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: **Federal-Mogul Corporation**
Facility Address: **Garfield Avenue and Race Street Lancaster, PA 17604**
Facility EPA ID #: **PAD991298266**

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 (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).

Background:

Federal-Mogul Corporation (Fed-Mogul or "the Facility") operated a ball-bearing manufacturing facility on a 3.42-acre property on Garfield Avenue (between Race Street and N. West End Avenue), in Lancaster, Pennsylvania from the mid-1950s through the mid-1990s. The Facility contains two separate single-story structures which accommodated approximately 80,000 square feet of manufacturing space and 3,000 square feet of office space separated by three open courtyards. Manufacturing processes at the facility included machining, press work, heat treating, and grinding. The Facility is located in a light industrial, commercial, and residential use zone.

Several investigations have been conducted at Fed-Mogul: Facility Cleanup Report (1999), Site Characterization Report (2000), and investigations to meet Pennsylvania Department of Environmental Protection (PADEP) Act 2 requirements (2000 to 2004). The most recent on-site investigation was completed at EPA's request in December 2011 to assess the vapor intrusion pathway inside the east building. In addition, non-site related investigations were historically performed both upgradient and downgradient of the facility.

Federal-Mogul, Garfield Business Center LP (owner of the property immediately after Fed-Mogul), and PADEP executed a Consent Order and Agreement (COA) on July 2, 2004, requiring Fed-Mogul to obtain liability protection under Act 2 for the Facility. On August 30, 2004, PADEP approved the Facility's Remedial Investigation and Final Report (RIFR) and provided a letter to Federal-Mogul stating that the site attained a site-specific standard via pathway elimination and its post-remediation care plan. A deed notice acknowledging the presence of hazardous constituents at the Facility was required because site-specific standards were attained. The liability protection obtained from PADEP was transferred to Garfield Center, LLC, and subsequently to the current owner, the K & W Tire Company (K&W).

The K&W Tire Company (K&W) currently uses the property for warehouse operations and office space. K&W leases portions of the buildings to tenants for use as warehouse space and retail stores. The building on the western half of the property is currently occupied by Nolt's Auto Parts and Gallo Kitchen & Bath. None of the current business operating at the Facility are listed hazardous waste generators. A deed restriction that will remain with the property in future changes of ownership allows for only non-residential use of the property and prohibits the use of groundwater for any drinking or agricultural purpose.

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):

The Facility is located within the Piedmont Physiographic Province, and is underlain primarily by Cambrian-aged dolomite of the Ledger Formation. The presence of shallow groundwater in the overburden at the Facility was variable during the site characterization, with recoverable groundwater available in less than 10 percent (4 out of 48) of the soil borings. Where present, shallow groundwater was found at the interface between a clayey, silty soil and saprolite and the underlying bedrock. The depth to bedrock at the property varied between 5 to 15 feet bgs (shallower in the west courtyard (5 to 8 feet bgs) than the east courtyard and southern side of the property (12 to 15 feet bgs)). The shallow groundwater has been interpreted to be present under localized perched conditions since groundwater elevations in soil borings were higher than the elevations encountered in the bedrock. Groundwater in the fractured karstic bedrock was present at a depth ranging from 36 to 57 feet bgs and a radial flow direction was considered probable. Investigations at a facility located southwest of the former Fed-Mogul facility identified a contiguous, perched aquifer beneath that property which possibly could flow north/northeast towards the former Federal-Mogul facility.

In January 2000, a consultant for Fed-Mogul conducted an initial subsurface investigation that included the installation of 48 soil borings. Grab groundwater samples were collected from the four soil borings locations that yielded enough water for sample collection. Barium was detected in the groundwater at one location (SB-47, between Building 8 and the railroad) at a concentration of 9.51 mg/L, which exceeded the Residential Medium Specific Concentrations (MSC) of 2 mg/L as well as its EPA Regional Screening Level (RSL) of 2.9 mg/L for tap water. Chrysene was detected in the shallow groundwater at one location (SB-10 outside Building 8 adjacent to the railroad) at a concentration of 2.79 µg/L, which exceeded its MSC of 1.9 µg/L. This chrysene concentration did not exceed EPA's tapwater RSL of 2.9 µg/L. The above MSCs were interpreted in the June 2004 Remedial Investigation and Final Report (RIFR) to be inapplicable to perched groundwater pursuant to PA Code 250.303, subsection (a). After the RIFR was submitted, PADEP designated the City of Lancaster with non-use aquifer status on November 20, 2007. While the chrysene MSC remains 1.9 µg/L for non-use aquifers, the barium groundwater MSC for a non-use aquifer is 2,000 mg/kg, more than two orders of magnitude greater than the concentration observed at the Facility.

Four bedrock monitoring wells were installed by a consultant for Fed-Mogul in January 2001. These wells were sampled four times each between February 2001 and October 2002. No contaminants were detected in any of the samples collected from the bedrock aquifer at concentrations above the residential MSCs. Chlorobenzene was detected in the bedrock monitoring wells located in the east courtyard and the central courtyard at a concentration as high as 96 µg/L, which is below the groundwater used aquifer MSC and EPA's maximum contaminant level (MCL) of 100 µg/L. The non-use aquifer MSC for chlorobenzene is 10,000 µg/L.

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).

Chlorobenzene and benzene were detected in soil samples within a limited area (Buildings 3/4 and the east courtyard) of the facility at concentrations above PADEP's non-residential Soil-to-Groundwater MSCs. Soils with elevated chlorobenzene concentrations were documented at sample locations SB-28 and SB-29 (located within the southeastern end of Building 3) and sample locations SB-31 and SB-33 (located in the east courtyard). Soils with elevated benzene concentrations were documented at sample location SB-43 (located within Building 4). Although chlorobenzene and benzene were detected in soil samples from a limited area of the facility at concentrations above the non-residential Soil-to-Groundwater MSCs, neither constituent was detected in facility groundwater samples at concentrations above the MSCs.

The ACM Company, Inc. (ACM) is an office equipment supplier located at the corner of Garfield and West End Avenues directly across the street from the northeastern corner of the Facility. While ACM is across the street from the Facility, it is physically located in Manheim Township, not the City of Lancaster. The ACM property has been subject to remedial action since the removal of a leaking 1,000-gallon gasoline underground storage tank (UST) in October 2000. Contaminated soil and non-aqueous phase liquid (NAPL) were removed and a pump-and-treat system was operated from March 2004 through July 2010. In 2003, ACM's consultant informed PADEP the shallow groundwater beneath ACM contained concentrations of chlorobenzene and chrysene in exceedance of their respective Residential Used Aquifer MSCs. The highest concentration of chrysene ever observed in the ACM wells was 7.47 µg/L reported in monitoring well no. MW-3 during a March 2003 sampling event (MSC for chrysene is 1.9 µg/L). The highest reported chlorobenzene concentration (191 µg/L) was detected in monitoring well no. MW-5 during a November 2003 sampling event (MSC for chlorobenzene is 100 µg/L). The only apparent source of the chlorobenzene and chrysene contamination is the Federal-Mogul facility. Since ACM believed it was not responsible for the chlorobenzene and chrysene contamination, it stopped analyzing for those compounds in 2004.

In May 2009, PADEP collected split groundwater samples from three of thirteen ACM groundwater monitoring wells located north of the Facility. The three wells (MW-2, MW-3 and MW-5) are located in the immediate vicinity of ACM's former groundwater extraction well (PW-2). PADEP's groundwater samples were analyzed for volatile and semi-volatile organic compounds, including chlorobenzene and chrysene. The chlorobenzene concentration in MW-5, located upgradient of the groundwater extraction well in relation to the Federal-Mogul facility (and closest to the Federal-Mogul facility) was 121 µg/L, which exceeds the residential MSC. The chlorobenzene concentrations in MW-3 (west of MW-5 and also upgradient of the groundwater extraction well) and MW-2 (north of MW-5 and downgradient of the groundwater extraction well) were 58.6 µg/L and 43.6 µg/L, respectively. Concentrations of chrysene were below detection limits and less than the MSC in the groundwater samples collected from the three monitoring wells that were sampled by PADEP.

Ref: Fourth Quarter Remedial Action Progress Report, ACM Company, prepared by GCI Environmental Services, December 20, 2011; Final Environmental Indicator Inspection Report for Federal-Mogul Corporation, prepared by Michael Baker Jr., Inc., March 2010; Remedial Investigation and Final Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, June 21, 2004; Site Characterization Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, April 14, 2000.

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):

ACM's groundwater extraction system likely captured the chlorobenzene and chrysene plumes in addition to the gasoline-related compounds until the system was terminated on July 8, 2010. The pump and treat system has effectively reduced the concentrations of gasoline-related compounds. For example, benzene in MW-1 has dropped from as high as 463 µg/L in February 2001 to 24.2 µg/L in the latest available quarterly sampling event (November 2011). Reductions in concentrations of chlorobenzene have not been as dramatic, but the trend has been downward over time. The highest concentration observed in the three split samples collected by PADEP in May 2009 was 121 µg/L in MW-5 (still above the MSC of 100 µg/L but below the 191 µg/L seen in November 2003 at that location). Concentrations of chrysene in the three split samples were all below its residential used aquifer MSC (1.9 µg/L). ACM is currently in the process of collecting eight rounds of post-remedial groundwater sampling to demonstrate attainment of a site specific cleanup standard under PADEP's Act 2 program. PADEP is planning to once again split samples with ACM in order to analyze for chlorobenzene and chrysene in the eighth quarterly post-remedial sampling event, currently scheduled for May 2012.

Chrysene has historically been detected in only six of the 13 ACM monitoring wells that have been sampled for this constituent and it has only been detected at concentrations above the MSC one time each in two wells (MW-2 at 2.91 µg/L in November 2003 and MW-3 at 7.47 µg/L in March 2003). As stated above, this contaminant was not detected in the split samples collected by PADEP in May 2009, which were taken from MW-2, MW-3 and MW-5. Therefore, chrysene is no longer considered an off-site contaminant of concern in groundwater.

The chlorobenzene plume appears to emanate from the northeastern portion of the Facility off-site in a relatively narrow band in a northeasterly direction. The only exceedances of the MSC/MCL are seen in the vicinity of the former extraction well (PW-2) in the southeastern corner of the ACM property. MW-12, located approximately 80 feet northeast of PW-2, did exhibit a chlorobenzene concentration of 103 µg/L when last sampled for that compound in November 2003, but due to the ACM pump and treat operation, concentrations above the MSC are no longer suspected at this location.

Ref: Fourth Quarter Remedial Action Progress Report, ACM Company, prepared by GCI Environmental Services, December 20, 2011; Final Environmental Indicator Inspection Report for Federal-Mogul Corporation,

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.

prepared by Michael Baker Jr., Inc., March 2010; Remedial Investigation and Final Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, June 21, 2004; Site Characterization Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, April 14, 2000.

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):

No surface water features were identified in the immediate site vicinity. The nearest water body, a small tributary of Little Conestoga Creek is located approximately 0.3 mile north of the Facility. Little Conestoga Creek is approximately 1 mile west and the Conestoga River is approximately 2 miles east. The minimal remaining chlorobenzene groundwater contamination lacks the strength and mobility to impact any of these surface water bodies.

Ref: Fourth Quarter Remedial Action Progress Report, ACM Company, prepared by GCI Environmental Services, December 20, 2011; Final Environmental Indicator Inspection Report for Federal-Mogul Corporation, prepared by Michael Baker Jr., Inc., March 2010; Remedial Investigation and Final Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, June 21, 2004; Site Characterization Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, April 14, 2000.

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):

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):

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):

ACM is currently in the process of collecting eight rounds of post-remedial groundwater sampling to demonstrate attainment of a site specific cleanup standard under PADEP's Act 2 program. While ACM only analyzes its samples for gasoline-related compounds, PADEP is planning to once again split samples with ACM in order to analyze for chlorobenzene and chrysene in the eighth quarterly post-remedial sampling event, currently scheduled for May 2012.

Despite the exceedances of the MSCs/MCLs, there is no complete pathway between the contaminated groundwater and human receptors. The City of Lancaster is a PADEP-designated non-use aquifer area, which means that groundwater derived from wells or springs for drinking or agricultural purposes is prohibited within the city limits and all downgradient properties are connected to a community water system. While Manheim Township is not covered by the Lancaster non-use aquifer designation, it does have an ordinance in place (Section 11-3003) that requires all property owners to make connection with the public water system wherever the water system is available for public use. The PADEP Act 2 Post-Remediation Care Plan required a 5-year annual water use survey to ensure that properties within a 0.5 mile radius of the facility did not use the upper bedrock aquifer for purposes other than industrial supply. According to the annual surveys, the last known drinking water well, located at 1140 Dillerville Road (0.3 mile from the Facility), was connected to the Lancaster City public water supply in 2007. Officials from both the City of Lancaster and Manheim Township have been informed of the groundwater contamination in the site vicinity and have confirmed that no potable wells are located downgradient of the Facility. The nearest potable wells are located more than ¾ miles west (crossgradient) of the Facility.

Ref: Fourth Quarter Remedial Action Progress Report, ACM Company, prepared by GCI Environmental Services, December 20, 2011; Final Environmental Indicator Inspection Report for Federal-Mogul Corporation, prepared by Michael Baker Jr., Inc., March 2010; Remedial Investigation and Final Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, June 21, 2004; Site Characterization Report for Federal-Mogul Corporation Facility, prepared by Environmental Strategies Consulting, LLC, April 14, 2000.

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).

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 **Federal-Mogul Corporation** facility, EPA ID # **PAD991298266**, located at **Garfield Ave. and Race St. Lancaster, PA 17604**. 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 02/07/2012

(print) Andrew Clibanoff

(title) RCRA Project Manager

Supervisor (signature) _____ Date 02/07/2012

(print) Paul Gotthold

(title) Associate Director, Office of PA Remediation

(EPA Region or State) U.S. EPA Region III

Locations where References may be found:

USEPA Region III
Waste and Chemical Mgmt. Division
1650 Arch Street
Philadelphia, PA 19103

PADEP
Southcentral Regional Office
909 Elmerton Avenue
Harrisburg, PA 17110

Contact telephone and e-mail numbers

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