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: Bayer, Incorporated
Facility Address: 807 South Shady Avenue, Damascus, VA 24236
Facility EPA ID #: VAD 00 337 9062

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?

   ☒ 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).

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

1. 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?

☐ 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):

This Environmental Indicator Report for the Migration of Groundwater was developed as an update to the original document published on August 21, 2002. Its purpose is to provide additional information and make documentation of the remedial investigations for this site comprehensive for the public. The remedy decision established for the site in the original November 7, 1997, Statement of Basis has not been modified. The investigation results detailed in the following sections represent the results of the RCRA Facility Investigation (RFI) prior to the completion of Interim Measures (IMs).

A groundwater investigation was conducted to determine the potential impact of various source areas at the site to groundwater. A network of 21 monitoring wells (20 onsite and 1 offsite) was installed and 65 samples were collected across four rounds of sampling events for Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), total metals, cyanide, total phenolics, anions, and cations to evaluate groundwater impacts and flow conditions at the site. Low-flow sampling technique was employed to minimize sediment interference and to procure a more representative sample.

Heavy metals were detected intermittently across the site's monitoring well network. Below are the range of heavy metals detected in groundwater:

Constituents	Total Metals (µg/L)	Dissolved Metals (µg/L)	EPA Drinking Water MCLs (µg/L)
Arsenic	ND – 13.0	ND – 6.8	10
Cadmium	ND – 4.0	ND	5
Chromium	ND – 8.0	ND – 3.0	100
Copper	ND – 84.0	ND – 31.0	1300
Lead	ND – 483.0	ND – 21.7	15*
Nickel	ND – 113.0	ND – 117.0	N/A
Zinc	ND – 52.0	ND	N/A

Note: ND = Non-Detect; N/A = No established EPA-established screening levels, *EPA action level for lead.

Only lead and arsenic were detected above the EPA action level for lead and the Maximum Contaminant Levels (MCLs) for drinking water, respectively. The maximum detected concentration of lead, 483 ug/L, was identified in a sample analyzed for total lead and is anomalously high compared to all other filtered and unfiltered groundwater samples. Dissolved lead was detected above the EPA action level during one sampling event in two monitoring wells at concentrations of 20 µg/L and 21.7 µg/L. No subsequent sampling events detected dissolved lead at concentration above the EPA lead action level.

Similarly, arsenic concentrations were primarily detected in samples analyzed for total metals and were either absent or detected below its drinking water MCL of 10 ug/L in samples analyzed for dissolved metals.

The SVOC bis(2-ethylhexy)phthalate was also detected at a maximum concentration of 11.8 µg/L, which exceeds its associated MCL of 6 µg/L. Exceedances were observed in multiple monitoring wells across the Southern Non-Process Area. Concentrations ranged from non-detect to a maximum of 11.8 µg/L.

Concentrations of bis(2-ethylhexylphthalate) which exceeded the EPA Drinking Water MCL of 6 µg/L were not consistent across sampling events. Most well locations only had one sample which exceeded the MCL, and multiple subsequent sampling events showed either low-level or non-detectable concentrations of bis(2-ethylhexy)phthalate.

A risk assessment was completed for all identified compounds during the RFI to assess the risks posed to current receptors (trespassing adults and children), likely future receptors (recreational adults and children), and unlikely future receptors (residential adults and children) for the property. The risk assessment determined that the summed theoretical excess lifetime cancer risks for cancer-causing compounds identified at the site were within the acceptable risk range of 1e-6 to 1e-4, and the summed hazard index for non-cancer-causing compounds was below the acceptable benchmark of 1, except for potential lead exposure for future residential children.

All other VOCs, SVOCs, and metals were either not detected or were detected at concentrations below their respective MCLs for drinking water.

Neither a source area or distinct plume could be identified for any of the constituents detected above EPA MCLs or lead action level due to the intermittent detections and inconsistent detection locations between sampling events. While detections of lead above the EPA lead action level of 15 ug/L and arsenic above the EPA MCL of 10 ug/L were identified, the exceedances were only found in samples analyzed for total metals and were generally absent in samples analyzed for dissolved metals. Follow-up sampling also did not identify total or dissolved lead or arsenic concentrations above their respective action levels/MCLs. Based on these observations, the few lead and arsenic exceedances detected during groundwater sampling appear to be bound to subsurface sediments inside the aquifer underlying the site and are not mobile.

Given the lack of identifiable plumes or source areas, inconsistent detections, the immobility of metals and their absence in dissolved samples, and the risk assessment confirming concentrations of all identified compounds fall within acceptable risk ranges, groundwater is not considered to be contaminated above appropriately protective levels and does not pose any unnecessary risk to current or likely future receptors.

In the unlikely event that redevelopment is proposed which includes both residential site use and the use of site groundwater as a potable water source, additional evaluation of the should be performed to ensure an influent filtration system or other protective measure is not required to prevent exposure to lead from aquifer sediments.

(References: Final RCRA Facility Investigation Report [10/26/1995], Statement of Basis [11/07/1997])

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).

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

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

   ☐ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2].

   ☐ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) – skip to #8 and enter "NO" status code, after providing an explanation.

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

Rationale and Reference(s):

Footnotes:

[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.

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

3. 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):

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

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 judgment/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):

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

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

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 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):

Footnotes:
[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.

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

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):

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

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 - 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 Bayer, Incorporated Facility (VAD003379062) located at 807 South Shady Avenue, Damascus, VA 24236. 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 _____ Date 6/20/2025
Quinton Ulrich
USEPA Remedial Project Manager

Supervisor KRISTIN KORONCAI Digitally signed by KRISTIN KORONCAI Date: 2025.06.24 09:16:18 -04'00' Date _____
Kristin Koroncai
LCRD South Section Manager
USEPA Region 3

Locations where References may be found:

US EPA Region III
Land and Chemicals Division
1650 Arch Street
Philadelphia, PA 19103

Virginia Department of Environmental Quality
Office of Remediation Programs
629 East Main Street
Richmond, VA 23219

Contact telephone numbers and e-mail

Quinton Ulrich
215-814-2708
Ulrich.Quinton@EPA.gov

Kristin Koroncai
215-814-2711
Koroncai.Kristin@EPA.gov