norco, Louisiana.
- PSI, 1998. Report of Round 1 Sampling Results of the Phase II Investigation. Perimeter Groundwater Assessment at the Shell Norco Manufacturing Facility – East Site, Norco, Louisiana.
- PSI, 1997. Phase I Evaluation Report. Perimeter Groundwater Assessment, Shell Norco Manufacturing Facility – East Site, Norco, Louisiana.
- PSI, 1997. Additional Assessment of OL-5 Gas-Oil Release, Shell Chemical Company – East Site, Norco Louisiana.

[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).

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)?

__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"[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):

South Property Benzene Investigation. Benzene exceedances were identified in groundwater during the South Property Benzene Investigation (PSI, 2002). Recent assessments have delineated the dissolved benzene plume. The assessment results along with limited groundwater modeling indicate that impact to a receptor is not anticipated. A network of monitoring wells was installed in October 2002 and quarterly sampling commenced in January 2003. Additionally, evaluation of corrective action alternatives is being performed under LDEQ's review.

West Pond Separator. During the 1996 groundwater assessment of the West Pond Separator (WPS), benzene and TPH exceedances were identified in one groundwater sample (WPS-2). No subsequent assessments in the WPS area have shown exceedances of MO-1 GW_{3NDW} standards. During the Perimeter Groundwater Assessment in 1999, neither TPH nor benzene was detected in any groundwater samples collected from WPS area. Norco submitted the East Site Perimeter Monitoring Plan to LDEQ in November 2000 (PSI, 2000) and plans to implement the plan upon approval. This monitoring program will detect any occurrence or migration of these contaminants at the site perimeter.

Groundwater Certification Assessments. Additional one-time exceedances of MO-1 standards have been documented during various Groundwater Certification assessments. These exceedances are located in the interior of the plant. Norco submitted the East Site Perimeter Monitoring Plan to LDEQ in November 2000 and plans to implement the plan upon approval. This monitoring program will detect any migration of contaminants from historic interior sources.

References:

- ERM, 2001. Source Characterization Summary – Rail Yard Area Site Assessment. Motiva Enterprises LLC.
- PSI, 2002. South Property Benzene Investigation. Shell Chemical LP, Norco East Site, Norco, Louisiana.

[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.

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

_____ If yes - continue after identifying potentially affected surface water bodies.

__X__ 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):

Perimeter Groundwater Assessment. In 1998 and 1999, a Phase II subsurface investigation was performed at the Norco East Site perimeter (PSI, 1998; PSI, 1999). Results from this Perimeter Groundwater Assessment indicated that the MO-1 GW_{3NDW} RECAP standard was exceeded for tetrahydrothiophene at well 150. It was also determined that shallow groundwater in the vicinity of well 150 discharges to the refinery wastewater conveyance and treatment system.

South Property Benzene Investigation. Since the Perimeter Groundwater Assessment in 1999, benzene exceedances have been identified in groundwater during the South Property Benzene Investigation (PSI, 2002). There are no surface water bodies in the vicinity of the benzene plume.

References:

- PSI, 2002. South Property Benzene Investigation. Shell Chemical LP, Norco East Site, Norco, Louisiana.
- PSI, 1999. Round 2 of the Phase II Investigation. Perimeter Groundwater Assessment at the Motiva Enterprises Norco Refinery and Shell Chemical Company – East Site, Norco, Louisiana.
- PSI, 1998. Report of Round 1 Sampling Results of the Phase II Investigation. Perimeter Groundwater Assessment at the Shell Norco Manufacturing Facility – East Site, Norco, Louisiana.

Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] 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 concentration[3] 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[3] 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[3] 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):

References:

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

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[4])?

_____ 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):

References:

[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.

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?"

__X__ 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):

Groundwater Monitoring Systems. The following monitoring systems are in place at the Norco East Site and are located on Figure 2 of Appendix A:

- Closed Solid Waste Landfill (Quarterly)
- New Solid Waste Landfill (Semi-annual)
- Refinery Wastewater Treatment System (Semi-annual)
- South Property Monitoring System (Quarterly)
- West Pond Separator Monitoring System (Annual)

Groundwater quality is monitored at each of these locations at the specified frequency, and reported to LDEQ in periodic reports (see References).

Perimeter Monitoring Plan. Following completion of the Perimeter Groundwater Assessment at the Norco East Site and as part of the overall Groundwater Management Program (GWMP) for the facility, Norco submitted the East Site Perimeter Monitoring Plan to LDEQ in November 2000 (PSI, 2000). The plan calls for a groundwater monitoring system consisting of 59 new monitoring wells and 15 existing wells. Groundwater samples will be collected on a semi-annual basis and reported to LDEQ in periodic reports.

References:

- Motiva, 2003. 2002 Annual Groundwater Monitoring Report, West Pond Separator Monitoring System, Norco Refinery, Motiva Enterprises LLC, AI #1406 (January 8, 2003).
- Motiva, 2002. Quarterly Groundwater Monitoring Report—October 2002 Sampling Event and Fourth Quarter 2002 Assessment Plan Status Report, Closed Solid Waste Landfill, Permit Number P-0114-A1, AI #1406, Motiva Enterprises LLC, Norco Refinery (November 21, 2002).
- Motiva, 2002. Semi-annual Groundwater Monitoring Report and Request for No Further Action, South Property Monitoring System, Motiva Enterprises LLC, Norco Refinery, Norco, Louisiana (November 1, 2002).
- Motiva, 2002. Groundwater Sampling Event—August 2002, Solid Waste Landfill, GD-089-0359/P-0310, Motiva Enterprises LLC—Norco Refinery, AI #1406 (October 21, 2002).
- Motiva, 2002. Semiannual Groundwater Monitoring Report, Refinery Wastewater Treatment System, Permit Number P-0268, AI #1406, Norco Refinery, Motiva Enterprises LLC (September 10, 2002).
- PSI, 2000. East Site Perimeter Monitoring Plan for the Motiva Enterprises Norco Refinery and Shell Chemical Company – East Site, Norco, Louisiana.

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 **Motiva Enterprises LLC/Shell Chemical LP, Norco East Site** facility, EPA ID # LAD **008 186 579**, located at **15536 River Road, Norco, Louisiana**. 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) Jeffrey T. Jones Date 12/30/02
(print) Jeffrey T. Jones
(title) Geologist III, Environmental Technology Division

Supervisor (signature) N M Dave Date 1/7/03
(print) Narendra M. Dave
(title) Geological Manager, Environmental Technology Division
Louisiana Department of Environmental Quality

Locations where References may be found:

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