DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

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

Facility Name: **Solvay (formerly Rhodia)**
Facility Address: **2300 South Pennsylvania Ave., Morrisville, PA**
Facility EPA ID #: **PAD002336410**

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

The Solvay facility is located in Falls Township, Bucks County, Pennsylvania, and occupies approximately 40 acres of a larger 90-acres property. The Site is bordered to the north by commercial properties, to the south by Biles Creek and vacant property, to the east by the Delaware River, and to the west by wooded areas and Pennsylvania Avenue. The 50- acres of the property is not occupied by the facility are wooded and were not used for, and remained un-impacted by, industrial processes or waste management activities.

The Site was operated as an inorganic chemical production facility from 1948 until December 2001. Operations were discontinued at the Site in later 2001. In early 2002, Rhodia began to demolish buildings and process equipment down to concrete slabs. The Site remained dormant from late 2002 through 2008. In 2008, demolition was reinterated. The only building currently remaining onsite is the former office building.

Throughout its operations history, numerous inorganic chemical products were produced at the Site for use in a variety of products, including food additives, dental paste, household cleaners, water treatment, dyes, flame retardants, and desiccants. The primary chemical produced at the Site was phosphoric acid. The main raw material for the production of phosphoric acid is phosphorus, which contain trace amount of arsenic. During the phosphoric acid manufacturing process, trace amounts of

arsenic were precipitated out of the phosphoric acid in the form of arsenic sulfide. The phosphoric acid was then filtered to separate and collect the arsenic sulfide precipitate.

The solid waste management units (SWMUs)/areas of concerns (AOCs) at the facility include: Burial site for phosphorus pentasulfide (P_2S_5); burial site for various sodium phosphates; acid waste pond; two arsenic sulfide settling tanks; two 50- by 100-foot and two 100- by 200-foot arsenic sulfide settling ponds; arsenic sulfide burial site; landfill consisting of clean fill, furnace brick containing residual arsenic and trash; storage area for P_2S_5 waste material in 55-gallon drums; burial site for P_2S_5; settling pond for stormwater runoff and process waste streams; P_2S_5 scrap and still residue drum storage area; and acid filter cake storage area.

Wastes generated from the production of phosphoric acid contain arsenic. The SWMUs that received arsenic wastes include the former arsenic trisulfide settling ponds, the former acid waste ponds, the former arsenic trisulfide burial site, and the landfill consisting of clean fill, furnace brick containing residual arsenic and trash. The former arsenic trisulfide settling ponds were out of service since 1971 and were backfilled upon closure. The arsenic sulfide burial site was closed in 1979 and clay capped, clay walled and seeded. The acid waste pond has been out of service since 1971. The landfill consisting of clean fill, furnace brick containing residual arsenic and trash was closed in 1972 and paved with asphalt.

Currently, the only building remaining on site is the former office building. The building is occupied by one Rhodia employee, for oversight of the Facility during the work week. Access to the facility is restricted by fencing. Groundwater at the site is not used as a source of drinking water. On August 14, 2001, Rhodia received PADEP's approval of the non-use aquifer designation request.

Groundwater investigation was conducted at the facility from 1979 to 2012. Groundwater flows east and south toward Biles Creek and Delaware River. Groundwater in shallow aquifer underneath the facility is contaminated with arsenic. Arsenic is not found to be present in the deep aquifer, due to a confining layer between the shallow and deep aquifers. Dissolved arsenic was detected in site wells at concentrations as high as 29,400 micrograms per liter (ug/l), above the MCL and PADEP MSC of 10 ug/l. The shallow aquifer is encountered from approximately 14 to 60 feet borings. The deep aquifer is present from approximately 130 to 170 feet borings. The two aquifers are separated by clay confining layers. Arsenic concentrations have decreased in Site wells overtime.

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).

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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?

☒ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

☐ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

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

Rationale and Reference(s):

Groundwater investigation at the facility was conducted from 1979 to April 2012. Dissolved arsenic was detected in Site wells at concentrations as high as 29,400 micrograms per liter (ug/l), above the MCL and PADEP MSC of 10 ug/l.

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).

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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)?

☒ 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):

The SWMUs that received arsenic wastes were out of service/closed since 1971. The arsenic sulfide burial site where arsenic was found at highest concentrations was capped with clay to prevent additional leaching of arsenic from the waste to the groundwater.

Groundwater investigation at the facility was conducted from 1979 April 2012. Concentrations of arsenic in the groundwater are decreasing thru natural attenuation.

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.

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

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

☐ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

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

Rationale and Reference(s):

The site is bordered to the south by the Biles Creek and to the east by the Delaware River. Contaminated groundwater from the facility discharges to the Biles Creek and Delaware River.

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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 concentration3 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 concentration3 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 concentrations3 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):

In 1998, surface water samples were taken from the Delaware River and Biles Creek by the facility. Arsenic was not detected in the upgradient and downgradient surface water samples from the Delaware River and Biles Creek. The effect of arsenic infiltrating into the Delaware River and Biles Creek from the facility groundwater was also evaluated. It was determined that the concentrations of arsenic discharge from the facility to the Delaware River and the Biles Creek are below the PADEP Surface Water Quality Criteria and therefore the discharge of groundwater contaminant from the facility into the surface water is not anticipated to have unacceptable impacts to the receiving surface water.

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

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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):

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.

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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):

Groundwater sampling of site wells was recently conducted in 2012. The groundwater sampling results indicated that the levels of arsenic in the groundwater are decreasing overtime. Concentrations of arsenic in the groundwater at the source area decreased from 29,400 ug/l (December 1979) to 8,700 ug/l (April 2012). Concentrations of arsenic at the facility boundary wells are also decreasing. Given that the source of arsenic groundwater contamination, the former arsenic trisulfide burial site, was out of service since 1971 and closed in 1979 (clay capped and clay walled), EPA expects groundwater concentrations of arsenic will continue to decline due to natural attenuation.

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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 Solvay facility, EPA ID # PAD002336410, located at 2300 South Pennsylvania Ave., Morrisville, Pennsylvania 19067. 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) _____ Date 3/16/2015
(print) Tran Tran
(title) RCRA Project Manager

Supervisor (signature) _____ Date 3/16/2015
(print) Paul Gotthold
(title) Associate Director
EPA Region 3

Locations where References may be found:

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