



**VIRGINIA DEPARTMENT OF ENVIRONMENT QUALITY**

**DIVISION OF LAND PROTECTION AND REVITALIZATION**

**OFFICE OF REMEDIATION PROGRAMS**

**STATEMENT OF BASIS**

**FEDERAL-MOGUL CORPORATION**

**(Formerly Abex Friction Products and Wagner Electric Co.)**

**EPA ID NO. VAD003070976**

**WINCHESTER, VIRGINIA**

**OCTOBER 31, 2016**

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## **1.0 INTRODUCTION**

### **1.1 Facility Name**

The Virginia Department of Environmental Quality (VDEQ or the Department) has prepared this Statement of Basis (SB) for the Federal-Mogul Corporation (formerly referred to as Abex Friction Products and Wagner Electric Corporation) facility located at 2410 Papermill Road, Winchester, Virginia 22601 (hereinafter referred to as the Facility).

The Facility is subject to the Corrective Action (CA) Program under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976, and the Hazardous and Solid Waste Amendments (HSWA) of 1984, 42 U.S.C. Sections 6901 to 6992k. The Corrective Action Program is designed to ensure that certain facilities subject to RCRA have investigated and cleaned up as necessary to protect human health and the environment, any releases of hazardous waste and waste constituents that have occurred at their property.

Information on the Corrective Action Program can be found by navigating <http://www.epa.gov/reg3wcmd/correctiveaction.htm>.

VDEQ has prepared this SB in cooperation with the United States Environmental Protection Agency (EPA) and is providing the opportunity for public comment and review on its proposal and the associated permit modification.

### **1.2 Proposed Decision**

This Statement of Basis explains VDEQ's proposed decision that further actions to remediate soil and groundwater, also known as corrective measures, are necessary to protect human health and the environment given current and reasonably anticipated future land use. VDEQ's proposed decision requires the Facility to continue In-Situ Chemical Oxidation (ISCO) application to treat groundwater, perform long term groundwater monitoring, and maintain certain property mechanisms known as Institutional Controls (ICs) and Engineering Controls (ECs). ICs are generally non-engineered mechanisms such as administrative and/or legal controls that minimize or eliminate the potential for human exposure to contamination. Engineering Controls are generally engineered mechanisms such as protective covers or caps. The proposed corrective measures objectives are discussed in Section 4.0 and the proposed remedy and controls are discussed in Section 5.0 below.

This Statement of Basis summarizes information that can be found in greater detail in the work plans and reports prepared and submitted by the Facility and reviewed by VDEQ and EPA, which can be found in the Administrative Record (AR). Attachments contain an index of documents for the AR and figures showing site location and the locations of Institutional and Engineering Controls.

### **1.3 Public Participation**

Interested persons are invited to comment on VDEQ's proposed decision by reviewing this SB and the documents contained in the AR. The information presented in this SB can be found in greater detail in the work plans and reports submitted by the Facility to VDEQ and EPA. To gain a more comprehensive understanding of the RCRA activities that have been conducted at the Facility, VDEQ encourages the public to review these documents, which are found in the AR. A copy of the AR is available for public review, in paper or electronic format, from the VDEQ contact person, the address and telephone number of which is provided in Section 9.0 below.

When making a determination regarding the proposed decision, VDEQ will consider all written comments received during the comment period (see Section 9.0), and requirements of the Virginia Hazardous Waste Management Regulations and 40 CFR Part 124. Each person who has submitted comments will receive a written response from VDEQ. VDEQ will then incorporate the final remedy into the Facility's Hazardous Waste Management Permit (Permit) after comments have been addressed.

### **2.0 FACILITY BACKGROUND**

The following provides a detailed description of the operational and ownership history of the facility.

Federal-Mogul Corporation (F-M) owns and formerly operated a brake liner production facility at 2410 Papermill Road in Winchester, Virginia (the Facility). F-M purchased the Facility in 1998. The site consists of an approximately 400,000 square-foot former Manufacturing Building and several smaller structures on a 40-acre property. The former Manufacturing Building is constructed of concrete block on a concrete slab; the third story is steel-framed with aluminum siding. The building contains former offices, shipping, receiving, storage, and manufacturing areas. The facility is bounded by CSX Railroad property on the west and Pleasant Valley Road on the east.

The physical plant was constructed during World War II on undeveloped land for defense production. After the war in 1947, the Facility was refitted for production of brake liner materials. Abex Corporation owned and operated the Facility from 1947 until 1988. Pneumo-Abex Corporation owned and operated the Facility from 1988 until 1994. Wagner Electric Corporation purchased the Facility in November 1994, and occupied the Facility until October 1998, when F-M purchased Cooper Automotive, which included Wagner Electric. F-M is the current owner and operator of the Facility. Active production activities ceased on March 28, 2013, and Facility activities now consist of maintaining site security and the property in compliance with the current Hazardous Waste Management Permit requirements.

The plant's principal products have been brake linings and disc pads for the heavy truck/automobile industry since production started in 1948. Although the production process remained essentially unchanged, the raw materials were changed in January 1988

such that the waste generated was no longer hazardous. Before 1988, the manufacturing process produced waste that was managed in surface impoundments and an on-site waste pile. The waste generated at the facility before 1988 contained lead and asbestos. The waste pile used to manage these hazardous wastes (primarily lead) and the associated surface impoundments were closed as RCRA “landfills” in 1984 and in 1991, respectively. The closed landfills are located on the northern portion of the F-M property with an inactive, closed non-hazardous waste landfill. Vegetation covers the ground surface and a fence encloses the RCRA landfills.

The former Print Shop is a smaller building located north and east of the former Manufacturing Building. These are separated by asphalt pavement. The former Print Shop was used until 1977 for part of the brake liner manufacturing process. Then from approximately 1977 to 1982 manufacturing equipment was removed from the Manufacturing Building and stored in the Print Shop. In 1982, the smaller building was converted to a Print Shop with a photographic lab for producing brake product marketing materials. The building reportedly had a satellite hazardous waste storage area beginning in the 1980s. Its use as a Print Shop was discontinued in late 2004. The building is vacant today and was used for limited material (i.e., non-chemical) storage and periodically as a meeting facility.

### 3.0 SUMMARY OF ENVIRONMENTAL HISTORY

Based on a review of files maintained by the VDEQ and EPA Region 3, a number of solid waste management units (SWMUs) and Areas of Concern (AOCs) were identified at the Facility. A site layout map is included as Figure 1 showing the location of each SWMU and AOC. The following table lists each SWMU and AOC.

**SWMU and AOC Identification Table**

<b>Identification</b>	<b>SWMU/AOC Name</b>
SWMU #1	Former Surface Impoundments #1 & #2
SWMU #2	Former Surface Impoundments #3 & #4
SWMU #3	Former Waste Pile
SWMU #4	Former Slurry Tanks (4 tanks)
SWMU #5	Former Drum Storage Area
SWMU #6	Transfer Stations (one former and one active)
SWMU #7	Former Non-hazardous Industrial Landfill
SWMU #8	Former Non-hazardous Burn Area
SWMU #9	Former Waste Pelletizing
SWMU #10	Former Active (<90 day) Storage Area
SWMU #11	Former Used Metal Storage Area
SWMU #12	Former Waste Conveyance Lines
SWMU #13	Former Satellite Hazardous Waste Storage Areas (<90 day, various locations)
AOC-1	Area around Apex well MW-4

AOC-2	Buried Black Fibrous Material
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A RCRA CA remedy for SWMU #5 (the former drum storage area) was approved by EPA Region 3 as part of a modification to the Facility's Hazardous Waste Management Permit in September 1994. The CA remedy for the SWMU #5 was subsequently incorporated into the Department's Hazardous Waste Management Permit in 1997 along with site-wide groundwater monitoring requirements. The final remedy elements for SWMU #5 have been implemented and maintained by the facility, and will continue to be required as part of the overall final CA remedy. Details on required maintenance and use-restrictions are provided in Section 5.0 below.

Based on operating history and records, it was determined by VDEQ that no further investigation or action was necessary at SWMUs #2, #4, and #6 through #13 in order to meet the goals of the Corrective Action program.

SWMUs #1 and #3 are discussed under the RCRA Closure Activities below. Controls for these SWMUs are in place (as required by the Hazardous Waste Management Permit, EPA ID NO. VAD003070976) and will be maintained as part of the overall CA remedy.

Below is a summary of the Facility's closure activities and environmental investigations.

**RCRA Closure Activities**

Before 1988, the manufacturing process produced waste that was managed in surface impoundments and an on-site waste pile. The waste generated at the Facility before 1988 contained lead and asbestos. The former waste pile (SWMU #3) used to manage these hazardous wastes (primarily lead along with asbestos) and the associated surface impoundments #1 and #2 (SWMU #1) were closed as RCRA "landfills" in 1984 and in 1991, respectively. Surface impoundments #3 and #4 (SWMU #2) were clean closed in December 1989 and November 1990, and are currently used for stormwater management.

The closed RCRA landfills are located on the northeastern portion of the F-M property. The closed RCRA units are related to Area of Concern AOC-2; they are adjacent, just north and partially surround the area of AOC-2. (Additional details regarding AOC-2 is provided below under "RCRA Facility Investigation Activities"). Grass vegetation covers the ground surface of the landfills and a fence encloses the closed RCRA units. As stipulated in the Hazardous Waste Management Permit (effective August 30, 2006 through August 30, 2016), compliance monitoring of certain groundwater monitoring wells is currently completed on a semi-annual basis. In addition, monthly inspections and maintenance checks are performed on the closed RCRA landfills.

## **RCRA Facility Investigation Activities**

Investigation results for soil and groundwater at the Facility were initially reported in a Phase II Subsurface Investigation completed by Apex Environmental, Inc. (Apex) in 1995. The findings of this investigation were summarized by Environmental Strategies Consulting LLC (ESC) in their *Site Investigation Report* (February 2005), which led to the identification of the geographical areas that became known as AOC-1 and AOC-2. The 2005 ESC report also detailed the investigation activities performed by ESC from 2002 through 2005 which documented further characterization of the two AOCs at the facility. The delineation of these AOCs was later refined in Environmental Resources Management, Inc. (ERM)'s *Supplemental Investigation Report* (July 2006), along with additional investigation activities conducted from 2007 to 2008 by ERM and reported in *RCRA Interim Measures Design Program: AOC-1* (March 30, 2007) and *Revised AOC-2 Work Plan* (August 14, 2008). In general, the Areas of Concern (AOC-1 and AOC-2) were identified as follows:

- AOC-1: A localized area around Apex monitoring well MW-4 where elevated concentrations of trichloroethylene (TCE) and its breakdown products have been detected in shallow groundwater.
- AOC-2: The presence of buried black fibrous waste material in the vicinity of, but outside the closed, former RCRA waste management units at the facility. The black fibrous waste material includes areas of the property within the fence that encloses the RCRA closed, former waste pile and landfills (later referred to as AOC-2a and AOC-2b), as well as an area just outside of that fence (later referred to as AOC-2c).

Most recently, a focused site characterization was completed and summarized in the June 11, 2013 *Supplemental Site Characterization Report*. A revised *RCRA Corrective Measures Study for AOC-1 and AOC-2* that evaluated potential corrective measure alternatives for those two AOCs was submitted in July 2015 and approved by the VDEQ on February 11, 2016. More detailed investigation activities and results related to AOC-1 and AOC-2 can be found below.

### **AOC-1**

During various investigations at the Facility an area of groundwater was discovered that contained elevated concentrations of volatile organic compounds (VOCs), mainly trichloroethene (TCE). The initial investigation in 1995 found elevated levels of TCE in the area around monitoring well MW-4 near the former Print Shop. Groundwater samples from other surrounding wells did not contain concentrations of VOCs above Virginia's Groundwater Protection Standards (GWPS) at that time.

In 2003 and 2004, six additional groundwater monitoring wells (MW-12, MW-13, MW-14, MW-15, MW-16, and MW-17) were installed and tested to evaluate the presence and concentration of certain VOCs believed to be associated with former Facility operations. At these new wells, elevated levels of VOCs (again, mainly TCE) were detected in groundwater samples from one well (MW-16) in 2008. After these analyses, site

investigations concluded that the area containing TCE in groundwater appeared to be localized and confined to the weathered bedrock zone in the vicinity of MW-4. Additionally, the location of MW-4 appeared to reflect a depression in the surface of the bedrock, and as such, the elevated levels of TCE suggest the presence of a “sink” where dissolved TCE has accumulated. The absence of TCE in deeper wells further supported the conclusion that the presence of TCE was limited to the uppermost weathered/fractured bedrock zone, generally encountered from 20 to 35 feet below ground surface.

Supplemental investigation of the groundwater around MW-4 was conducted by ERM in 2006, including sampling and installation of two additional monitoring wells (MW-32 and MW-33). The 2006 data validated the local groundwater conditions and were consistent with results from previous investigations, indicating that the presence of TCE in the groundwater corresponded to a low point in the bedrock surface around MW-4.

Additional investigations have been conducted by ERM since 2008 to support the design and implementation of Interim Measures (IMs) for AOC-1. Injection wells IW-1 through IW-7 were installed in 2008 around MW-4 in preparation for a planned in-situ chemical oxidation (ISCO) IM remediation program. The locations of these oxidant application wells were selected to take advantage of the shallow groundwater flow gradient (i.e., to the east-northeast) to treat the area with the highest total VOC concentrations in groundwater. The wells were screened in water-producing fracture zones of the underlying bedrock. Consistent with the presumed TCE source located by MW-4, elevated TCE concentrations were noted particularly in IW-1 and IW-2, the wells closest to MW-4. An additional application well (IW-8) was later installed in 2009 in an attempt to better delineate the lateral extent of chlorinated solvents in the northwestern direction and to facilitate groundwater treatment in this area. Three groundwater recovery wells and one additional monitoring well were also installed in 2009. The recovery wells (RW-1, RW-2, and RW-3) were installed hydraulically down-gradient of the application wells, while the new monitoring well (MW-34) was installed to monitor groundwater quality down-gradient of the ISCO treatment area and recovery wells.

The Facility continues to sample and analyze groundwater on a quarterly basis to monitor and evaluate the effectiveness of the ISCO treatment. Greater detail on these results can be found in the Quarterly Progress Reports submitted by the Facility to VDEQ. Groundwater monitoring data collected from 2005 to present has shown that VOC constituents have not migrated offsite.

The location of AOC-1 and the groundwater well locations are depicted on Figure 2.

#### AOC-2

In 2004, during installation of monitoring wells within the fenced RCRA area, a black, fibrous material was observed in the borings. The material sampled from the borings



contained between 5 and 7 percent chrysotile asbestos. Boring log descriptions (e.g., black silt, dark potentially charred material, and black mottling) from the Apex 1995 investigation indicated that suspect anthropogenic materials were observed at several other soil boring locations within the RCRA area. Because the black fibrous material was encountered at a location within the delineated RCRA area, further investigation was conducted to delineate the distribution of this material.

The ESC 2005 *Site Investigation Report* documented the presence of black fibrous waste material at site locations immediately outside of the closed RCRA landfills. In 2006, ERM performed a supplemental investigation that delineated the lateral extent of the black fibrous waste material. The identified fibrous waste areas included:

- a) within the grassed area north and west of the former pelletizer room;
- b) beneath the asphalt driveway (located between the northeast wall of the former Manufacturing Building and south of the closed RCRA unit fence); and
- c) between the closed waste impoundments and the closed waste pile (the closed RCRA sites) and extending south to the RCRA fence and the asphalt pavement west of the former Print Shop.

Test results from waste material sampling indicated that the black fibrous waste material contains, at certain locations, asbestos at greater than one percent, and lead at concentrations that exceeded regulatory limits.

To provide the most effective remediation of the area where waste was identified outside of what was believed to be the closed RCRA landfill units; AOC-2 was divided into three areas because of the different characteristics of each area. AOC-2 is shown on Figure 1 and descriptions of each area are provided below:

- AOC-2a is an approximately two acre area. The existing compacted clay cap located in the area was determined to be similar to that of the existing closed waste pile. This cap met the objectives set forth in the 1984 Waste Pile Closure Plan; therefore, no further corrective measures were warranted by the available information beyond the permit-required post-closure care consisting of groundwater monitoring, inspection, and maintenance.
- AOC-2b is an approximately one-fourth acre area inside the fence that encloses the RCRA closed landfills. Site investigations determined that the cap in this area did not meet the specifications described in the 1984 Waste Pile Closure Plan. The Waste Pile Closure Plan called for a cap consisting of two and one-half feet of compacted clay overlain by six inches of topsoil; Site investigations discovered the thickness of the barrier over waste within AOC-2b ranged between 0.9 and 1.9

feet based on soil borings conducted by ESC and ERM. It is thought that the 1984 closure activities may have intentionally covered this area with less clay and/or topsoil to address slope, drainage, and erosion concerns as the area provides drainage for areas up-gradient of the on-site surface water ponds via a shallow swale.

- AOC-2c is an approximately one-half acre area outside of the RCRA fence that contains similar buried waste material that was covered by both asphalt pavement and grass. The asphalt paved portion of this area had active vehicular traffic from facility operational activities. AOC-2c is now covered with a supplemental cap and asphalt pavement as described below under “Interim Measures”.

### **Interim Measures**

Interim Measures were conducted for AOC-1 and AOC-2 under RCRA policy to stabilize and mitigate threats to human health and the environment in an accelerated manner. Detailed work plans were prepared and submitted to the VDEQ for review, comment, and ultimate approval. Subsequently, IM Work Plans and Design Programs were prepared by ERM and approved by the VDEQ for each AOC. A summary of the IMs conducted is presented below.

#### **AOC-1**

To address AOC-1, the application of ISCO utilizing sodium permanganate as an oxidant in the area of MW-4, was selected as an IM remedial design. This remedial technology is well-documented in its effectiveness and was selected because it will further mitigate the potential for groundwater with VOC concentrations above GWPS to migrate off-site. The ISCO application with permanganate was designed to fully mineralize the TCE to carbon dioxide and salt (chloride, Cl<sup>-</sup>). Several treatability studies were conducted leading up to the implementation of the ISCO remediation system, including natural oxidant demand (NOD), a dye trace study, a geophysical study to determine shallow-bedrock fracture orientation, and aquifer testing, to ensure effective contact between the reagent and TCE source area to maximize the oxidation reaction in the source area and the effectiveness of the ISCO application.

The original ISCO application system that was designed for the Facility was a “recirculating” system whereby extracted groundwater was amended with sodium permanganate and returned to the aquifer hydraulically up-gradient of the treatment area. In this manner, the extracted groundwater served two primary purposes:

1. Create a dilute oxidant solution for application, eliminating the need to add excess water to the site that could potentially impact the existing hydraulic conditions; and

2. Provide advection of the injected fluid to facilitate flushing (desorption and treatment) within the affected treatment zone using the oxidant solution.

At the conclusion of each application event, the ISCO system was flushed with un-amended groundwater and drained. The system remained in place for potential additional application events. The necessity of additional application events was determined following a review of the data from each post application event groundwater sampling. Two ISCO application events have taken place using the recirculation method and system. The first application was conducted from 2009 to 2010 and the second application was conducted in 2011. The above-ground application equipment (i.e. mixing tank) was removed from the Facility in 2014 since a subsequent ISCO application performed in 2015 used mobile application equipment and the fixed tank was no longer needed.

Upon review of site groundwater data, two areas up-gradient of the initial ISCO application area which were not treated by the initial IM remedial design were identified and included as part of the ISCO application program:

- The area to the west around MW-16 and MW-33;
- The MW-12 area, directly south and up-gradient of the MW-4 well area.

ERM proposed a focused site characterization in the area of MW-16 and 33, as well as in the area of MW-12 to facilitate effective ISCO application in these areas. This supplemental site characterization work was approved by VDEQ on February 7, 2013. Soil sampling and groundwater well installation (MW-101 through MW-113) and sampling were conducted in 2013. The characterization results were summarized in the June 12, 2013 *Supplemental Site Characterization Report*. Based upon the results of the focused site characterization and prior ISCO application events, an ISCO groundwater remediation application (the third application) was recommended to target the MW-16, MW-33, and MW-12 areas. The third ISCO application using a low-pressure, mobile application process was completed during the period of April 6, 2015 to May 5, 2015.

Groundwater monitoring continues to be conducted to monitor the results of the ISCO applications. Currently, groundwater concentrations of TCE and its breakdown products exceed GWPS in some monitoring wells. As discussed in Section 5, the Facility will continue active groundwater remediation at AOC-1 using ISCO application or other remediation technology approved by VDEQ.

## AOC-2

To address AOC-2, an IM remedial design was selected involving installation of a RCRA-equivalent cap at AOC-2b and 2c. The caps were designed to achieve compliance with the RCRA Cap Equivalency Standards.

For AOC-2b, the supplemental cap utilized the existing compacted clay that is present above the waste materials as the base low permeability soil layer and a supplemental cap approved by VDEQ. The supplemental cap was constructed of the following:

- 40-mil smooth high-density polyethylene (HDPE) geomembrane;
- 200-mil double-sided geocomposite with 10 oz/yd<sup>2</sup> non-woven geotextile; and
- Minimum 10-inches of soil seeded with grass and other vegetative ground cover.

The AOC-2c supplemental cap consisted of the following elements as approved by VDEQ:

- 7.5 oz/yd<sup>2</sup> non-woven geotextile;
- 40-mil smooth HDPE geomembrane;
- 200-mil double sided geocomposite with 10 oz/yd<sup>2</sup> non-woven geotextile;
- 3.8 oz/yd<sup>2</sup> non-woven orange geotextile (warning layer);
- Subsurface warning tape with continuous wording as follows: “Hazardous Waste – Do Not Enter” at five foot intervals;
- Minimum six inches of VDOT No. 21-A dense graded aggregate as the asphalt sub-base;
- Four inches of base course asphalt (VDOT BM-25.0); and
- Two inches of wearing course asphalt (VDOT SM-9.0A).

VDEQ approved the IM design for AOC-2b and AOC-2c on September 9, 2008. Installation of the supplemental caps at AOC-2b and AOC-2c was conducted during October to November 2009 by ERM contractors, EWMI and Chenango Contracting, a specialty geosynthetic liner installation firm.

Subsequent to the completion of those installation activities, AOC-2b and AOC-2c were surveyed, along with the entire RCRA closed landfill area inside the fence (including AOC-2a). Additionally, as part of the AOC-2 IM, a deed restriction was recorded with the City of Winchester on January 23, 2012 for AOC-2b and AOC-2c to amend the existing deed restriction information for the previously closed RCRA surface impoundments and waste pile. The deed restriction restricts subsurface disturbance within the boundaries of these areas without prior notification and approval of VDEQ.

## **Current Conditions**

### **AOC-1**

Currently, the contaminated groundwater area at issue, which primarily consists of TCE and breakdown products, is contained onsite and is limited to the uppermost weathered/fractured bedrock zone in a localized area. The TCE and breakdown products are present in the vicinity of MW-4, near the Print Shop. TCE is present above the GWPS in seven groundwater wells within approximately 150 feet of MW-4. The highest concentration of TCE is currently found at MW-33 and MW-4. Figure 2 shows the location of groundwater monitoring wells. The facility is continuing interim measure activities for AOC-1 by monitoring concentrations of Constituents of Concern (COCs), including TCE and its breakdown products and other chlorinated and non-chlorinated VOCs in groundwater on a quarterly basis. Analytical data are submitted to VDEQ in routine progress reports.

### **AOC-2, SWMU #1, SWMU #3, SWMU #5**

The Facility currently conducts semiannual groundwater compliance monitoring for the closed RCRA landfills (SWMU #1 and #3) in accordance with the requirements of the Hazardous Waste Management Permit. Groundwater monitoring results are routinely reported to the VDEQ and the results currently show parameters are below applicable permit limits or have alternate source demonstrations approved by VDEQ. The vegetative cover on the closed RCRA landfills and AOC-2b is routinely inspected and maintained to ensure its integrity. Site personnel continue to monitor site security, including the existing perimeter fencing. A pest management contractor is utilized to manage any rodents in the closed RCRA landfill area on a seasonal basis. In addition, site personnel perform monthly inspections of SWMU #5, including integrity of the asphalt cap, as required by the Facility's Hazardous Waste Management Permit.

## **4.0 CORRECTIVE ACTION OBJECTIVES**

### **A. Closed RCRA Landfills and SWMU #5**

VDEQ has determined that industrial risk-based levels are protective of human health and the environment for individual contaminants at this Facility provided that the closed RCRA landfills and SWMU #5 areas are not used for residential purposes. Deed restrictions prohibiting residential use have been imposed by the Hazardous Waste Management Permit. Accordingly, VDEQ's Corrective Action Objectives for these Facility areas are the following:

1. To control exposure to the hazardous constituents remaining in place by requiring compliance with and maintenance of land use restrictions at the Facility. This restriction is imposed by the Facility's Permit; and
2. To prevent infiltration of stormwater and control exposure to the hazardous constituents remaining in place in the closed RCRA landfills and SWMU #5 by

requiring existing RCRA caps and asphalt covers to be maintained at the Facility. This restriction is imposed by the Facility's Permit.

**B. Groundwater**

VDEQ has determined that drinking water standards, namely Maximum Contaminant Levels (MCLs) or risk-based Alternate Concentration Limits (ACLs) for constituents that do not have an MCL, for COCs in groundwater at the Facility are protective of human health and the environment. VDEQ's Corrective Action Objectives for Facility groundwater are the following:

1. To control exposure to the hazardous constituents in the groundwater by requiring compliance with and maintenance of a groundwater use restriction at the Facility as long as drinking water standards are exceeded. This restriction will be imposed by the Facility's Permit;
2. To remediate groundwater using in-situ chemical oxidation (ISCO) technology or other groundwater remediation technology approved by the VDEQ; and
3. To monitor stability and/or attenuation of concentrations of the following hazardous constituents in groundwater until drinking water standards are met:

Remedial Cleanup Goals

Constituent	Remedial Goal (ug/L)	Basis
Trichloroethene (TCE)	5	EPA Drinking Water MCL
cis-1,2-Dichloroethene (cis-1,2-DCE)	70	EPA Drinking Water MCL
trans-1,2-Dichloroethene (trans-1,2-DCE)	100	EPA Drinking Water MCL
Vinyl Chloride (VC)	2	EPA Drinking Water MCL

ug/L = micrograms per liter

**C. Indoor Air**

VDEQ's Corrective Action Objective for indoor air is to control exposure to volatile hazardous constituents in indoor air by requiring the use of vapor mitigation in or beneath existing and any newly constructed totally enclosed structures designed for occupation within 100 feet of the foot print of groundwater having site-related VOCs and SVOCs identified above protective levels (MCLs/ACLs), unless it is demonstrated to VDEQ that vapor mitigation is not necessary to protect human health. For existing building(s) that are designed for occupation but are not currently occupied (i.e. vacant), the need for vapor intrusion mitigation measures shall be assessed should the use of such building(s) be modified from its current use in such a manner that vapor intrusion could reasonably become an unacceptable human health risk. The method of assessment will be based on

current VDEQ and/or EPA risk assessment guidance. This requirement will be imposed by the Facility's Permit.

## **5.0 SUMMARY OF PROPOSED REMEDY**

### **A. Summary**

Under this proposed remedy, VDEQ is requiring the following actions:

1. Maintain existing engineering controls consisting of RCRA caps and asphalt cover at the closed RCRA landfills and SWMU #5. Conduct routine inspection and maintenance of the controls, and place and maintain notification signs at the perimeter of the capped/covered areas.
2. Continue active groundwater remediation at AOC-1 using ISCO application or other remediation technology approved by VDEQ.
3. Continue the groundwater monitoring program to confirm stabilization and/or reductions in hazardous constituents on site, and to confirm hazardous constituents do not migrate beyond the facility boundary at concentrations above their GWPS. The groundwater monitoring program will include sampling and analysis of hazardous constituents necessary to confirm the above conditions, taking into consideration previous groundwater data collected from the site.
4. Maintain compliance with land use restrictions and institutional controls. Institutional controls are imposed by the Facility's Permit and include the following:
  - A. The closed RCRA landfills and SWMU #5 area of the Facility shall not be used for residential purposes or for children's (under the age of 16) daycare facilities, schools, or playground purposes.
  - B. Groundwater beneath the property shall not be used for any purposes except for environmental monitoring and testing, or for non-contact industrial use as may be approved by VDEQ. Any new groundwater wells installed at the facility area must be approved by VDEQ.
  - C. Excavation and disturbance in RCRA capped and asphalt covered areas shall be prohibited. Future modifications at the property that could be reasonably understood to adversely affect or interfere with the integrity or protectiveness of the final remedy will be evaluated by VDEQ to identify and address unacceptable potential impacts or interferences with corrective measures or Facility environmental conditions. VDEQ shall approve any requested removal, disturbance, or alteration at the property, including, but not limited to groundwater monitoring wells, unless the removal, disturbance, or alteration violates a deed restriction or creates unacceptable risk to human health or the environment.
  - D. Vapor intrusion mitigation measures shall be installed in any existing or newly constructed totally enclosed building(s) designed for occupation within 100 feet of the footprint of groundwater having site-related VOCs and SVOCs identified above protective levels (MCLs/ACLs), unless it is

demonstrated to VDEQ that vapor mitigation is not necessary to protect human health. For existing building(s) that are designed for occupation but are not currently occupied (i.e. vacant), the need for vapor intrusion mitigation measures shall be assessed should the use of such building(s) be modified from its current use in such a manner that vapor intrusion could reasonably become an unacceptable human health risk. The method of assessment will be based on current VDEQ and/or EPA risk assessment guidance. Vapor intrusion mitigation measures may be waived with VDEQ approval based upon a demonstration that mitigation measures are not necessary for protection of human health.

## B. Implementation

VDEQ proposes to implement the remedy through the Facility's Hazardous Waste Management Permit for Post Closure Care and Site-Wide Corrective Action. Therefore, VDEQ does not anticipate any regulatory constraints in implementing its remedy.

## C. Reporting Requirements

Compliance with and effectiveness of the proposed remedies and institutional controls at the Facility shall be evaluated and included in annual groundwater monitoring and corrective measures implementation reports. The Facility shall notify the Department every three years of whether the institutional controls are being observed.

## **6.0 EVALUATION OF VDEQ'S PROPOSED DECISION**

This section provides a description of the criteria VDEQ used to evaluate the proposed decision for AOCs 1 and 2, consistent with EPA guidance. The criteria are applied in two phases. In the first phase, VDEQ evaluates three decision threshold criteria as general goals. In the second phase, for those remedies which meet the threshold criteria, VDEQ then evaluates seven balancing criteria to determine which proposed decision alternative provides the best relative combination of attributes.

The Facility's *RCRA Corrective Measures Study for AOC-1 and AOC-2, November 2013, Revised June 2015*, documents the screening of four (4) IM alternatives for AOC-1 and three (3) IM alternatives for AOC-2. Evaluation of the alternatives resulted in the selection of In-situ Chemical Oxidation (ISCO) with groundwater monitoring for AOC-1 as the final corrective measure. For AOC-2, installation of an engineered cap including cap inspections, maintenance, and a deed restriction was selected as the final remedy.

### **A. Threshold Criteria**

#### 1. Protect Human Health and the Environment



Based on the results of investigations and cleanup activities all known sources of contamination have been characterized and have been or are currently being addressed. The proposed remedy includes institutional and engineering controls which protects human health and the environment from exposure to hazardous constituents in groundwater, indoor air, and in soil.

AOC-1 - Human health and the environment are protected by destruction of TCE (and related VOCs) within the groundwater with treatment to meet GWPSs onsite and to prevent offsite migration above GWPSs. Also groundwater is precluded for potable use on-site and within the City of Winchester.

AOC-2 - Human health and the environment are protected by eliminating potential contact pathways, minimizing infiltration that could potentially leach contaminants from the waste into the groundwater, and controlling the release of asbestos from the waste.

## 2. Achieve Media Cleanup Objectives

AOC-1 - The target TCE remediation objective established by VDEQ (and the VDEQ remedial action targets for the other VOCs present in groundwater), can be reasonably achieved by this remedy, combined with long-term groundwater monitoring to confirm that the media standards have been met. The technology is proven to be effective in destroying dissolved chlorinated ethenes.

AOC-2 - There are no media clean-up standards, as set by the implementing agency, for AOC-2. However, engineering and institutional controls ensure overall protectiveness.

## 3. Remediating the Source of Releases

AOC-1 - ISCO is a proven technology for source area treatment of chlorinated ethenes in groundwater. Its use at the Facility to date has demonstrated its effectiveness for the conditions at the Facility. The potential for migration of the impacted area is controlled through targeted treatment of the impacted area source.

AOC-2 - The potential for leaching of lead into the groundwater and release of asbestos into the air from the known sources of those constituents is eliminated by installation of a low permeability barrier over the waste.

## **B. Balancing/Evaluation Criteria**

### 1. Long-Term Effectiveness

AOC-1 - This remedy provides for the permanent destruction of TCE and its breakdown products. Continuous oversight of the application will ensure effectiveness throughout the operation. Additionally, the oxidizing solution would continue to break down TCE until the oxidant solution is fully consumed, which can occur for up to several years. Monitoring of groundwater quality will help track remedial progress subsequent to the ISCO application activity, and ensure that remedial objectives are met over the long-term.

AOC-2 - An engineered cap, already in place at AOC-2, is a reliable and well-documented approach for long term waste cover and is utilized by modern landfills. The remedy provides for maintenance of the cap to ensure long-term protectiveness. Deed-recorded institutional controls should also provide long-term protection.

## 2. Reduction of Toxicity, Mobility, or Volume of the Hazardous Constituents

AOC-1 - The mass of TCE would be significantly reduced by ISCO; as a result, the toxicity and volume of impacted groundwater will be reduced.

AOC-2 - The mobility of lead and asbestos within the black fibrous waste is reduced as a result of the existing cap.

## 3. Short-Term Effectiveness

AOC-1 - Although the oxidizing solution will interact with TCE (and its breakdown products) immediately upon contact and treat the TCE promptly, achieving the corrective action target concentrations for the respective compounds may take up to several years during the period where the oxidant remains viable in solution and migrates through the impacted fractured bedrock water-bearing zone. There are no meaningful adverse short-term impacts associated with the ISCO application, as demonstrated by application of the technology to date.

AOC-2 – The engineered cap system became immediately effective once it was constructed in place and should have no meaningful adverse impacts in the short-term.

## 4. Implementability

AOC-1 – ISCO is a demonstrated technology that is readily implemented, as demonstrated by its previous application at the facility and elsewhere. An ISCO system requires numerous controls to ensure effective and safe application. Experienced and capable personnel will be utilized to perform the ISCO applications. A hydraulic investigation is also utilized to understand the subsurface hydrogeology of the site to determine suitable application points and groundwater flow to enhance oxidant distribution within the aquifer. In addition three applications have already been successfully implemented.

AOC-2 – The engineered cap has already been constructed and will be maintained.

## 5. Cost

AOC-1 - The total opinion of probable cost (OPC) for this remedy was estimated at approximately \$600,000(based upon three application events). A majority of the cost is associated with investigations and installation costs, with approximately \$65,000 to

\$70,000 per year associated with operation and maintenance and groundwater monitoring after ISCO applications.

AOC-2 – The Facility has already incurred the majority of the initial costs associated with the AOC-2 remedy since the cap has been constructed in place. Ongoing maintenance costs will continue.

#### 6. Community Acceptance

VDEQ will evaluate community acceptance of the proposed decision during the public comment period, which will last sixty (60) calendar days. VDEQ's final decision will be described in the Facility's Hazardous Waste Management Permit for Post Closure Care and Site-Wide Corrective Action, which will be modified as necessary to address the final remedy components.

#### 7. State/Support Agency Acceptance

VDEQ will evaluate EPA's acceptance of the proposed remedy during the public comment period. VDEQ's final decision will be set forth in the Facility's Hazardous Waste Management Permit, which will be modified as necessary to address the final remedy components.

### **7.0 ENVIRONMENTAL INDICATORS**

Under the Government Performance and Results Act ("GPRA"), EPA has set national goals to address RCRA corrective action facilities. Under GPRA, EPA evaluates two key environmental indicators for each facility: (1) Current Human Exposures Under Control and (2) Migration of Contaminated Groundwater Under Control. Compliance with both the Human Health and Groundwater indicators was confirmed by EPA on January 31, 2002.

### **8.0 FINANCIAL ASSURANCE**

The Facility is already providing financial assurance for continued groundwater monitoring and post closure care activities required by the Facility's Permit. Updated cost estimates for VDEQ's final decision are required by that Permit and will be the basis for financial responsibility of the implementation and operation and maintenance of the final remedy.

### **9.0 PUBLIC PARTICIPATION**

Before VDEQ makes a final decision on its proposed final remedy for the Facility, the public may participate in the decision selection process by reviewing this SB and documents contained in the Administrative Record for the Facility. The Administrative Record contains all information considered by VDEQ in reaching this proposed decision.

Interested parties are encouraged to review the Administrative Record and comment on VDEQ's proposed decision. For additional information regarding the proposed remedy, please contact Mr. Ryan Kelly at (804) 698-4045 or [ryan.kelly@deq.virginia.gov](mailto:ryan.kelly@deq.virginia.gov).

The public comment period will last sixty (60) calendar days from the date notice of VDEQ's proposed final remedy is published in a local newspaper. Comments may be submitted by mail, fax, or e-mail to Ms. Angela Alonso at the address listed below.

Virginia Department of Environmental Quality  
629 East Main Street  
P.O. Box 1105  
Richmond, VA 23218  
Contact: Ms. Angela Alonso  
Phone: (804) 698 - 4328  
Email: [angela.alonso@deq.virginia.gov](mailto:angela.alonso@deq.virginia.gov)

VDEQ will make a final decision after considering all comments, consistent with applicable RCRA requirements, regulations, and guidance. If the decision is substantially unchanged from the one in this Statement of Basis, VDEQ will issue a final decision and inform all persons who submitted written comments or requested notice of VDEQ's final determination. If the final decision is significantly different from the one proposed, VDEQ will issue a public notice explaining the new decision and will reopen the comment period.

## **Attachments**

**Figure 1 –**

# SWMU AND AOC AREAS (Locations are Approximate)



Solid Waste Management Unit (SWMU)  
Area of Concern (AOC)

Drawn By RLM
CADD Review
Date Drawn/Rev'd 6/27/16



## FEDERAL-MOGUL SITE LAYOUT

WINCHESTER, VIRGINIA

Environmental Resources Management

CHK'D MC
0334437
FIGURE 1

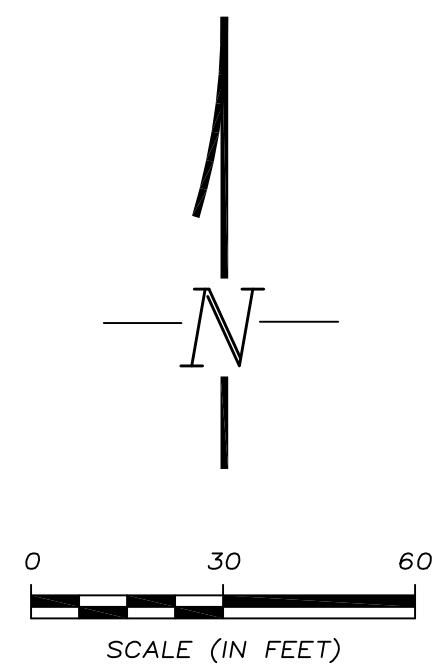
**Figure 2 -**





**LEGEND**

- ⊙ MW MONITORING WELL
- IW INJECTION WELL
- AP APPLICATION WELL (DECOMMISSIONED)
- RW RECOVERY WELL



R:\Cadd\ChIE-H\Federal-Mogul\0334437-Houston\0334437-01.dwg, MW LOCATION MAP, 9/19/2016 2:41:03 PM, GML

REVISIONS TO BE MADE ON THE CADD FILE ONLY

				<b>FEDERAL MOGUL CORPORATION</b> WINCHESTER, VIRGINIA				
<b>Environmental Resources Management</b>				<b>MONITORING WELL LOCATION MAP</b>				
Rev.	Date	Description	By	Chk	SCALE	PROJECT NUMBER	SHEET	REV.
					AS NOTED	0334437	FIGURE 2	
DRAWN BY GML    CADD Review RMK    CHECKED BY TN					DATE	06/08/2016		

**Administrative Record – Index of Documents for Statement of Basis**

FEDERAL-MOGUL CORPORATION  
EPA ID NO. VAD003070976  
Winchester, Virginia

ADMINISTRATIVE RECORD  
INDEX OF DOCUMENTS FOR STATEMENT OF BASIS

This index includes documents that the Virginia Department of Environmental Quality (VDEQ) relied upon to develop and propose the final remedy selection determination described in the Statement of Basis. These documents were prepared for the Federal-Mogul Corporation facility and are listed chronologically by document date.

1. January 31, 2002, *Documentation of Environmental Indicator Determination – Current Human Exposures Under Control*, USEPA Region 3.
2. January 31, 2002, *Documentation of Environmental Indicator Determination – Migration of Contaminated Groundwater Under Control*, USEPA Region 3.
3. February 18, 2005, *Site Investigation Report*, ESC LLC.
4. July 2006, *Supplemental Investigation Report*, ERM.
5. July 31, 2006, *Hazardous Waste Management Post-Closure Care Permit*, VDEQ.
6. March 30, 2007, *Interim Measures Design Program: AOC-1*, ERM.
7. August 14, 2008, *Revised AOC-2 Work Plan*, ERM.
8. September 9, 2008, *Revised AOC-2 Work Plan – Approval*, VDEQ.
9. February 7, 2013, *Corrective Measures Study – Additional Characterization – Approval*, VDEQ.
10. June 11, 2013, *Supplemental Site Characterization Report*, ERM.
11. June 2015, *RCRA Corrective Measures Study for AOC-1 and AOC-2*, ERM.
12. February 11, 2016, *Corrective Measures Study Approval*, VDEQ.