Documentation of Environmental Indicator Determination
in accordance with EPA Interim Final Guidance 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info Code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Amoco Sugar Creek Former Refinery
Facility Address: 1000 North Sterling Road, Sugar Creek, Missouri 64054
Facility EPA ID #: MOD007161425

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.

Groundwater analytical data and light non-aqueous phase liquid (LNAPL) measurements were from various sampling activities and reported in:

Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Reports BP, 1988-2003),
Interim Measures Quarterly Progress Reports (BP, 1989-2003),
Background RCRA Facility Investigation (RFI) report (pre-1995 data) (ThermoRetec, 2000a),
May 1997 Additional Investigation (TriTechnics, 1997a),
1999 Norledge Area Investigation Report (ThermoRetec, 1999),
Methyl tert-butyl ether (MTBE) groundwater investigation (Amoco, 2000),
Norledge Area RFI report (RETEC, 2001a)
Crawford Area RFI report (RETEC, 2001b) and responses to comments (BP, 2002a)
Sugar Creek Area RFI report (RETEC, 2002a) and responses to comments (BP, 2003a)
West Bluffs Area RFI report (RETEC, 2002b) and responses to comments (BP, 2003b)
Norgaard Tank Area RFI report (RETEC, 2002c)
West Hills Tank Area RFI report (RETEC, 2003a)
Norledge Area Corrective Measures Study (CMS) (ThermoRetec, 2001)
Phase 2 Norledge Area CMS (RETEC, 2002d)
Crawford and Sugar Creek Areas CMS (RETEC, 2002e),
Investigation work plan for the West Plant Process Area (RETEC, 2002f)
Investigation work plan for the Lower Refinery and East Bluffs Areas (RETEC, 2003b)

BACKGROUND

Definition of Environmental Indicators (for 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 EIs 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 EIs 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 groundwater 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 Determination status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info 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 [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) 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): Since 1986, the groundwater at the Former Refinery has been sampled for petroleum-related compounds including volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), and metals. The primary compounds of concern (COCs) and associated Maximum Contaminant Levels (MCLs) (USEPA, 2002) are:

Benzene at 5 micrograms per liter (ug/L)
Toluene at 1,000 ug/L
Ethyl benzene at 700 ug/L
Xylenes at 10,000 ug/1,2-dichlorethane (DCA) at 5 ug/L
Benzo(a)pyrene at 0.2 ug/L
Dissolved Lead at 15 ug/L

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Dissolved metals, such as arsenic and selenium, also exceed their MCLs. These exceedances are attributed to naturally occurring soils. These metals are, therefore, not considered primary COCs. Compounds that infrequently exceeded the regulatory levels and laboratory contaminants are also not considered primary COCs.

Light non-aqueous phase liquid (LNAPL) is also present on the groundwater in isolated areas.

Footnotes:

[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).

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)?

__**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):

Horizontal Extent:

At the Former Refinery, groundwater discharges to surface water, or has historically migrated into one off-site area, the off-site Norledge Area (Figure 1). The groundwater constituents that migrated to the off-site Norledge Area are now below appropriate MCLs. Impacted groundwater discharges to surface water and is discussed under Question 4.

In the Norledge Area, COC concentrations have stabilized and decreased significantly. As documented in the Norledge Area RFI report, the source of contamination is the residual hydrocarbon remaining in the smear zone (Section 9.6.1 in RETEC, 2001a). Monitoring well data indicate that groundwater migrating across the property boundary into residential areas does not exceed the MCL for any constituents. (Section 9.8.1 in RETEC, 2001a). Samples from property boundary wells (MW-041, -042, -043, -032, and –034) were analyzed during the 1990 RFI, 1995 RFI, and 1999 investigation for the associated COCs. Samples from wells MW-041 and –042 were also analyzed during the West Bluffs RFI. Samples from the property boundary wells are collected quarterly and analyzed for BTEX and MTBE as part of the Interim Measures Groundwater Monitoring Program. Benzene has not been detected in any of these boundary wells since 2001 (Interim Measures Groundwater Sampling Summary Table in appropriate *Quarterly Progress Report*).

Also, the horizontal extent of the off-site benzene plume has decreased significantly. Figures 2-5 through 2-10 from the Norledge Area Phase 2 CMS (RETEC, 2002d) show the

decreasing horizontal extent from May 1997 to February 2002. Ethyl benzene, the other COC exceeding an MCL, is within the extent of the off-site benzene plume (Figure 2-11 in RETEC, 2002d).

Historically, LNAPL has been sporadically measured in the Norledge Area groundwater wells in minor amounts. These wells are located within the benzene plume. During the latest Interim Measures Quarterly Groundwater Sampling event, one well (MW-054) out of 28 wells had measurable LNAPL (see attached water level data sheets).

Vertical Extent:

The underlying geology of the site is part of the Forest City Basin and was discussed within the 1987 refinery-wide geology report (Woodward-Clyde, 1987). The specific text or figure references in this paragraph refer to this report. The Forest City Basin extends approximately 80 miles east, south, and west of the site and 160 miles north (Figure 2). According to the report, the basin includes a well-developed thick sequence of pre-Pennsylvanian and Pennsylvanian rock system. At the site, two of the five groups of the Pennsylvanian system are present: the Kansas City and Pleasanton Groups. The Kansas City Group lies above the Pleasanton Group and is present in the bluffs areas of the site. Its thickness is approximately 20 to 25 feet for the Bethany Falls or 30 feet for the Winterset Limestone (Section 4.3.2). The Pleasanton Group forms the stratigraphic base under the entire site, and sub-crops below the Missouri River and Sugar Creek flood plan and is predominantly shale (Section 4.3.2). The thickness of this group averages 90 feet and can be as much as 150 feet thick (Section 4.3.2).

The impacted groundwater remains within the uppermost aquifer at the Former Refinery. For the majority of the refinery, this is the unconfined aquifer. In the West Bluffs and the East Bluffs Areas, the groundwater is within the Bethany Falls or Winterset Limestones, which are above shale aquitards of very low permeability. The underlying Pleasanton Group bedrock acts as an aquitard. Contaminated groundwater, therefore, has very nearly no chance to go deeper than the top of the Pleasanton Group. The hydraulic conductivity (K) estimates for wells are included within each phased RFI or within the draft 1995 RFI (TriTechnics, 1995) for the remaining areas.

The bedrock wells have been sampled and analyzed for the associated COCs during the 1995 RFI, 1999 investigation, Norledge Area Phase 2 CMS investigation, Crawford RFI, Norgaard RFI, and West Bluffs RFI. To further support that the contamination remains within the uppermost aquifer, the only primary COCs that exceeded the MCLs were benzene in BRW-016 (East Bluffs Area) and benzo(a)pyrene in BRW-034 (West Bluffs Area). Both these wells are within the uppermost aquifer. The laboratory analytical reports are in the Background RFI report for BRW-016 and the West Bluffs RFI report for BRW-034. The non-aqueous phase liquids at the Former Refinery are light and therefore remain in the uppermost aquifer.

Monitoring System:

A monitoring system exists which is currently adequate to demonstrate vertical and horizontal extent of groundwater contamination. The system is also adequate to identify future possible expansion of the plume areas or LNAPL bodies.

[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?

__**X**__ 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):

Groundwater discharges to the West Bluff Tributary, Missouri River, Sugar Creek, or East Bluffs Tributary (Figure 1). Groundwater detections from wells adjacent to these surface water bodies are summarized in the attached Tables 1 through 4. The locations of the adjacent wells are shown on Figure 1.

West Bluffs Tributary
During the RFI in 2001, neither benzene nor any of the other key COCs were detected in groundwater (Section 5.3.2 of RETEC 2002b). Table 1 lists the compounds detected in groundwater wells near the tributary. No compounds, aside from dissolved arsenic and barium, exceeded the associated MCL. Two LNAPL areas of interest were detected along the West Bluffs Tributary (Figure 1). LNAPL samples from these two locations were collected and analyzed, and neither contained BTEX constituents. One LNAPL area of interest (WBOP-01) was controlled by a gradient control pump, which has been replaced with a more robust gradient control sump pump in April 2003. The second LNAPL area (WBOP-02) is also controlled by a sump pump starting in March 2003. Gradient control pumps reverse the groundwater gradient away from the creek and thereby, stabilize the migration of LNAPL. Contaminated groundwater does not exceed MCL's nor does groundwater exceeding MCL's discharge into the West Bluffs Tributary. Water quality in the West Bluffs Tributary meets MCL's.

East Bluffs Tributary
Groundwater flowing to the East Bluffs Tributary generally comes from the East Bluffs Area or the northern portion of the Gerber Tank Area. In 2001, water samples were collected from a groundwater spring discharging to the East Bluffs Detention Pond (EBSP) and the pond in the vicinity of the spring (EBSW). Neither samples had any VOC or polyaromatic hydrocarbons (PAHs) detections above the detection limits (Table 2). Contaminated groundwater does not exceed MCL's and surface water quality meets MCL's in the East Bluffs Tributary.

Missouri River
The majority of groundwater samples collected from wells along the Missouri River historically have not had benzene or other key COC detections. The results from the latest sampling event for each adjacent well are summarized on Table 3. Dissolved lead was the

only key COC with concentrations above the associated MCL. The MCL was slightly exceeded in one well (A-043) located over 250 feet from the river. Due to the distance, this slightly elevated concentration would naturally attenuate before reaching the river. LNAPL has never been measured in any of the wells immediately adjacent to the Missouri River. Contaminated groundwater does not excceed MCL's adjacent to the Missouri and surface water is not impacted above MCL's in the Missouri River.

Sugar Creek

In the Sugar Creek Area, elevated benzene concentrations are present in groundwater along both banks of the creek (Figure 1 and Table 4). The low permeability of the soil adjacent to the creek, however, allows only a very low contaminant loading to the creek. The Sugar Creek Area RFI report determined through using Darcy's Law, that "the amount of groundwater migrating to Sugar Creek is less than 1 gallon per minute (gpm) and the mixed benzene concentration from groundwater into surface water is below detection limits" (Section 5.3.3 or RETEC, 2002a). Dissolved-phase constituents in groundwater adjacent to Sugar Creek can discharge into Sugar Creek, although at a minimal amount (as discussed under Question 5) which does not exceed MCL's in surface water.

LNAPL is also present on the groundwater adjacent to the creek and 11 areas of interest (SCOP-01 to SCOP-11) have been found along both sides of the creek (Table 1 and Figure 1). These identified areas of interest are inactive and/or controlled by interim measures. The interim measures are source removal and gradient control pumps; the latest pump was installed at SCOP-06 in May 2003. The gradient control pumps create a groundwater drawdown to reverse the groundwater gradient away from the surface water. Therefore, LNAPL migration has stabilized.

5. 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 the appropriate groundwater "level," and there are no other conditions (e.g., the nature or 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[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 the 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):

Sugar Creek

Of the constituents identified as exceeding the MCL adjacent to Sugar Creek, benzene and 1,1-dichloroethene are the only constituents that could potentially exceed 10 times the MCL in surface water (see table below). In addition, the detected methyl tert-butyl ether (MTBE) concentration in one well (A-017) exceeded the more conservative Missouri Cleanup Levels for Missouri (CALM) by more than 10 times. Surface water samples collected downstream of the groundwater locations and at the most impacted surface water location were all below MCLs (see table below). Table 4 summarizes the detected

compounds in groundwater. Attached is the preliminary laboratory report for the latest round of surface water samples; other surface water laboratory reports are located in the Sugar Creek Area RFI report (Appendix 4-E of RETEC, 2002a).

Key Contaminant	Max. Concentration in Groundwater	MCL	Latest Concentration in Downstream Surface Water	Latest Concentration in Most Impacted SW Location (SW-33)
Benzene	23,000 ug/L at SC-33	5 ug/L	2.2 ug/L at SW-06A	3.2 ug/L
Toluene	1,500 ug/L at SC-33 and 1,400 ug/L at SC-43	1,000 ug/L	ND(2) at SW-06a	ND(2)
Ethyl benzene	1,800 ug/L at SC-43	700 ug/L	ND(2) at SW-06a	ND(2)
Xylenes	6,200 ug/L at SC-43	10,000 ug/L	ND(5) at SW-06a	ND(5)
MTBE	1,400 ug/L at A-017	20 ug/L	ND(5) at SW-20	Not analyzed
1,1-Dichloroethene	110 ug/L at MW-022B	7 ug/L	ND(5) at SW-11	Not analyzed
1,2 DCA	ND along Sugar Creek	5 ug/L	N/A	N/A
Benzo(a)pyrene	1.7 ug/L at A-017	0.2 ug/L	ND(0.029) at SW-20	Not analyzed
Lead	9 ug/L at A-017	15 ug/L	ND(5) at SW-20	Not analyzed

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The Sugar Creek and Norgaard Areas RFI reports estimated the benzene concentration in the creek resulting from groundwater migration to the creek. Section 3.2.2 of the Norgaard RFI report (RETEC, 2002c) estimated that 4.7 ug/L of benzene enters Sugar Creek along the Norgaard Area. Section 5.3.3 of the Sugar Creek RFI report (RETEC 2002a) estimated that the benzene concentrations from groundwater would be below detection limits. As shown in the table above, the benzene surface water concentrations downstream of the highest groundwater concentration and in the historically most impacted surface water location were below groundwater MCLs. The remaining key groundwater constituents were not detected within the latest sampling event.

Interim measures have also reduced the benzene concentrations within Sugar Creek. The Norgaard Spring (SPSC-01) discharged groundwater into Sugar Creek at a rate of 3.5 gpm and was considered to be one of the primary reasons for benzene detections within the creek (at SW-33). A sump pump was installed in October 2002 to eliminate the spring. In March 2003, the impacted bank soil was removed and restored with clean clay and riprap. During each subsequent weekly inspection, the spring has been dry and the resulting benzene concentrations in the creek have been reduced to below MCLs.

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The risks to human health and ecological systems were calculated in the Sugar Creek RFI report (RETEC, 2002a). The human health risks for all identified receptors were below the acceptable risk range of 10^{-4} to 10^{-6} for carcinogens and below the target hazard index (HI) of 1 for non-carcinogens (Tables 7-14 through 7-17). The results of the ecological risk assessment indicated no significant risk to key receptors including the Great Blue Heron and the raccoon (Tables 8-16 and 8-15, respectively).

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

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[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 specialist(s), 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 cannot 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):

The mass flux calculation demonstrated that groundwater discharge into Sugar Creek is insignificant (See Question 5). The latest surface water concentrations of benzene are below groundwater MCLs. MTBE and 1,1-dichloroethene were below laboratory detection limits.

[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?"

   __**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/Measurement Data:

Norledge Area: Groundwater samples are collected quarterly from 28 wells within the Norledge Area (Figure 2-13 from Annual Interim Measures Performance Monitoring Summary) (RETEC, 2002g). The analytical reports are summarized and submitted with the *Quarterly Progress Reports* (BP, 1989-2003). Section 7.3 of the Norledge Area Phase 2 CMS (RETEC, 2002d) proposed continued monitoring of wells based on the reduced footprint of the horizontal extent of the plume.

Missouri River: Groundwater samples are collected semiannually from the 25 RCRA wells by the Single Waste Management Unit (Figure 3 from the 2002 Fourth Quarter and Annual RCRA Groundwater Monitoring Report).

Site-wide: A site-wide monitoring system demonstrates extent for the plumes in three dimensions and is adequate in size and configuration to identify future plume movement(s). Monitoring frequency is adequate to prevent undetected plume movement beyond the monitoring system perimeter.

Surface Water Monitoring/Measurement Data:

West Bluffs Area: Inspections are conducted monthly along the tributary and weekly at the former seep locations. The inspection sheets are submitted with the *Quarterly Progress Reports* (BP, 1989-2003).

Sugar Creek Area: Inspections are conducted monthly along the creek, especially at the former seep locations. Fluid levels are also measured monthly along Sugar Creek. A

weekly inspection is conducted on the Norgaard Spring to ensure that the spring is dry. The other gradient control pumps and associated nearby observation wells along Sugar Creek are also inspected weekly. Inspections are performed to verify that adequate drawdown occurs. The inspection sheets are submitted with the Quarterly Progress Reports (BP, 1989-2003).

Attached are cross sections and hydrographs for the nine hydraulic gradient control pumps along Sugar Creek.

Surface Water and Sediment Monitoring/Measurement Data:

Sugar Creek Area: The surface water along key locations in Sugar Creek has been monitored for the last two years. The last proposed sampling event was conducted in May 2003. The Sugar Creek CMS proposed semiannual sediment sampling. The sampling locations have been revised (BP, 2003c) based on the January sediment sample results (BP, 2003d). Sediment sampling began May 2003.

8. Check the appropriate RCRA Info 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 facility, EPA ID # **MOD007161425** , located at the **Former Refinery at Sugar Creek, Missouri**. 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) Original signed by (Date) 9/30/03
(Print) R. Bruce Stuart, P.E., R.G.
(Title) Chief, Groundwater Unit

Supervisor: (Signature) Original signed by (Date) 9/30/03

(Print) Robert K. Morrison, P.E.
(Title) Chief, Permits Section
(EPA Region or State) State of Missouri

Locations where References may be found: Missouri Department of Natural Resources, Hazardous Waste Program, 1738 E. Elm Street, Jefferson City, Missouri; Hazardous Waste Program Files

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