10/31/2023

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 Cities Service Refinery
Facility Address:	2500 Rear East Chicago Avenue, East Chicago, Indiana
Facility EPA ID #:	INR 000 123 927

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 (EIs) 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 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 Determination 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):

"Contamination" has been identified through comparison of the RCRA Framework Investigation (RFI) groundwater characterization data with conservative risk-based screening levels, as shown in Table 5.2a (perimeter/off-Site groundwater) and Table 5.2b (interior groundwater) of the RFI Report.

Data for this EI includes RFI groundwater data collected in August 2020, November 2020, March 2021, and June 2021, and supplemental groundwater data was collected over eight quarterly events and two additional targeted sampling events associated with additional well installations between August 2021 and June 2023. As discussed in Section 4 of the RFI Report, the screening levels are based on a combination of the 2019 Indiana Department of Environmental Management (IDEM) and United States Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs), in accordance with the Site's Corrective Action Framework (CAF). Perimeter sample results were initially screened using residential criteria to identify the potential for off-Site migration. Sample locations that are internal to the property were screened using industrial screening levels, because the current use of the property is commercial/industrial.

Groundwater results were evaluated as either perimeter or interior samples. In accordance with the CAF, perimeter groundwater sample results were compared to the following screening levels:

- EPA Drinking Water MCL or, if an MCL was not available the IDEM 2019 Screening Levels Table A-6, Groundwater, Tap, Residential
- IDEM, 2019 Screening Level Table A-6, Vapor Exposure, Groundwater, Residential (protective of vapor intrusion from groundwater)
- IDEM, 2019 Screening Level Table A-6, Vapor Exposure, Groundwater, Commercial/Industrial (protective of vapor intrusion from groundwater)

In accordance with the CAF, interior groundwater sample results were compared to the following screening levels:

- IDEM, 2019 Screening Level Table A-6, Vapor Exposure, Groundwater, Commercial/Industrial (protective of vapor intrusion from groundwater)

The perimeter locations defined in the RFI are as follows: GSH-MW01-20, GSH-MW03-20, GSH-MW05-20, GSH-

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).

MW06-20, GSH-MW10-20, and GSH-MW12-20. Additional perimeter locations were added following the RFI at locations: GSH-MW15-22, GSH-MW16-22, GSH-MW17-22 and GSH-MW18-23.

The interior locations defined in the RFI are as follows: GSH-MW02-20, GSH-MW04-20, GSH-MW07-20, GSH-MW08-20, GSH-MW09-20, GSH-MW11-20, and GSH-MW13-20. An additional interior location was added following the RFI: GSH-MW14-22.

Perimeter and interior groundwater results were compared to the above screening levels and are presented in the RFI Report in Table 5.2a and Table 5.2b, respectively. Supplemental groundwater data was screened similarly and submitted in the quarterly progress reports. Groundwater concentrations that exceed the screening levels and therefore meet the definition of contamination are shown in the tables. Five metals (arsenic, cobalt, iron, manganese, and thallium), two semi-volatile organic compounds (SVOCs) (2 methylnaphthalene and naphthalene), and two volatile organic compounds (VOCs) (benzene and methylene chloride) exceeded the residential groundwater screening levels at the perimeter of the property. These constituents exceeded the residential screening levels at the southwestern property boundary. Currently, there are no drinking water wells in the vicinity of the monitor wells in these areas.

One SVOC (naphthalene) and one VOC (benzene) exceeded the commercial/industrial groundwater screening levels at the interior of the property. These exceedances are bounded by additional wells to the south, southwest, and west where the concentrations did not exceed commercial/industrial screening levels.

Light non-aqueous phase liquid (LNAPL) was not observed in any of the monitoring wells but has been observed in six sewer system infrastructure manholes during routine inspections at locations: MH-28, MH-43, MH-48, MH-96, MH-99, and MH-117.

Oily product has been periodically removed from manholes by bailer, pump, or adsorbent booms. The oily product is containerized in drums, characterized, and disposed off-Site in accordance with applicable laws. Immediately following each oil removal event, the measurable thicknesses of oil in each manhole were negligible. The product removed is summarized below.

Manhole Oily Product Removals (Gallons)

Time Period	Q2 2021*	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023
Gallons of oily product removed	275	0	15	0	15	0	15	3	3

Note*: During the first event, adsorbent booms and pads were utilized to remove the oily product and contributed to the volume. Subsequent events utilized a peristaltic pump or bailer to skim oil from the surface of the water within the manholes reducing the amount of waste generated. Volumes include a mixture of oily product and water.

Based on the existing dataset and Site observations, isolated sections of the sewer system appear to be behaving as a trap for oil accumulation, and slight fluctuations in the shallow groundwater table are facilitating the movement of oil in the sewer system into the manhole structures. Several of the manhole structures were observed to have been backfilled, and as such flow is not observed for a large portion of the sewer system. In addition, most sewer inverts are not visible due to presence of standing water in the sewers (water surcharged within the system).

The amount of oily product being recovered is minimal and any water or oil that migrates through the system outlets

to an oil-water separator on the CITGO Terminal property where it is treated and discharged under a National Pollution Discharge Elimination System (NPDES) permit. In addition, oily product present in the sewer is residual and not mobile since it is not observed in any surrounding monitoring wells.

While there are no generic screening levels for LNAPL, the identification of LNAPL represents impacts to the Site. However, the LNAPL was not identified on groundwater and the water/LNAPL that may migrate through the Industrial Sewer System is treated through CITGO's oil-water separator and monitored via the conditions of the associated NPDES permit.

Note, as presented in the CAF, no ecologically relevant habitat is present at the Former Cities Services Refinery; therefore, no ecological risk assessment was completed.

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):

Groundwater data from perimeter and interior monitoring wells were evaluated to determine whether the area of contaminated groundwater at the facility has stabilized. Comparison of the RFI groundwater data from perimeter and interior monitoring wells to the standards is shown in Table 5.2a and Table 5.2b of the RFI Report, respectively. Supplemental groundwater data was screened similarly and submitted in the quarterly progress reports. Groundwater concentrations that exceed the screening levels and therefore meet the definition of contamination are shown in the tables. Additionally, a statistical evaluation of the groundwater results was also performed to evaluate potential concentration trends. This is to be presented in the Corrective Measures Proposal (CMP) and is summarized below.

As discussed in the previous question, RFI and supplemental groundwater data identified five metals (arsenic, cobalt, iron, manganese, and thallium), two SVOCs (2-methylnaphthalene and naphthalene), and two VOCs (benzene and methylene chloride) that exceeded the groundwater screening levels at the perimeter of the southwestern property boundary. One SVOC (naphthalene) and one VOC (benzene) exceeded the groundwater screening levels at the interior of the property.

Benzene concentrations in groundwater exceeded the IDEM Commercial/Industrial Vapor Value of 120 micrograms per liter (ug/L) at four interior wells and the EPA Drinking Water MCL of 5 ug/L at two perimeter wells at the southwestern property boundary. In the interior, the results have been consistent through the quarterly RFI and post-RFI sampling events, with the exception of the sample collected in June 2021 (fourth quarterly event) from GSH-MW11-20 which had elevated concentrations of benzene, compared to previous sampling results. A re-sampling was conducted in August 2021 and analyzed for TCL VOCs. The results of the re-sample confirmed that the fourth quarterly event result was anomalous, and, through a further review of the results, it appears likely related to elevated total suspended solids (TSS) levels. At perimeter well GSH-MW06-20 on the southwester property adjacent to Gary Road, groundwater exceeded the EPA Drink Water MCL for benzene, but concentrations have been consistent through the quarterly RFI and Post-RFI sampling events. As discussed in Section 3.5 of the RFI

[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.

Report, groundwater flow radiates outwards from the center of the Site towards Gary Road. Three additional monitoring wells were installed downgradient of GSH-MW06-20 on the south side of Gary Road to delineate benzene: monitoring wells GSH-MW16-22, GSH-MW17-22, and GSH-MW18-23. The results for groundwater samples collected from these wells confirmed that benzene concentrations did not exceed screening levels and therefore are not crossing Gary Road. The exceedances of the other constituents at the perimeter of the property were generally marginal and less than twice the screening levels, except for those at GSH-MW06-20. The three wells downgradient of GSH-MW06-20 had no SVOC or VOC concentrations that exceeded the screening levels, with the exception of a minor exceedance of screening levels for naphthalene at GSH-MW18-23, demonstrating that impacts do not cross Gary Road. There are also no drinking wells within one mile of the Site nor residential properties immediately downgradient of contaminated groundwater, so contaminated groundwater is not expected to impact off-Site residents.

In addition, a statistical evaluation was completed on the 12 rounds of groundwater data for parameters that exceeded the EPA MCL/IDEM-Tap (protective of drinking water), IDEM-Vapor-residential (protective of vapor intrusion), and/or IDEM-Vapor-commercial/industrial (protective of vapor intrusion) screening level in at least one sample. The evaluation was performed using the Mann-Kendall Trend Test, and the magnitude of any statistically significant trends identified was described by computation of Sen's Slope. Statistical trend analyses of parameter concentrations over time for facility related constituents (SVOCs and VOCs), where conducted, show that concentrations are stable or decreasing. The statistical evaluation is to be presented in the Corrective Measures Proposal (CMP).

4. 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):

Based on the documented groundwater flow direction and velocities there is no potential for Site-related constituents in groundwater to impact surface water in the natural area to the south or the Grand Calumet River. This is supported by data from the three monitoring wells downgradient of GSH-MW06-20: GSH-MW16-22, GSH-MW17-22, and GSH-MW18-23, which confirm that benzene, along with other SVOCs and VOCs, do not exceed screening levels protective of drinking water uses, off-Site, south of Gary Road. The exception is one slight exceedance over the screening levels for naphthalene at GSH-MW18-23 in one sampling event that was not replicated in subsequent sampling events.

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 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):

Skipped because of answer to Question 4

[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 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 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):

Skipped because of answer to Question 4

[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):

Proposed monitoring for groundwater is as follows:

Groundwater

As part of the CMP, OXY will propose a groundwater monitoring program, which will include periodic sampling of three off-Site (downgradient) monitoring wells GSH-MW16-22, GSH-MW17-22, and GSH-MW18-23, and a subset of on-Site wells (GSH-MW03-20, GSH-MW05-20, GSH-MW07-20, GSH-MW10-20, GSH-MW11-20, GSH-MW13-21). The purpose of the groundwater monitoring program is to confirm that groundwater conditions remain stable and to verify the conclusions of the RFI/HHRA, specifically that benzene concentrations remain at levels that do not pose unacceptable risk for potential on and off-Site receptors. EPA will evaluate the proposed groundwater monitoring program as part of the CMP review process. EPA also requested limited groundwater monitoring activities as part of ongoing site evaluation during the period leading up to the final approval of the CMP.

Monitoring wells will remain in place until EPA agrees that they can be removed.

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).

YE 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 Cities Service Refinery** facility, EPA ID # **INR 000 123 927 (**formerly part of IND 095 267 381**)**, located at **2500 Rear East Chicago Avenue in East Chicago, Indiana**. 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) RENEE WAWCZAK Digitally signed by RENEE WAWCZAK Date: 2023.10.31 14:40:04 -05'00' Date _____
(print)
(title)

Supervisor (signature) PETER RAMANAUSKAS Digitally signed by PETER RAMANAUSKAS Date: 2023.11.09 13:18:23 -06'00' Date _____
(print)
(title)
(EPA Region or State)

Locations where References may be found:

- RCRA Facility Investigation Report – October 1, 2021
- LNAPL Degradation Pilot Study Results Summary - January 18, 2023.
- Quarterly Progress Report – Q4-2022 – January 13, 2023 (additional well installation results)
- Quarterly Progress Report – Q1-2023 – April 12, 2023 (additional well installation results)
- Quarterly Progress Report – Q2-2023 – July 14, 2023 (additional well installation results)

Contact telephone number and e-mail

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