



VIRGINIA DEPARTMENT OF ENVIRONMENT QUALITY
DIVISION OF LAND PROTECTION AND REVITALIZATION
OFFICE OF REMEDIATION PROGRAMS

STATEMENT OF BASIS

FEDERAL-MOGUL CORPORATION

BLACKSBURG, VIRGINIA

EPA ID NO. VAD054039961

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1.0 INTRODUCTION

1.1 Facility Name

The Virginia Department of Environmental Quality (VDEQ) has prepared this Statement of Basis for the Federal-Mogul Corporation located at 300 Industrial Park Road, SE, Blacksburg, Virginia 24060 (hereinafter referred to as the Facility or Federal-Mogul).

The Facility is subject to the Corrective Action 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 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 Statement of Basis in cooperation with the United States Environmental Protection Agency (EPA). VDEQ has reviewed all available Facility data and has determined that remediation is necessary for the Facility to satisfy its RCRA Corrective Action obligations. VDEQ proposes its final remedy for the Facility in this Statement of Basis 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 operate and maintain a soil vapor extraction (SVE) system, to continue operating the existing groundwater pump and treat (P&T) system (installed in 1998), 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 and/or protect the integrity of a remedy. Engineering Controls are generally engineered mechanisms such as securing water supply points. The proposed corrective measures are discussed in Section 6.0 and the proposed controls are discussed in Section 6.3 below.

This Statement of Basis summarizes information that can be found in greater detail in the work plans and reports reviewed by VDEQ and EPA, which can be found in the Administrative Record. Figures are included following the text showing the locations of each hazardous waste management unit (HWMU), solid waste management unit (SWMU) and areas of concern (AOC) (Figures 1 and 2), Facility layout (Figure 3), Locations of Institutional and Engineering Controls (Figure 4), SVE system layout (Figure 5), Remedial area for soil (Figures 6 and 7), Remedial area for groundwater (Figure 8), and Soil Management Area (Figure 9).

1.3 Importance of Public Input

The purpose of this document is to solicit public comment on VDEQ's proposed remedy prior to VDEQ completing its remedy selection for the Facility. The public may participate in the

remedy selection process by reviewing this Statement of Basis and documents contained in the Administrative Record in support of VDEQ's proposed decision and submitting written comments to VDEQ during the public comment period. The information presented in this Statement of Basis 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 Administrative Record. A copy of the Administrative Record is available for public review, in electronic format, from the VDEQ contact person, for which the address and telephone number is provided in Section 9.0.

VDEQ will make a final decision after considering all comments received during the comment period, consistent with applicable RCRA requirements and regulations. If the decision is substantially unchanged from the one proposed, 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.

Each person who has submitted written comments will receive a written response from VDEQ. VDEQ will incorporate the remedy selection in its modification of the Facility's Hazardous Waste Management Post-Closure Permit.

2.0 FACILITY BACKGROUND

The Federal-Mogul Corporation Facility in Blacksburg, Virginia occupies approximately 58 acres of property in an industrial park approximately 0.5 mile north of the intersection of U.S. Route 460 and Business Route 460. The Federal-Mogul Facility is located within the City of Blacksburg, which is in the Valley and Ridge physiographic province of south-western Virginia. An unnamed tributary of Wilson Creek is located south of the property and receives discharge from natural springs located between the Federal-Mogul Facility and Jennelle Road. Wilson Creek is within the Roanoke River basin. Groundwater is present primarily in the bedrock underlying the Facility and is found at depths between approximately 30 and 70 feet below ground surface. The environmental setting and updated site specific information is fully described in the RFI Report dated March 2004.

The Facility has produced precision, high specification engine crankshaft and piston rod bearings for the automotive and industrial engine industries since 1971, when the Facility was constructed. Currently, aluminum casting operations and small-scale manual chromium plating of hand tools generate waste that is disposed of as hazardous waste. The bearing manufacturing process previously included electroplating of components using an automated plating line. Copper, tin, zinc, and lead were used in the electroplating process. In the past, the Facility performed vapor degreasing of parts using trichloroethylene (TCE).

The VDEQ issued Federal-Mogul a Post-Closure Permit in 1994 for two closed hazardous waste management units. In 1998, the Post-Closure Permit was modified to implement a Base Corrective Action (also sometimes referred to as "Regulated Unit Corrective Action") Program for groundwater at the Facility to address concentrations of TCE above the groundwater protection standard (GPS). The two closed hazardous waste management units were considered a single unit in this permit for purposes of post-closure care monitoring and corrective action. In 2001, the VDEQ issued a Hazardous and Solid Waste Amendments (1984) Corrective Action

Permit for facility-wide corrective action at solid waste management units and areas of concern (AOCs) identified at the Facility by the EPA. This permit was superseded in 2006 by a Hazardous Waste Management Post-Closure Permit (Permit) issued by the VDEQ, which included the Base Corrective Action Program for the two (2) closed hazardous waste management units (HWMUs) and facility-wide corrective action. VDEQ's review of information provided by the Facility to date indicates there is enough data to support the determinations presented in Section 1.2. The Administrative Record may be reviewed in paper or electronic format at the location provided in Section 9.0.

3.0 SUMMARY OF ENVIRONMENTAL HISTORY AND INTERIM MEASURES

3.1 Environmental History and Milestones

To date, the following RCRA Corrective Action milestones have been completed at the Facility:

- On September 1994, the Facility was issued an initial Hazardous Waste Management Post-Closure Permit for two closed surface impoundments and two closed sludge drying beds managed as a single unit for purposes of post-closure care and monitoring.
- On January 25, 1999, the Facility was ranked as a "high" priority site according to the National Corrective Action Prioritization Schedule (NCAPS).
- On January 28, 1999, the RCRA Facility Assessment (RFA) was completed by EPA.
- On April 13, 1998, the Post-Closure Care Permit was modified to incorporate a Baseline Corrective Action Program for groundwater at the Facility.
- On August 21, 1998, the Baseline Corrective Action Program was implemented at the Facility with startup of a groundwater recovery and treatment system. This system initially consisted of two extraction wells (RW-1 and RW-2) to extract and treat groundwater containing TCE by air stripping and carbon filtration.
- On April 17, 2001, the VDEQ issued the Facility a Hazardous and Solid Waste Amendments Permit for the facility-wide corrective action process.
- In October 2002, the existing groundwater recovery and treatment system was expanded by the Facility to include a third on-site extraction well (RW-3).
- As part of the Base Corrective Action Program, Federal-Mogul implemented institutional controls and engineering controls for off-site properties to control and prevent potential human health exposure to any TCE that may be present in groundwater or springs on these properties at concentrations above the maximum contaminant level (MCL) promulgated under 40 CFR 141, pursuant to Section 1412 of the Safe Drinking Water Act (SDWA). These activities were completed between 2002 and 2007.
- Human Exposures Controlled Determination: The VDEQ has made the environmental indicators (EI) determination of "yes, that current human exposures are under control." The above determination is based upon the DEQ's Current Human Health Environmental Indicator (HHEI) Determination Report, CA725, dated September 2003, and is considered current as of the date of this Statement of Basis.
- Release to Groundwater Controlled Determination: The VDEQ has made the EI determination of "yes, that migration of contaminated groundwater is under control," based upon the review of CA information for the Federal-Mogul Facility contained in the Groundwater Environmental Indicator (GWEI) Determination Report, CA750, dated

September 2003, and is considered current as of the date of this Statement of Basis.

- The Facility completed RCRA Facility Investigations (RFI) in 2003 and submitted an RFI Report to the VDEQ on March 26, 2004. The RFI Report was accepted by the VDEQ on June 8, 2006. The RFI report recommended remedies be evaluated for soil in and around HWMU 9 and for groundwater. Both soil and groundwater were shown to have elevated levels of TCE and degradation by-products.
- The Facility's Hazardous Waste Management Post-Closure Permit was reissued on February 8, 2006 and incorporated facility-wide corrective action included in the HSWA Permit. The Post-Closure Permit remains in effect until February 8, 2016. The post-closure period for the closed regulated units remains in effect until June 14, 2013, which corresponds to 30 years from the date of final closure certification. The Facility is required to operate under a hazardous waste management permit as long as there are obligations for post-closure care and/or facility-wide corrective action.
- In November 2007, and in November 2009 and December 2009, the Facility performed short term pilot tests for soil vapor extraction (SVE) using two extraction wells and six vapor monitoring points. In April 2010, a full scale SVE pilot test was initiated for the Corrective Measures Study (CMS) using 18 extraction wells and 16 vapor monitoring points.
- On June 15, 2010, the Facility finalized a CMS, which selected SVE, groundwater extraction and treatment, institutional and engineering controls, and performance monitoring of groundwater as the final corrective action remedy for the Facility.
- On September 16, 2010, the VDEQ issued final approval of the CMS Report.
- On June 21, 2012, VDEQ issued approval of CMS – Addendum No. 1. Because the CMS addressed VOCs only, an addendum to the CMS was required to address additional constituents detected above residential and industrial screening criteria.

The documents listed above may be found in the Administrative Record developed for the Facility. The Administrative Record may be reviewed in electronic format at the location provided in Section 9.0.

The historical documents and investigations identified 39 SWMUs, 4 HWMUs, and 6 AOCs (one additional AOC was later added to the facility-wide corrective action list as a result of a 2010 explosion incident at the facility). Figures 1, 2, and 2B show the locations of Interior and Exterior HWMUs, SWMUs, and AOCs. The approved RCRA Facility Investigation (RFI) workplan concluded that 4 HWMUs, 16 SWMUs, and 1 AOC should be investigated under the requirements of the facility's Permit. The RFI also concluded that there was no evidence of a release at the remaining 23 SWMUs and 5 AOCs and therefore no further action was warranted at these areas. The environmental investigations performed at the Facility required detailed characterizations of the HWMUs, SWMUs, and AOC, including soil sampling to assess impacts from hazardous constituents. In addition, groundwater was sampled and characterized site-wide to assess impacts from hazardous constituents from each HWMU, SWMU, and AOC.

The results of the RFI are presented in the RFI Report accepted by the VDEQ on June 8, 2006. The RFI primarily identified soil impacts around HWMU 9 and provided additional data on site-wide groundwater impacts. The primary constituents of concern (COCs) identified during the investigations were trichloroethene (TCE) and cis-1,2-dichloroethene in soil and groundwater. Secondary COCs identified at the Facility included tetrachloroethene, trans-1,2-dichloroethene and vinyl chloride. In addition, several metals, Polycyclic Aromatic Hydrocarbons (PAHs), and

one Polychlorinated Biphenyl (PCB) were identified in on-site soil above screening criteria.

3.2 Summary of Interim Measures

From 1983 through 2010, clean-up activities were completed at several HWMUs, SWMUs and AOCs and in off-site areas by Federal-Mogul to eliminate impacts to human health and the environment as a result of hazardous materials management practices. Initial clean up activities included closure of three HWMUs under approved closure plans in 1983 and 1985. In 1992 and 1993, the Facility completed limited removal actions for localized releases of hazardous constituents to soil. In 1998, the Facility implemented a Base Corrective Action Program for groundwater under a RCRA Post-Closure Permit, which required the Facility to design, install, and operate a groundwater pump and treat system to address groundwater with TCE concentrations above its MCL and maintain off-site water purification systems at affected properties. From 2002 to 2007, Federal-Mogul implemented off-site institutional and engineering controls at several off-site properties to control and prevent potential human health exposure to any TCE that may be present in groundwater or springs on these properties at concentrations above the MCL. In November 2009, Federal-Mogul began SVE pilot testing for the CMS. A full-scale SVE pilot test was implemented for the CMS in April 2010 to address an area of soil containing TCE impacted soil identified at the Facility. For purposes of this discussion, these clean up activities are referenced in this Statement of Basis as interim measures. The following is a detailed summary of these interim measures.

3.2.1 1983 Closure of Sedimentation Ponds and Sludge-Drying Beds

The two sedimentation ponds (HWMU 2) and two sludge-drying beds (HWMU 3) were certified closed on July 20, 1983 by Federal-Mogul. Closure consisted of the discharge of all liquids to Cedar Run under the Facility's National Pollution Discharge Elimination System Permit, and excavation and offsite disposal at a permitted landfill of all sludge, waste residues, and impacted soil. Approximately 1,415 cubic yards of dewatered sludge were excavated from exterior HWMU 3, and 580 cubic yards of wet sludge were removed from HWMU 2. Impacted soil was also removed based on visual inspection with excavation in some areas extending to depths of 5 to 10 feet below ground surface, principally in Pond No. 2. The Facility demonstrated that no hazardous waste or waste constituents remained in the unsaturated soils and was therefore not required to install any engineering controls such as caps at the two HWMUs. Final closure approval for unsaturated soils was received by Federal-Mogul from the Commonwealth of Virginia in February 1986.

3.2.2 1985 Former Drum Storage Pad Closure (HWMU 9)

A Closure Plan for the drum storage pad (HWMU 9, also known as scrap pad) was finalized and approved by the Virginia Bureau of Waste Management on July 1, 1985. Closure activities were implemented in 1985 and included the excavation of approximately 283 cubic yards of concrete, gravel, and soil, and off-site disposal of this material at Wayne Disposal, Detroit, Michigan. TCE and metals were detected in initial closure assessment samples. Detections in post-excavation confirmation samples were limited to cadmium, copper, chromium, lead, and tin. Closure certification was submitted by the Facility on November 26, 1985. On February 5, 1986, the Virginia Bureau of Waste Management notified the Facility that closure of the drum storage pad had been performed in accordance with the approved closure plan.

3.2.3 1992 Broken Cyanide Rinse Water Pipe (AOC)

On February 3, 1992, a construction worker accidentally dislodged an underground pipe that carried cyanide rinse water from the electroplaters to the wastewater treatment plant. The

electroplater was shut down and a bucket was used to collect the remaining water in the pipe. Soil samples from around the piping were collected and analyzed to assess the extent of contamination. Soil and weathered rock within a 5.5-foot radius around the source of the leak was removed to a depth of 3 to 12 inches below the weathered bedrock surface. The contaminated soil and rock was disposed off-site by Laidlaw Environmental Services of Reidsville, North Carolina.

3.2.4 1993 Baghouse Fire (AOC)

On January 4, 1993, a fire occurred in a dust collection baghouse containing dust with elevated levels of aluminum, lead, and cadmium. The fire was extinguished and foam and water generated were collected and drummed. Contaminated soil was excavated to a depth of 6 inches and staged on plastic liners. The baghouse structure was disassembled, decontaminated, and scraped. Residual dust and debris were drummed. Soil sampling was conducted during the remediation to identify contaminated areas and determine the extent of required cleanup. Soil, upon being determined hazardous, was moved to two roll-off containers. The soil was then transported and disposed at permitted hazardous waste facilities by Envirosafe Services of Ohio, Inc. of Oregon, Ohio.

3.2.5 1993 Aluminum Dust Baghouse (Exterior SWMU 20)

Soil excavation and sampling was conducted in April 1993 in the area of the Aluminum Dust Baghouse (now exterior SWMU 20) after a particulate filter failed. This incident resulted in the deposition of dust containing cadmium and lead onto the roof of the building, an adjacent concrete pad and baghouse structure, and a grass area. Remedial actions completed for this release included vacuuming and pressure-washing metal dust from the affected roof area of the main building, pressure-washing the exterior of the main building wall and the adjacent bag house equipment and concrete pad, and excavation of soil surrounding the concrete pad to a depth of 4 inches. Excavated soil was managed on-site after toxicity characteristic leaching procedure analysis of the soil indicated that material was non hazardous and had low levels of cadmium and lead.

3.2.6 Off-Site Water Purification Systems - 1996

The Facility conducted several phases of hydrogeological investigations from October 1995 to July 1997 to delineate the extent of TCE and associated degradation by-products in on-site and off-site groundwater. Water samples collected during these investigations indicated the presence of TCE in three private water supply wells located south of the Facility at 680 and 758 Jennelle Road. Accordingly by April 1996, the affected properties were provided with carbon-based water purification systems, which were operated and maintained by Federal-Mogul until the properties were connected to public water systems in 2002 and 2003. Additional information for public water system connections and implemented institutional and engineering controls is provided in Section 3.2.8.

3.2.7 2010 Aluminum Dust Baghouse Explosion (Exterior SWMU 20)

On December 31, 2010, an explosion occurred in a dust collection baghouse and exhaust ductwork containing dust with elevated levels of aluminum oxide, lead, and copper. The fire was extinguished by the local fire department and a licensed environmental services company was utilized to clean-up and manage the residual and related materials from the immediate response. A subsequent soil investigation was performed to determine the extent of impacted soil. Sampling and analysis identified elevated levels of lead in surface soil. Contaminated soil was excavated to a depth of 6 inches and placed in roll-off containers. Confirmatory sampling

within the excavation indicated the extent of lead contaminated soil was removed. Toxicity characteristic leaching procedure analysis of the excavated soil indicated the material was non hazardous and was transported to a solid waste disposal facility. Clean dirt was utilized to back fill the area prior to reseeding with grass.

3.2.8 Base Corrective Action Program for Groundwater 1998 to Present

A Base Corrective Action Program for groundwater was implemented by the Facility in 1998 under the Facility's Post-Closure Permit and included:

- Installation and operation and maintenance (O&M) of an on-site groundwater pump and treat system since August 21, 1998;
- Implementation and maintenance of off-site institutional and engineering controls to prevent uncontrolled human health exposure to groundwater; and
- Long-term performance monitoring of the groundwater pump and treat system, on-site groundwater, and off-site groundwater and springs.

Groundwater Pump and Treat System

The on-site groundwater pump and treat system was implemented to hydraulically contain, remove, and treat groundwater containing TCE and degradation by-products. The system has one groundwater extraction well (RW-1) in the area where TCE was released to soil and groundwater and two downgradient groundwater extraction wells (RW-2B and RW-3) near the Facility's property line. Figure 3 shows the location of the groundwater extraction wells. The groundwater treatment process has a flow equalization tank, bag filtration system, chemical sequestering system, air stripper, and two liquid-phase granular activated carbon adsorption units connected in series. Treated system effluent is discharged to an unnamed tributary of Wilson Creek under Virginia Pollution Discharge Elimination System (VPDES) Permit VA0089991. The Facility also has a Town of Blacksburg Industrial Waste Water Permit that allows for discharge of treated water to the Town's sanitary sewer system.

As of mid January 2011, the groundwater pump and treat system has extracted and treated more than 120 million gallons of water containing approximately 1,034 pounds of TCE. Average system flows are typically in the range of 22 to 46 gallons per minute. Performance monitoring of the pump and treat system, on-site groundwater, off-site groundwater, and springs has been conducted since system startup. Monitored parameters have included tetrachloroethene, TCE, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride. The results of the performance monitoring have indicated a stable or shrinking groundwater constituent plume over time with an overall decrease in TCE concentrations detected in off-site groundwater and at spring locations.

Off-Site Institutional and Engineering Controls

As part of the Base Corrective Action Program, Federal Mogul implemented institutional controls and engineering controls for off-site properties to control and prevent potential human health exposure to any TCE that may be present in groundwater or springs on these properties at concentrations above the MCL. The following controls were implemented:

1. Acquisition of property water rights through executed legal instruments, which consist of declaration of restrictive covenants and deeds of easement to prevent use of groundwater, springs, and surface water for any purpose.
2. Decommissioning and removal of water supply well pumps, associated

- appurtenances, and securing the former water supply wells for use by Federal-Mogul as monitoring points, as appropriate.
3. Secured any spring boxes, collection pipes or other devices on associated properties for use by Federal-Mogul as monitoring points, as appropriate.
 4. Connected these properties to the Montgomery County public water system or Town of Blacksburg water system depending on the location.

Figure 4 identifies the properties where institutional and engineering controls were implemented by Federal-Mogul for the Base Corrective Action Program and shows that property water rights were acquired and public water connections were made at locations where TCE has been detected in groundwater at concentrations above the MCL. Figure 4 also shows the properties that are connected to Town of Blacksburg public water system. TCE has been detected in Spring No. 1 at concentrations below the EPA MCL. Access to this spring from the property is limited by a barbed wire fence. TCE has not been detected in groundwater samples collected on several parcels including those where TCE was detected in springs below the MCL. Federal-Mogul did not acquire the water rights on these parcels.

Federal Mogul will continue to administer and maintain institutional and engineering controls on the properties identified as part of the proposed remedy, as discussed in Section 6.3. Routine monitoring of groundwater on various off-site properties will also be conducted as discussed in Section 6.2.2.

3.2.9 Soil Vapor Extraction System 2009 to Present

The Facility's RFI Report dated March 2004 recommended evaluation of potential remedial options for area of soil located between exterior HWMUs 9 and 3, which contained TCE and cis-1,2-dichloroethene at concentrations that represented a continuing source of leaching to groundwater at levels of concern.

The Facility submitted a focused CMS to the DEQ in May 2007, which proposed implementation of an interim measure consisting of SVE. SVE is an EPA presumptive remedy for *in situ* treatment of TCE and volatile organic compounds (VOCs) in soil and involves the application of a vacuum to soil to induce the controlled flow of air and removal of VOCs from the soil. As part of the request for preparation of an Interim Measures Work Plan, the DEQ requested revision of the CMS Report for soil to incorporate groundwater in support of selecting and implementing a final remedy for site-wide corrective action. A revised CMS was submitted to the DEQ in May 2008, which recommended implementation of SVE as a final remedy for soil as described in the Interim Measures Work Plan submitted to the VDEQ in August 2008.

In September 2009, Federal-Mogul withdrew its proposal for interim measures as described in the August 2008 Interim Measures Work Plan and proceeded with additional evaluations and pilot tests beginning in October 2009 to implement a modified remedy for soil consisting of a solar-powered SVE system. Initial pilot testing was conducted in November 2009 and December 2009 using two existing extraction wells and six observation wells, temporary aboveground piping, and a SVE skid unit equipped with a photovoltaic panel array. Data from this test and other data collected during the RFI/CMS were used to design and implement a full scale SVE pilot test to cover the targeted remedial area identified in the CMS.

Full-scale pilot testing was initiated at the Facility in April 2010 in support of the CMS. For pilot test purposes, an SVE remediation system was designed and constructed at the Facility between January and April 2010. Installed SVE system components included:

- 18 SVE wells with 12 well clusters consisting of a shallow extraction well (20 foot depth) and deep extraction well (20+ foot depth) and six additional deep extraction wells;
- Eight vapor monitoring point clusters with shallow and deep monitoring points to allow for measurement of induced vacuums, assessment of system radius of influence, and monitoring of soil vapor levels;
- SVE system collection piping, valve boxes, and main manifold installed below ground for conveyance and control of extracted vapor; and
- An SVE skid unit with an array of six 200-watt photovoltaic panels to provide direct current power to a 1 horsepower regenerative blower. The skid unit has a weather-proof blower box, control switches, valves, sample ports, and instrumentation, rotary gas meter, and 10 foot high discharge vent. Extracted vapors discharge directly to the atmosphere per the DEQ approved determination that the SVE system is exempt from air permitting requirements.

Figure 5 shows the SVE system layout and components. Discrete full-scale pilot tests were performed on April 6, May 25, and from May 26 through June 9, 2010. The system design information, as-built details, and pilot test results were incorporated into the Final CMS Report submitted to the DEQ on June 15, 2010. The CMS Report recommended operation of the solar powered SVE system installed for the pilot test as the final remedy for VOCs in soil. Further details on the system are included in the Final CMS Report.

With the concurrence of the DEQ, the full scale SVE pilot test has operated with 18 extraction wells since May 25, 2010. As of January 12, 2011, approximately 304 pounds of VOCs have been extracted by the system with approximately 5.5 million cubic feet of vapor. This corresponds to the removal of approximately 233 pore volumes from the target remedial area.

4.0 SUMMARY OF HUMAN HEALTH RISK ASSESSMENT

4.1 Human Health Risk Assessment – Procedures Performed

The RFI report for the Federal-Mogul Facility includes an assessment of human health risks for each HWMU, SWMU, and AOC area sampled for the investigation. The assessment for soil included data screening comparisons and evaluations with respect to the following:

- Site-specific background values established for metals;
- EPA Residential Regional Screening Levels (RSLs) (formerly referred to as Risk-Based Concentrations or RBCs) based on a target risk of 1E-06 and a target hazard of 0.1;
- EPA Industrial RSLs based on a target risk of 1E-06 and a target hazard of 0.1; and
- Soil-to-groundwater screening levels (SSLs) based on a dilution attenuation factor of 20.

The risk assessment for groundwater included data screening, comparisons, and evaluations with respect to the following;

- EPA Region 3 Tap Water RSLs based on a target risk of 1E-06 and a target hazard of 0.1;
- EPA MCLs; and
- DEQ risk-based GPS in effect for the Facility's corrective action program for groundwater.

A summary of the risk evaluations is provided below. Detailed risk assessment information and assessments are included in the RFI report, which is part of the Administrative Record.

4.2 Human Health Risk Evaluation Soil Results Summary

Soil evaluations were performed for the following areas at the Facility per the RFI Work Plan:

- Interior SWMU 6;
- Interior SWMU 20;
- Interior HWMU 23 (and associated AOC – Former Main Degreaser);
- Exterior HWMU 2;
- Exterior HWMU 3;
- Exterior SWMU 7 (and nine nearby SWMUs);
- Exterior SWMU 20; and
- Exterior HWMU 9.

The evaluations performed indicated that further actions were warranted for soil located in the area between exterior HWMUs 9 and 3 due to potential continued leaching of TCE and associated VOCs from soil to groundwater in this area.

In addition, the soil evaluations performed for the majority of the other areas (except Interior SWMU 20 and Exterior SWMU 20) indicated detections of various metals, PAHs, and PCB which exceeded the applicable industrial and/or residential risk screening criteria.

A discussion of remediation goals and clean up targets for soil is included in Section 5.0.

4.3 Human Health Risk Evaluation Groundwater Results Summary

The results of the risk evaluations and comparisons to MCLs and permit GPS completed for the RFI and the ongoing Base Corrective Action Program for groundwater indicated that TCE and cis-1,2-dichloroethene exceeded their MCLs and permit GPS and required remediation to meet the most beneficial future use of groundwater as a drinking water resource.

5.0 SUMMARY OF REMEDIAL OBJECTIVES AND CLEAN UP TARGETS

The following remedial objectives were identified in the CMS based on the results of the site investigations, fate and transport assessment, risk evaluation, remedial goals, and clean up targets:

1. To the extent possible, reduce constituent concentrations and VOC mass in soil to prevent leaching to groundwater at concentrations that would result in groundwater concentrations above EPA MCLs.
2. Reduce concentrations of constituents of concern in soil to levels that are protective of future use of the Facility.
3. Reduce concentrations of constituents of concern in groundwater to levels at or below groundwater remedial goals and clean up targets, which consist of EPA MCLs.
4. Prevent uncontrolled human exposure to on-site and off-site groundwater with constituent concentrations above groundwater remedial goals and clean up targets.
5. Prevent uncontrolled human exposure to on-site soil with constituent concentrations above risk-based concentrations.

5.1 Soil

The VOC soil remedial area identified in the CMS is an approximate 0.5 acre area located between exterior HWMUs 9 and 3. Figure 6 shows the targeted SVE remedial area for the depth interval of 0 to 20 feet, which includes approximately 95 percent of the TCE mass identified in soil within this depth interval. Figure 7 shows the targeted SVE remedial area for the depth interval greater than 20 feet, which encompasses approximately 98 percent of the TCE mass identified in soil within this depth interval. These target remedial areas include soil areas where additional reductions in VOC concentrations are generally considered feasible with SVE, and where leaching of TCE and degradation by products from soil to groundwater is apparent.

Remedial goals and clean-up levels for VOCs were developed for soil in the CMS and consist of calculated site-specific SSLs for the soil-to-groundwater migration pathway. The clean up targets are concentrations of the constituents of concern in soil that would prevent leaching to groundwater at concentrations that would potentially results in concentrations in groundwater above EPA MCLs. Remedial goals/clean up target concentrations for VOCs in soil are listed below.

VOC Soil Remedial Goals/Clean Up Targets

Constituent	Remedial Goal/ Clean Up Target (µg /kg)
Tetrachloroethene	20
Trichloroethene	4.8
Cis-1,2-dichloroethene	41
Trans-1,2-dichloroethene	69
Vinyl chloride	0.93

µg/kg = micrograms per kilogram

Remedial goals and clean-up levels for non-VOC constituents (metals, PAHs, PCB) were developed for soil in the CMS – Addendum No.1 and consist of EPA Residential RSLs (the most current version of the EPA Region 3 RSL table available shall be utilized). The additional constituents are listed below. These constituents have not been found in groundwater above their respective MCL/GPS and therefore calculated site-specific SSLs as remedial goals are not warranted since leaching to groundwater is not evident. The facility retains the option to also evaluate these COCs through a quantitative risk assessment at such time as the remedies for VOCs in soil and groundwater are completed. The facility shall supply VDEQ with a request and the details of the risk assessment prior to performing the evaluation.

Additional Constituents in Soil

Metals	PCB	PAHs
Arsenic	PCB-1254	Benzo(a)anthracene
Chromium		Benzo(a)pyrene
Lead		Benzo(a)fluoranthene
Thallium		Dibenzo(a,h)anthracene
Vanadium		Indeno (1,2,3-cd)pyrene

5.2 Groundwater

The remedial area for groundwater is shown on Figure 8 and includes areas of groundwater where the concentrations of TCE and cis-1,2-dichloroethene are above their MCLs. This area extends from the on-site soil source area approximately 2,900 ft south toward Jennelle Road. It varies in width from approximately 280 feet near the soil source area to 1,900 feet at its southern limit.

Remedial goals and clean up targets were developed for groundwater in the CMS and consist of EPA MCLs under the Safe Drinking Water Act, which also correspond to GPS established in the Facility's RCRA Permit. Remedial goals/clean up target concentrations for groundwater are listed below.

Groundwater Remedial Goals/Clean Up Targets

Constituent	Remedial Goal/ Clean Up Target (µg /L)	Basis
Tetrachloroethene	5	EPA Drinking Water MCL
Trichloroethene	5	EPA Drinking Water MCL
Cis-1,2-dichloroethene	70	EPA Drinking Water MCL
Trans-1,2-dichloroethene	100	EPA Drinking Water MCL
Vinyl chloride	2	EPA Drinking Water MCL

µg/L = micrograms per liter

6.0 SUMMARY OF PROPOSED REMEDY

Based on the findings set forth in the RFI and CMS reports, VDEQ has determined that past operations at the Facility have resulted in soil and groundwater contamination. The proposed remedy for the Facility emphasizes source control and mass removal through operation of SVE and groundwater pump and treatment systems to address soil and groundwater with concentrations of contaminants above remedial goals and clean up targets. VDEQ additionally proposes that performance groundwater monitoring be conducted to ensure clean up goals are met and for remedial effectiveness. Finally, VDEQ will require continued maintenance of institutional and engineering controls to prevent current and potential future exposure to contamination. This section details the active soil and groundwater remedial measures, proposed performance groundwater monitoring, and the proposed institutional and engineering controls.

6.1 Soil

The proposed remedy for VOCs in soil consists of the operation of the solar powered SVE system as designed and implemented for the full-scale pilot conducted for the CMS. This system is designed to address the target remedial areas for shallow and deep soil. Detailed information on the system design, SVE systems operations and maintenance (O&M), monitoring activities, and remedial effectiveness sampling is included in the CMS (Section 4 and Appendix D) and a complete description of the SVE system is provided in Section 3.2.8. An O&M Plan has been prepared for operation of the SVE system that specifies system operation and maintenance and describes how remedial effectiveness will be evaluated in support of attaining clean up targets for soil.

The soil area impacted with metals, PAHs, and PCB is identified as the "soil management area" on Figure 9. Land use restrictions and controls as described in Section 6.3 below are proposed

for this area. These restrictions and controls will prevent exposure to the contaminated soil and will remain until such time as the VOC soil and groundwater remedies have achieved remedial goals and these additional COCs can be evaluated for risk and/or corrective measures.

6.2 Groundwater

The proposed remedy for groundwater consists of the corrective action elements that have been implemented under the Base Corrective Action Program in the Facility’s RCRA permit:

- Operation of the existing onsite groundwater pump and treat system until groundwater remedial goals and clean up targets are achieved;
- Maintenance of implemented institutional controls and engineering controls to prevent uncontrolled human health exposure to groundwater; and
- Long-term performance monitoring of groundwater to verify the effectiveness and progress of the groundwater remedy in achieving remedial goals and clean up targets.

A description of the proposed elements of the final remedy for groundwater is presented in the following sections.

6.2.1 Groundwater Pump and Treat System

The existing groundwater pump and treat system implemented under the Base Corrective Action Program will be operated and maintained as part of the proposed remedy for groundwater. This system is designed to hydraulically control, extract, and treat on-site groundwater containing TCE and degradation by products at concentrations above remedial goals and clean up targets. Detailed information on the system design, O&M, and monitoring activities is included in the Administrative Record and in the CMS (Section 5 and Appendix E). The O&M Manual for the pump and treat system was updated in December 2009 to incorporate modifications to the system completed in 2009. This manual specifies system O&M requirements, sampling and analysis procedures, and safety measures.

6.2.2 Groundwater Performance Monitoring

Performance monitoring of groundwater will be conducted to verify the effectiveness and progress of the remedy in achieving remedial goals and clean up targets. A single, site-wide groundwater monitoring program will be implemented for the proposed remedy given the previous achievement of clean closure for soil for the closed RCRA Units (HWMUs 2 and 3) and the findings of the RFI, which indicate an alternative source of constituents of concern detected in groundwater than the closed RCRA units.

Groundwater monitoring will be conducted consistent with the approved monitoring frequency under the RCRA Permit. Planned on-site and off-site performance monitoring locations are identified in the following table and are shown on Figure 8 with respect to the identified area of TCE in groundwater.

Performance Groundwater Monitoring Locations

Monitoring Location ID	Type	Property Location	Parcel ID/Tax No.	Hydro. Position
MW-5	MW	Federal Mogul	006287/347-A41	U
PZ-B	MW	Federal Mogul	006287/347-A41	C
MW-8b	MW	Federal Mogul	006287/347-A41	S

Monitoring Location ID	Type	Property Location	Parcel ID/Tax No.	Hydro. Position
MW-9	MW	Federal Mogul	006287/347-A41	S
MW-10	MW	Federal Mogul	006287/347-A41	S
MW-13	MW	Federal Mogul	006287/347-A41	S
DW-1	MW	Federal Mogul	006287/347-A41	D
DW-2	MW	Federal Mogul	006287/347-A41	D
DW-3	MW	Federal Mogul	006287/347-A41	D
Jones Spring 1	Spring	3342 Yellow Sulphur Rd	028957/378-A6A	D
Stump Spring	Spring	646 Jennelle Rd	018804/378-A5	D
Stump Well	MW	646 Jennelle Rd	018804/378-A5	D
Kytchen Well	MW	655 Jennelle Rd	010512/067-A177	D
Smith Well	MW	662 Jennelle Rd	017959/378-A1	D
A&T 1 Well	MW	680 Jennelle Rd	006177/378-A2	D
A&T 2 Well	MW	680 Jennelle Rd	006177/378-A2	D
Hall Well	MW	758 Jennelle Rd	035232/378-A6,7	D
VDOT Spring 2	Spring	Adjacent to 758 Jennelle Rd	Smart Rd. ROW	D

Notes: MW = monitoring well, U = upgradient from soil source area, C = cross-gradient from soil source area, S = source area, and D = downgradient from soil source area.

Target analytical parameters for the performance monitoring program will include TCE and associated degradation by products cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride. Tetrachloroethene will be included as a target analytical parameter based on historic detections in selected on-site wells. General water quality parameters measurements will be obtained at each sample location in the field including: pH, specific conductance, temperature, dissolved oxygen, turbidity, and oxidation/reduction potential.

A Groundwater Monitoring Plan will be developed that specifies the locations, frequency, and types of samples necessary to evaluate remedial effectiveness and whether it is capable of attaining clean up targets. Additionally, this plan will specify reporting periods and endpoints for which groundwater monitoring may be discontinued.

Performance groundwater monitoring will continue at the Facility until it is demonstrated that remedial goals and clean up targets are met and maintained. Changes to the long-term groundwater monitoring program may be proposed by the Facility based on results from groundwater sampling and will be implemented via the Groundwater Monitoring Plan.

6.3 Institutional and Engineering Controls

Institutional and engineering controls will be implemented in order to protect human health and the environment and to maintain the integrity of the remedy. Given the nature and extent of impacted media, more than one institutional control is necessary to prevent activities which could interfere with the integrity or protectiveness of the remedy. Therefore, VDEQ has determined that institutional and engineering controls are necessary during implementation of the remedy until such time that the remedial goals identified in Section 5 have been achieved. These controls will apply unless it is demonstrated to the Department that such restricted use or activity will not pose a threat to human health or the environment and the Department provides prior written approval for such restricted use or activity.

6.3.1 On-site Institutional and Engineering Controls

The Facility will:

- 1) Notify prospective buyers of the property of the environmental conditions at the Facility and of VDEQ's selected corrective measures as part of the remedy for the Facility under RCRA Corrective Action;
- 2) Prohibit use of the property for residential purposes (including single family homes, multiple family dwellings, schools, day care facilities, child care centers, apartment buildings, dormitories, other residential style facilities, hospitals, and in-patient health care facilities);
- 3) Prohibit the use of groundwater beneath the property except for non-contact cooling water and purposes to support selected corrective measures. No new wells will be installed on Facility property unless it is demonstrated to VDEQ that such wells are necessary to implement the final remedy and VDEQ provides prior written approval to install such wells;
- 4) Require vapor barriers be utilized in or beneath new, totally enclosed structures designed for occupation within the foot print of the VOC soil remediation area;
- 5) Restrict subsurface soil excavation within the footprint of the VOC soil remediation area, the footprint of the soil management area identified on Figure 9, and within any areas with contaminants in soil above residential levels except in conformance with an appropriate soil management plan that has been approved by VDEQ. All earth moving activities, including excavation, drilling and construction activities, in the areas at the Facility where any contaminants remain in soils above EPA's Screening Levels for residential use or groundwater above Federal MCLs/Tap Water RSLs, shall be prohibited unless it is demonstrated to VDEQ that such activity will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy, and VDEQ provides prior written approval for such use;
- 6) Maintain any current soil cover (concrete floor, asphalt, etc.) in the soil management area identified on Figure 9;
- 7) Owner agrees to provide VDEQ with a "Certified, True and Correct Copy" of any instrument that conveys any interest in the Facility property or any portion thereof;
- 8) Owner agrees to allow the EPA, VDEQ, and/or their authorized agents and representatives, access to the Property to inspect and evaluate the continued effectiveness of the final remedy and if necessary, to conduct additional remediation to ensure the protection of the public health and safety and the environment based upon the final remedy; and
- 9) Restrict activities that would interfere with or adversely impact the remedy.

Institutional controls described above will be implemented at the site through the following mechanisms;

- A declaration of restrictive covenant or similar instrument consistent with applicable requirements under the laws of the Commonwealth of Virginia will be recorded with the real property records for the Site such that prospective purchasers of the Site will have constructive notice of land use restrictions. The declaration of restrictive covenants will contain the land use controls described above and will be recorded with the land records

in the office of the clerk of the circuit court for the jurisdiction in which the Site is located within ninety (90) days of executing the declaration. The current owner and future owners of the Site will be obligated to comply with the recorded restrictive covenant until such time that the soil and groundwater are restored to the proposed remedial goals identified in the CMS;

- The existing Hazardous Waste Management Post-Closure Permit will be modified to include the RCRA Corrective Action remedy decision after it is approved, and will be used as the controlling authority for implementation of the remedy through the VDEQ. The Permit will also be modified, as appropriate, to include land use restrictions as described above; and
- While groundwater beneath the site is not currently used as a drinking water source and there are no plans for such future use, to provide additional protection, the proposed remedy includes institutional controls to prohibit the development of wells for drinking water or other domestic uses at the Facility and off-site. A notification to prohibit well drilling under Virginia's Private Well Regulations, 12VAC 5-630-380 will be provided to the local health district in writing describing the nature and extent, including a map, of the contaminated groundwater located on the Facility property itself and off-site. The notice will be updated every three (3) years to reflect the latest contaminated groundwater plume boundary. A copy of the notification will be provided to VDEQ.

6.3.2. Off-Site Institutional and Engineering Controls

As part of the Base Corrective Action Program, Federal Mogul has already implemented institutional controls and engineering controls for off-site properties to control and prevent potential human health exposure to any TCE that may be present in groundwater or springs on these properties at concentrations above the MCL. As presented in the CMS, the following controls have been implemented and will be maintained as part of the proposed remedy to protect human health and the environment:

1. Acquisition of property water rights through executed legal instruments, which consist of declaration of restrictive covenants and deeds of easement to prevent use of groundwater, springs, and surface water for any purpose.
2. Decommissioning and removal of water supply well pumps, associated appurtenances, and securing the former water supply wells for use by Federal-Mogul as monitoring points, as appropriate.
3. Secured any spring boxes, collection pipes or other devices on associated properties for use by Federal-Mogul as monitoring points, as appropriate.
4. Connection of properties to the Montgomery County public water system or Town of Blacksburg water system depending on the location.
5. Notification to the local health department about the extent of the plume as described above.

Properties where institutional and engineering controls have been implemented by Federal-Mogul in connection with the Base Corrective Action Program are identified on Figure 4. Federal-Mogul will continue to administer and maintain institutional and engineering controls on the properties as part of the proposed remedy. Routine monitoring of groundwater on various off-site properties will also be conducted as discussed in Section 6.2.2.

The Facility will also be required to provide coordinate surveys for these use and activity restrictions that define the boundary of each activity and use restriction as a polygon for mapping on publicly accessible viewers such as Google Earth.

6.4 Reporting

Federal-Mogul will be required to submit annual reports containing, but not be limited to, semi-annual performance groundwater monitoring data, SVE system O&M data, groundwater pump and treated O&M data, and an evaluation of remedial effectiveness. Federal-Mogul will also be required to submit a remedy-status evaluation report every three (3) years, which evaluates remedial progress and achievement of remedial goals and clean up targets. Federal-Mogul will also be required to report every three (3) years to the local health department regarding the extent of the groundwater plume and provide notice to the VDEQ.

VDEQ will review the progress of the remedy activities to confirm that clean up targets and remedial goals have been met. If VDEQ determines that Federal-Mogul is not achieving remedial goals and clean up targets, VDEQ may require Federal-Mogul to perform additional studies and/or to modify the existing corrective measures. If new contamination is discovered or if the proposed remedial options cannot adequately mitigate risk to human health or the environment, additional corrective measures will be developed and implemented. In the event that VDEQ requires Federal-Mogul to perform additional studies and/or to modify the existing corrective measures, an opportunity for public comment will be provided prior to the initiation of changes to the existing corrective measures, as necessary or appropriate.

7.0 EVALUATION OF PROPOSED REMEDY

This section provides an evaluation of the proposed remedy using the EPA's RCRA Corrective Action Program criteria. These criteria consist of three threshold criteria and seven balancing criteria.

7.1 Threshold Criteria

7.1.1 Overall Protection of Human Health and the Environment

The previously implemented Base Corrective Action Program for groundwater and implementation of the full-scale SVE pilot test of the proposed remedy have already resulted in protection of human health and the environment by substantially reducing constituent mass in soil and groundwater, by significantly reducing constituent concentrations, and preventing potential uncontrolled exposure to groundwater, which may contain constituents of concern at concentrations above drinking water MCLs. The proposed remedy will continue to provide for overall protection of human health and the environment by continued remedial operations, performance monitoring, and maintenance of institutional and engineering controls.

7.1.2 Attainment of Media Cleanup Standards

The active remediation of soil and groundwater, remedial performance monitoring, and semi-annual groundwater monitoring indicate that media clean up standards have not yet been attained. SVE and groundwater pump and treat systems will remain operational until remedial goals and clean up targets for soil and groundwater are attained, respectively. Performance groundwater monitoring will be conducted until remedial goals and clean up targets, namely drinking water standards, are attained. The completion of soil sampling for remedial effectiveness is expected to occur by the year 2017. The attainment of remedial goals and clean up targets for soil and groundwater will be based on the results of the soil sampling, SVE system

monitoring, and semi-annual performance groundwater monitoring. These results will be reported to VDEQ annually and a remedy status evaluation will be conducted every three years.

7.1.3 Source Removal

Active remediation of TCE and associated degradation by products in soil and groundwater is being conducted by the SVE and groundwater pump and treat systems, respectively, to reduce or eliminate contaminant mass. As of mid January 2011, the estimated contaminant mass removed by the remediation systems was approximately 1,338 pounds including 304 pounds by the SVE pilot test system, indicating the effectiveness of the proposed remedies in source removal. Attainment of remedial goals and clean up targets for soil will be based on soil sampling and system monitoring trends. Performance monitoring of groundwater will be used to evaluate attainment of groundwater remedial goals and clean up targets.

7.2 Balancing Criteria

7.2.1 Long-Term Reliability and Effectiveness

Operation of the SVE system and groundwater pump and treat system, remedial performance monitoring, and maintenance of institutional and engineering controls are required. Long-term reliability and effectiveness will be ensured using the Facility's current Hazardous Waste Management Permit for Site-Wide Corrective Action, acquired water rights, deed notices and notifications to the local health department.

7.2.2 Reduction of Waste Toxicity, Mobility or Volume

The full scale SVE pilot system implemented for the CMS is capable of substantially reducing the mass and volume of constituents present in soil by volatilization and extraction as vapor phase. It is estimated that SVE will reduce the constituent mass in soil by 90 percent or more. In six months of initial operation, the full-scale SVE pilot system has removed a constituent mass equal to or greater than estimated present during the design phase. The substantial reduction in constituent mass and operation of the SVE system within the targeted remedial area will reduce the toxicity, mobility, and leaching of the constituents in the source area. Continued operation of the groundwater pump and treat system will effectively reduce the toxicity, mobility, and volume of constituents in groundwater by controlling and capturing on-site groundwater with constituent concentrations above remedial goals and clean up targets, and extracting and treating groundwater to remove any constituents present by using a combination of solids filtration, air stripping, and carbon absorption.

7.2.3 Short-Term Effectiveness

The proposed soil and groundwater remedies, SVE, groundwater pump and treat, and off-site institutional and engineering controls, are already in place and in full-scale operation.

7.2.4 Implementability

The proposed remedy is anticipated to be fully implementable with readily available methods. No regulatory hurdles are anticipated for continued implementation.

7.2.5 Cost

The proposed remedy represents a good balance between cost and risk reduction. Federal-Mogul has already expended costs for installation, operation, and maintenance of the groundwater system under the Base Corrective Action Program. Additionally, Federal-Mogul has expended approximately \$230,000 in capital costs related to design, construction, startup, and

implementation of the full-scale SVE pilot study for the CMS. For years 1 through 6 of the proposed remedy, annual O&M costs for the SVE system, groundwater pump and treat system, and performance monitoring are estimated at \$171,011 per year. Beyond year six (6), annual O&M costs are estimated at \$126,117 per year. The cost estimate for the proposed remedy is provided in Table 6-1 in the CMS.

7.2.6 Community Acceptance

Community acceptance of the proposed remedy will be determined based on comments from the public. Federal-Mogul has in the past updated the community via public notifications and meetings under the RCRA permit for the Base Corrective Action Program and proposed SVE remedy. Additionally, the Facility routinely contacts adjacent property owners for groundwater sampling events. The modification of Federal-Mogul's Hazardous Waste Management Permit for Site-Wide Corrective Action, incorporating the remedy decision, will undergo public comment and a public meeting will be conducted. Additional details about public participation are provided in Section 9.0 below.

8.0 FINANCIAL ASSURANCE

Assurances of financial responsibility for corrective action will be provided in accordance with the Facility's current Permit as follows. Within ninety (90) calendar days of final acceptance of the proposed determination and corrective measures remedy by the VDEQ via the Facility's Permit modification, the Permittee shall submit a cost estimate for completing the approved remedy(ies). The estimate may be based on the Corrective Measure Study, the approved remedy(ies), or any other available information. The cost estimate for completing the approved remedy(ies) shall be updated pursuant to the development of more detailed information (e.g., Corrective Measure Design or Implementation) and any modifications to the approved remedy(ies).

Within thirty (30) calendar days of approval of the cost estimate for financial assurance, the Permittee shall demonstrate compliance with financial assurance to the Department for completing the approved remedies in accordance with 40 CFR § 264.101(b). Within thirty (30) calendar days of approval of any revised cost estimate, the Permittee shall demonstrate to the Department financial assurance for the updated cost estimates.

Financial assurance will be required by the Permit for ongoing operation and maintenance costs associated with the proposed determination including corrective/remedial measures, groundwater monitoring, and institutional/engineering controls during the Corrective Measures Implementation (CMI) period. Financial assurance is currently posted for post-closure care of the former hazardous waste management units as required by the Facility's Permit, and is reviewed and adjusted on an annual basis to account for inflation.

9.0 PUBLIC PARTICIPATION

Interested persons are invited to comment on VDEQ's proposed decision. The public comment period will last sixty (60) calendar days from the date the notice is published in a local newspaper. Comments may be submitted by mail, fax, e-mail, or phone to Mr. Ryan Kelly at the address listed below.

A public meeting will be held upon request fifteen (15) calendar days from the date the notice is published in a local newspaper. The Administrative Record contains all the information

considered by VDEQ for its proposed remedy for the Facility. To receive a copy of the Administrative Record, contact Mr. Ryan Kelly at the address below:

Virginia Department of Environmental Quality

629 East Main Street

P.O. Box 1105

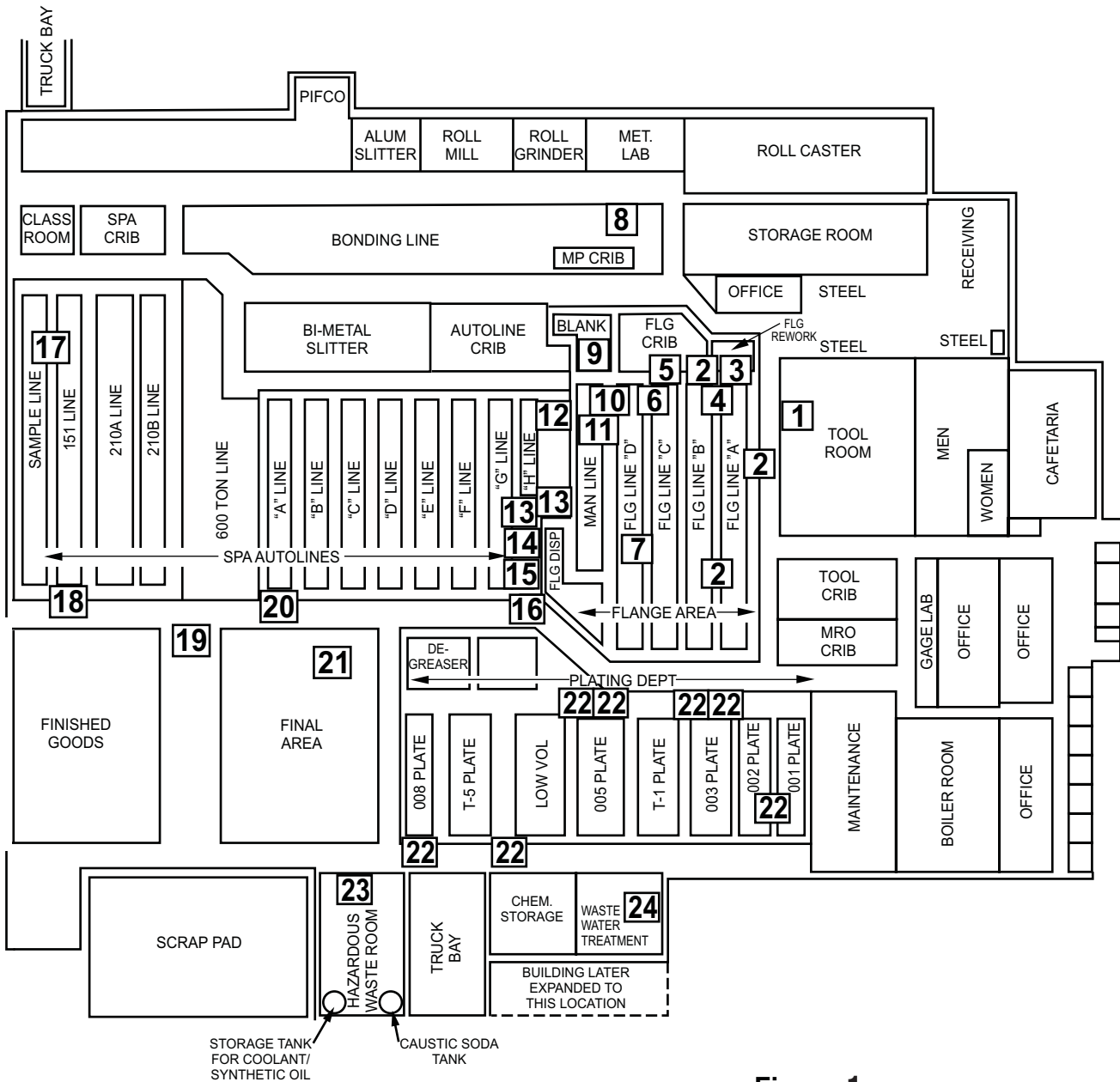
Richmond, VA 23218

Contact: Mr. Ryan Kelly

Phone: (804) 698 - 4045

Email: ryan.kelly@deq.virginia.gov

FIGURES



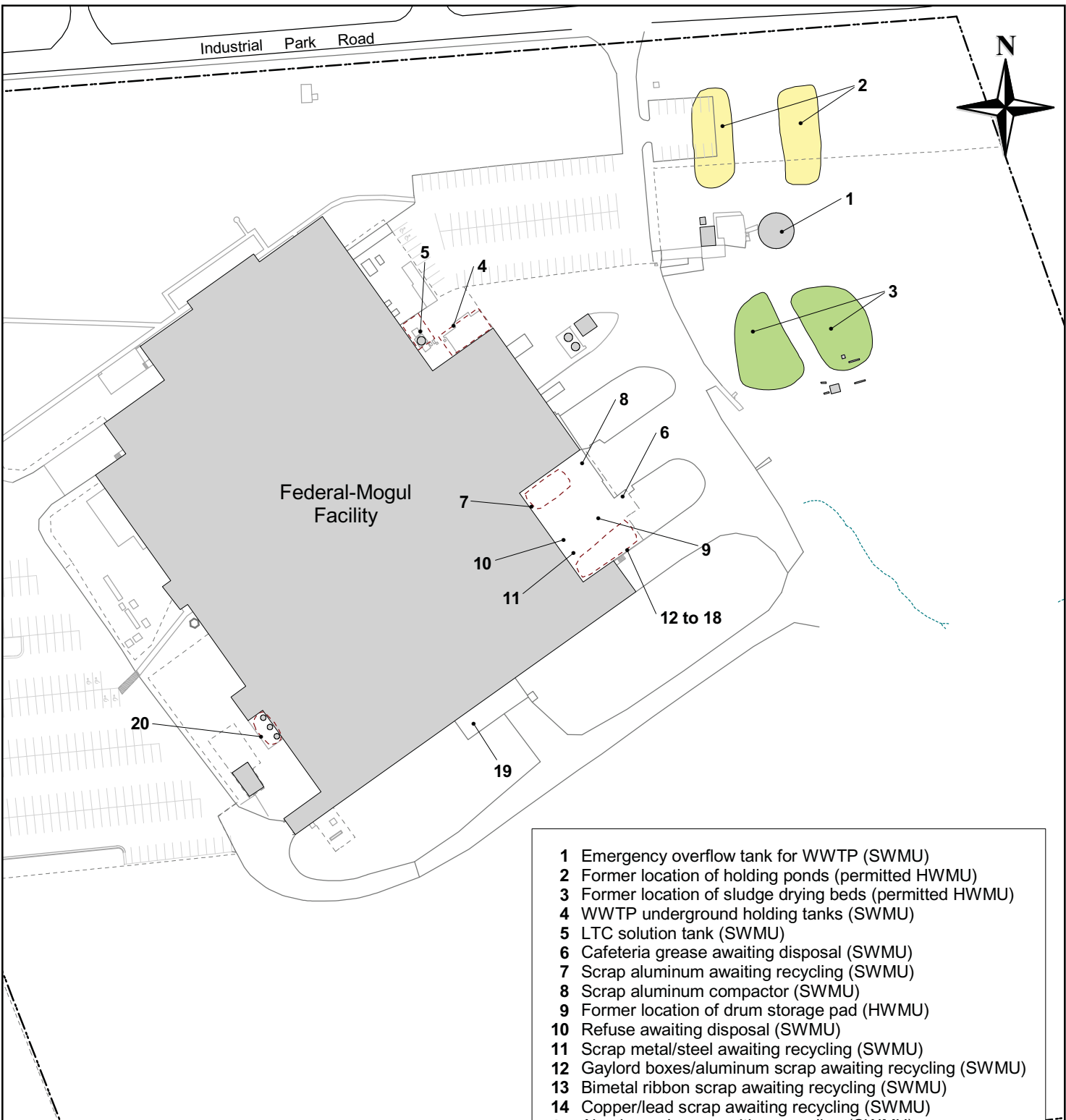
LEGEND:

1. SATELLITE ACCUMULATION AREA (SWMU)
2. LEAKAGE FROM PROGRESS MACHINE TO FLOOR (AOC)
3. BIMETAL CHIPS AWAITING RECYCLING (SWMU)
4. LIP MACHINE - CLEANS PROCESS MACHINE OF ALUMINUM CHIPS AND STORES THEM IN A SMALL CONTAINER (SWMU)
5. BIMETAL CHIPS AWAITING RECYCLING (SWMU)
6. USED COOLANT AWAITING RECYCLING (SWMU)
7. BIMETAL CHIPS AWAITING RECYCLING (SWMU)
8. ROTO CLONE SLUDGE ACCUMULATION AREA (SWMU)
9. BIMETAL SCRAP AWAITING RECYCLING (SWMU)
10. VACUUM COLLECTOR OF ALUMINUM CHIPS WITH DRUM (SWMU)
11. SCRAP COPPER AND LEAD BROACHINGS AWAITING RECYCLING (SWMU)
12. MAJOR AIR PICKUP SYSTEM OF BIMETAL BROACHINGS FOR FLANGE LINES A - D (SWMU)
13. SCRAP COPPER AND LEAD BEARINGS AWAITING RECYCLING (SWMU)
14. BAGHOUSE COLLECTOR FOR COPPER (SWMU)
15. BIMETAL CHIPS AWAITING RECYCLING (SWMU)
16. ALUMINUM CHIPS AWAITING RECYCLING (SWMU)
17. CENTRAL BAGHOUSE FOR SPA LINES (SWMU)
18. ALUMINUM CHIPS AWAITING RECYCLING (SWMU)
19. SCRAP ALUMINUM AWAITING RECYCLING (SWMU)
20. CENTRAL COOLANT SYSTEM - LOCATION OF MOP RINSE WATER FROM FLOOR CLEANIN (SWMU)
21. WASTE INK SATELLITE ACCUMULATION AREA (SWMU)
22. BACK BRUSH ACCUMULATION AREA (SWMU)
23. HAZARDOUS WASTE STORAGE AREA (LESS THAN 90-DAY STORAGE)(HWMU)
24. WASTEWATER TREATMENT PLANT (SWMU)

NOTES:

1. SPA = SPECIAL PROCESS AREA
2. MP = MATERIAL PREPARATION
3. FLG = FLANGE
4. MRD= MAINTENANCE & REPAIR ORGANIZATION
5. THE INDICATED SWMU LOCATIONS ARE PER THE PERMIT. ACTUAL LOCATIONS FREQUENTLY DIFFER DUE TO THE MOBIL NATURE OF MOST OF THE SWMUS.
6. THE PERMIT INDICATES SEVEN DIFFERENT LOCATIONS FOR SWMU 22 (BACK BRUSH ACCUMULATION AREA); HOWEVER, THIS CURRENTLY HAS BEEN REDUCED TO A SINGLE AREA.

Figure 1
Interior SWMUs, HWMUs, and AOC
Identified in the HSWA Permit



- 1 Emergency overflow tank for WWTP (SWMU)
- 2 Former location of holding ponds (permitted HWMU)
- 3 Former location of sludge drying beds (permitted HWMU)
- 4 WWTP underground holding tanks (SWMU)
- 5 LTC solution tank (SWMU)
- 6 Cafeteria grease awaiting disposal (SWMU)
- 7 Scrap aluminum awaiting recycling (SWMU)
- 8 Scrap aluminum compactor (SWMU)
- 9 Former location of drum storage pad (HWMU)
- 10 Refuse awaiting disposal (SWMU)
- 11 Scrap metal/steel awaiting recycling (SWMU)
- 12 Gaylord boxes/aluminum scrap awaiting recycling (SWMU)
- 13 Bimetal ribbon scrap awaiting recycling (SWMU)
- 14 Copper/lead scrap awaiting recycling (SWMU)
- 15 Aluminum dross awaiting recycling (SWMU)
- 16 Scrap pallets awaiting recycling (SWMU)
- 17 Chemical pallets awaiting recycling (SWMU)
- 18 Scrap from gaylords awaiting recycling (SWMU)
- 19 Synthetic oil collector system (SWMU)
- 20 Aluminum dust baghouse (SWMU)

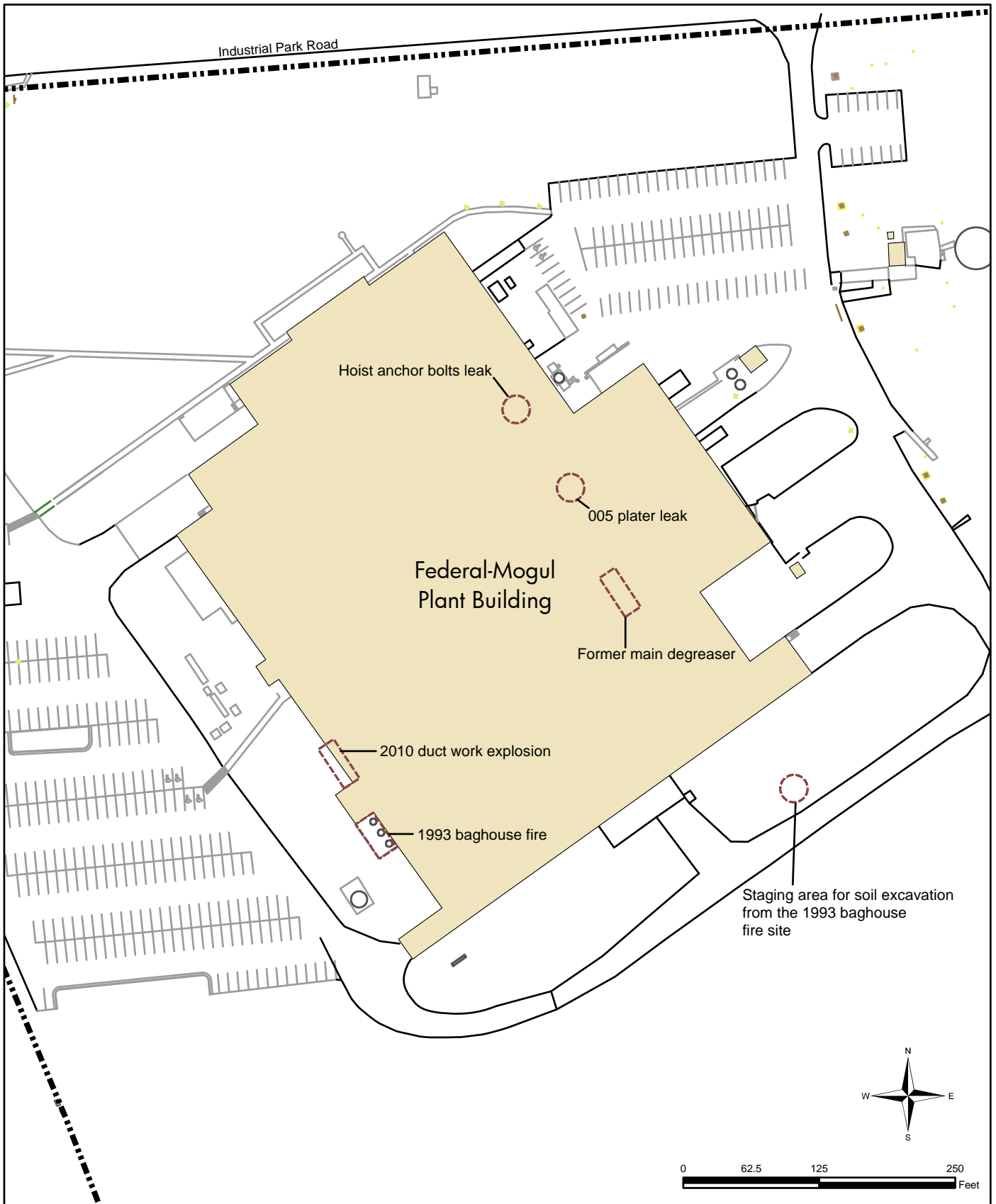
Base-Map Source:
 Federal Mogul property:
 Draper Aden Associates,
 Blacksburg, VA, February, 2001

- Federal-Mogul Property Boundary
- Building, Structure
- Fence
- Paved, Parking
- Road
- Intermittent Surface Water
- Former Location of Holding Ponds
- Former Location of Sludge Drying Beds

1:1800
 50 0 50 100 150 Feet

URS
 File: W:\48800\329\GISData\
 \projects\app-g.apr
 Date: 07/25/02
 Created: JMW
 Checked:
 Senoir: BE

Figure
Exterior SWMUs and HWMUs
Identified in the Permit



Legend

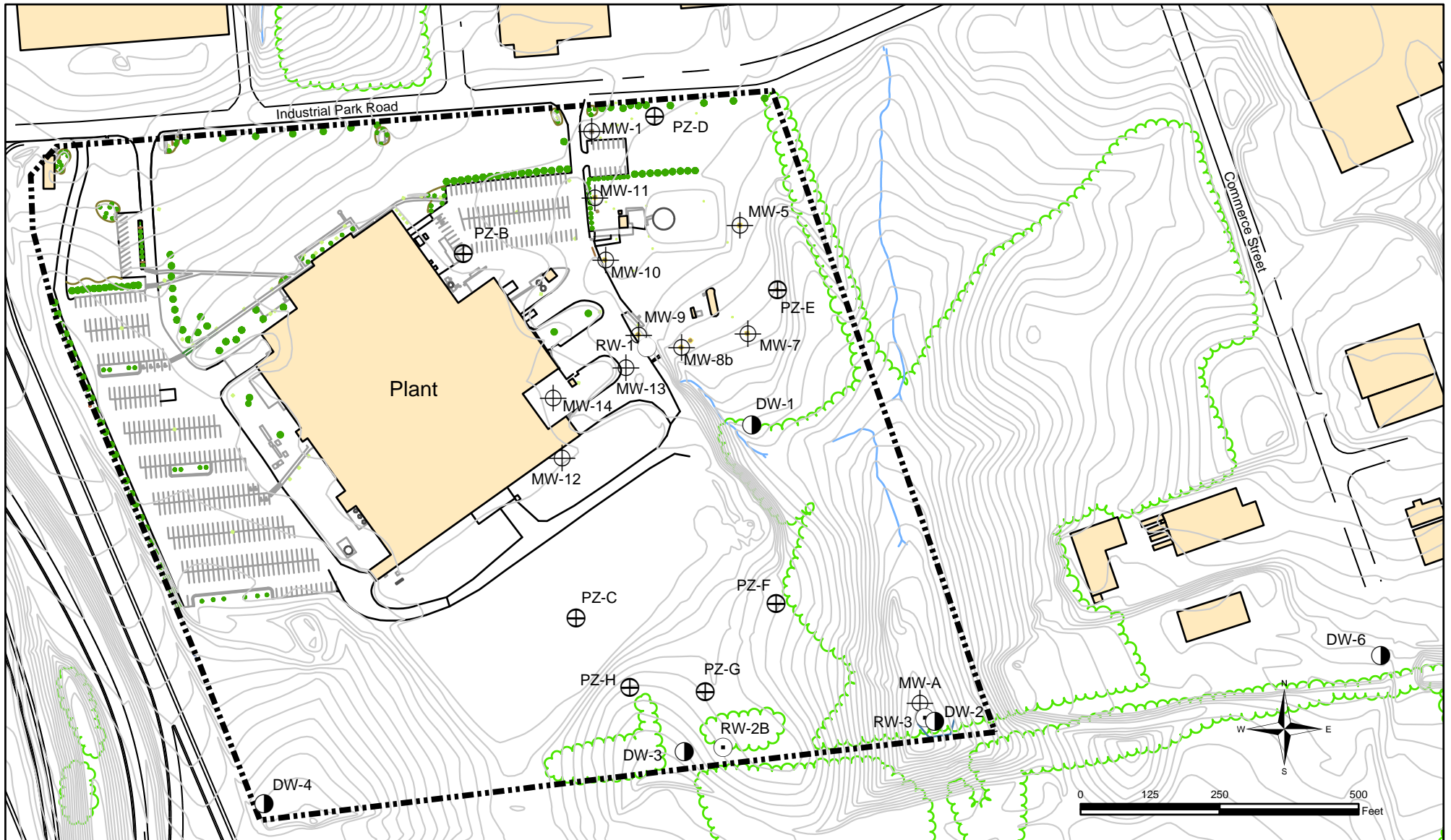
- Property Line
- - - - Approximate Location of Area of Concern (AOC)

Figure 2B
AOCs Not Identified in
Figures 1 and 2

Date: June 28, 2012	Job Number: 13651392
Prepared By: KAH	Reviewed By: JOS
Scale: 1" = 125'	File Name: Fig.2B AOCs Additional

Federal - Mogul Corporation
Blacksburg, Virginia
EPA ID No. VAD054039961





Legend

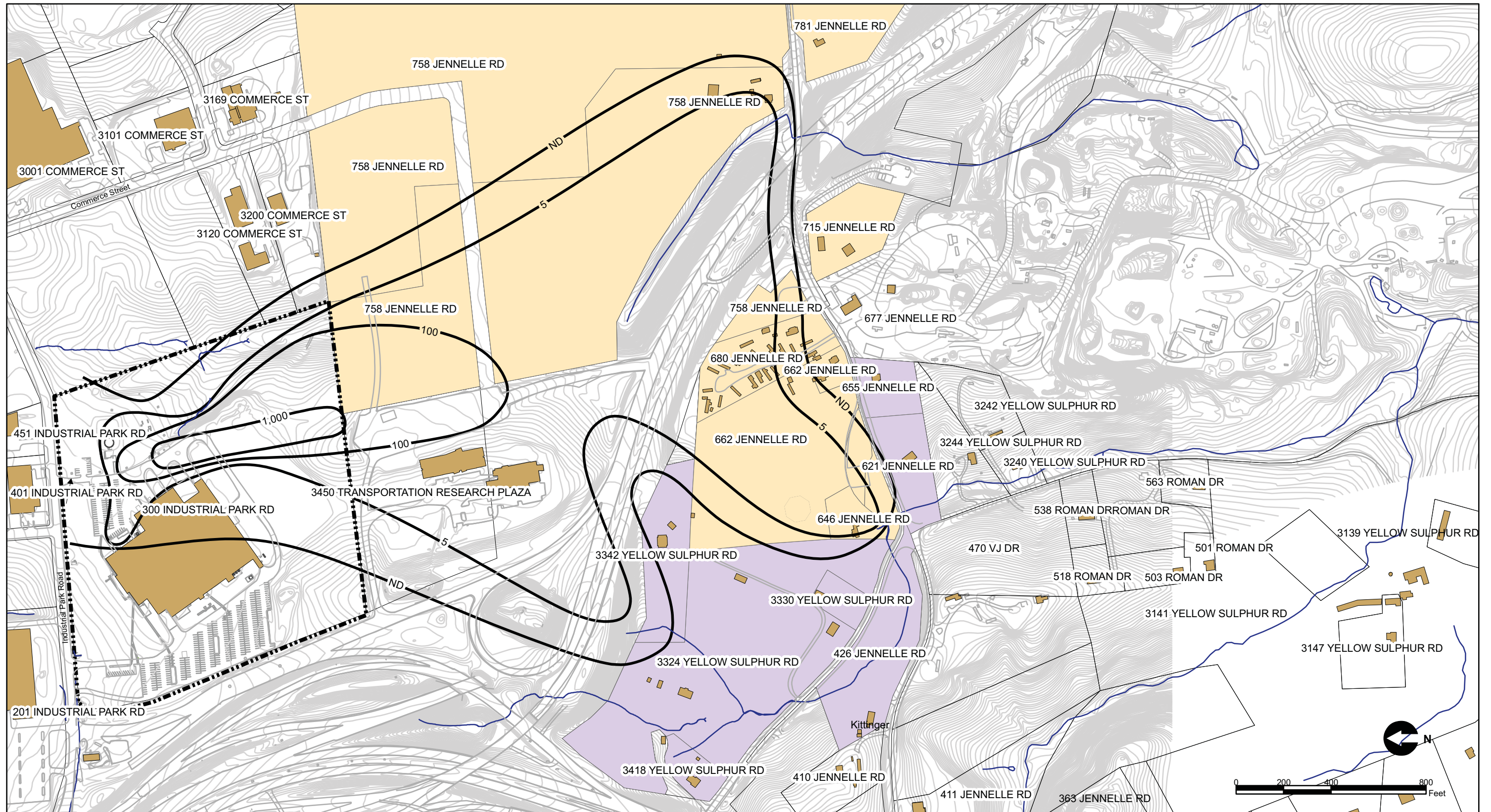
- Landscaped Trees and Shrubs
- Property Line
- Deep Well Location
- Topographic Contour (feet, mean sea level)
- + Monitoring Well Location
- Streams
- ⊕ Piezometer Location
- Tree Line
- Recovery Well Location

Figure 3
Facility Layout

Date: December 2010	Job Number: 13650759
Prepared By: MRF	Reviewed By: KAH
Scale: 1" = 250'	File Name: Fig.2-1 Facility Layout

Federal - Mogul Corporation
Blacksburg, Virginia
EPA ID No. VAD054039961





Legend








-  Topographic Contour
-  Surface Water Flow Patterns
-  Property Line
-  Isoconcentration Contour for TCE in Groundwater (Data from October 2007)
-  Structures
-  Water Rights Acquired by Federal-Mogul and Connected to Public Water System
-  Connected to Public Water System

FIGURE 5-6

Offsite Property Location: Institutional Controls and Engineering Controls

Date:
April 2008

Job Number:
13650209

Prepared By:
DBC

Reviewed By:
KAH

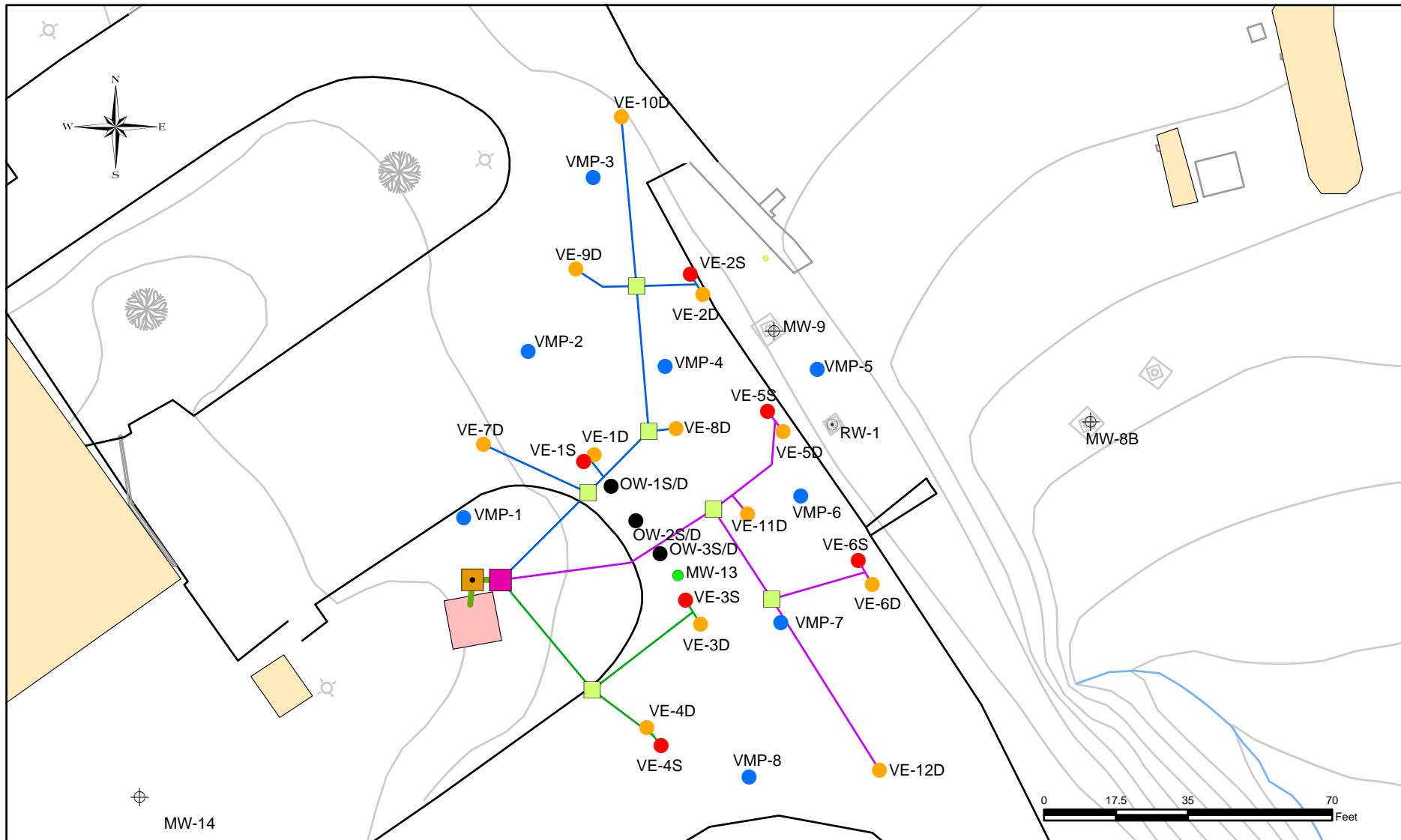
Scale:
1" = 400'

File Name:
Fig.5-7 Controls

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Legend

- Deep SVE Wells
- Shallow SVE Wells
- Vapor Monitoring Points
- Valve Box Vaults
- Main Manifold Vault
- Moisture Separator
- Piping Line 1
- Piping Line 2
- Piping Line 3
- 4" Trunk Line
- SVE Skid
- Topographic Contour

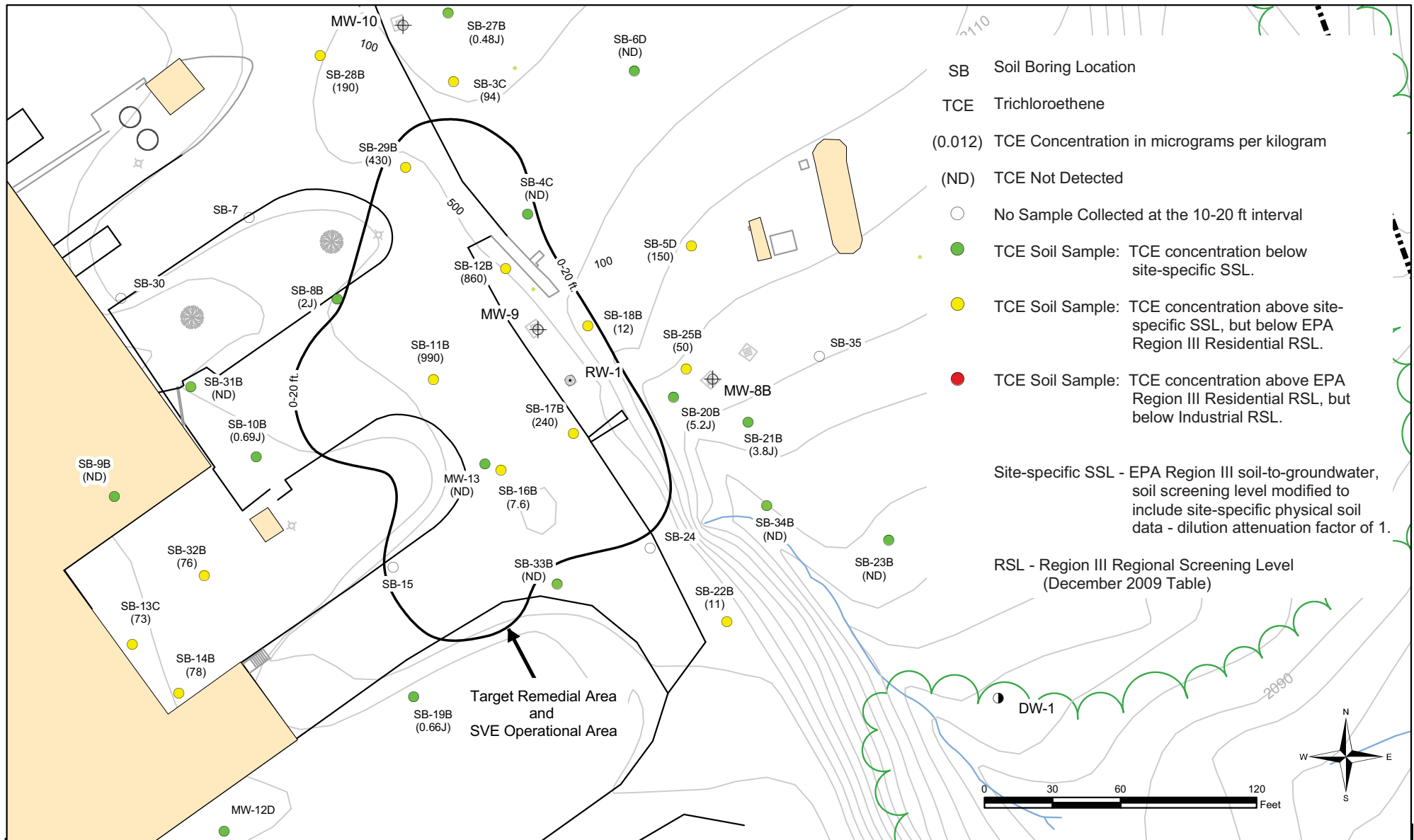
Figure 5

SVE System Layout

Date: May 2010	URS Project #: 13650537
Drawn By: MRF	Approved By: JOS
Scale: 1" = 35'	File Name: SVE Layout

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EPA ID No. VAD054039961

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 Suite 201
 Richmond, VA 23230



Legend

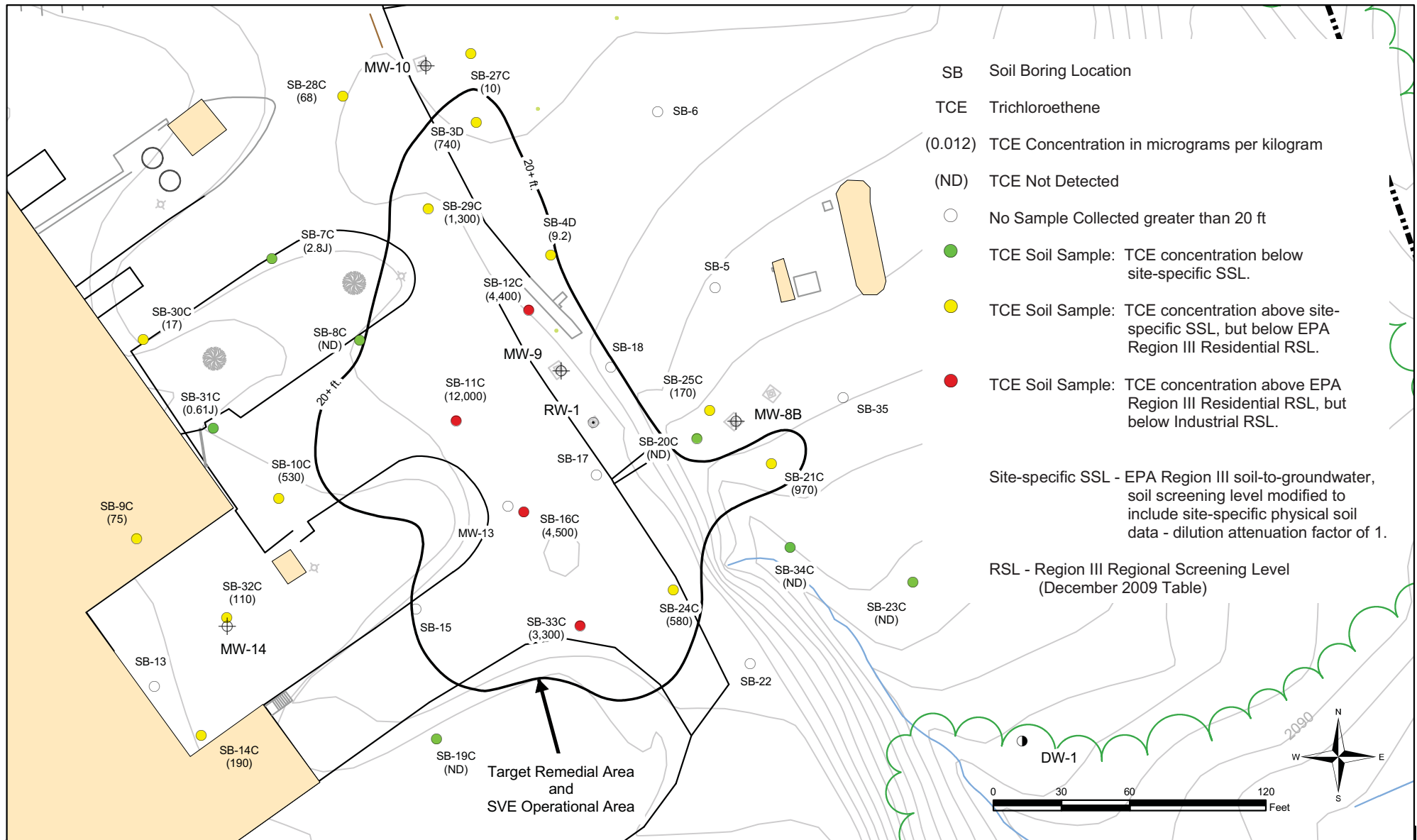
- Property Line
- Target Remedial Area and SVE Operational Area
- Topographic Contour
- Recovery Well
- Streams
- ⊕ Monitoring Well
- Tree Line
- Deep Well

Figure 6
 Target Remedial Area for Soil
 (0 to 20 feet)

Date: May 2010	Job Number: 13650759
Prepared By: MRF	Reviewed By: JOS
Scale: 1" = 60'	File Name: Fig.3-1 Impacted 0-20ft

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 EPA ID No. VAD054039961






Legend	
—•••• Property Line	— Target Remedial Area and SVE Operational Area
— Topographic Contour	○ Recovery Well
— Streams	⊕ Monitoring Well
— Tree Line	● Deep Well

Figure 7 Target Remedial Area for Soil (> 20 feet)	
Date: May 2010	Job Number: 13650759
Prepared By: MRF	Reviewed By: JOS
Scale: 1" = 60'	File Name: Fig.3-2 Impacted 20+ ft

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Legend

- Groundwater Performance Spring Location
- ⊕ Groundwater Performance Well Location
- ⊙ Recovery Well Location
- ⊕ Groundwater Elevation Monitoring Well
- Surface Water Flow Patterns
- - - - Property Line
- Topographic Contour
- Limit of Corrective Measures Area for Groundwater (TCE Concentration > 5ug/L)

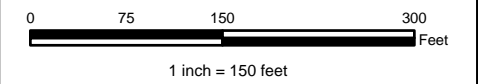
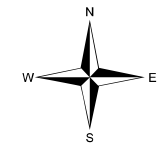
Figure 8
FIGURE 5-7
Target Remedial Area for Groundwater and
Performance Monitoring Network for Groundwater
Performance Monitoring Locations

Date: April 2008	Job Number: 13650209
Prepared By: DBC	Reviewed By: KAH
Scale: 1" = 400'	File Name: Fig.5-7 Perf.Network

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Richmond, Virginia 23230



Legend

- Property Line
- Topographic Contour (feet, mean sea level)
- Streams
- Tree Line
- Location of soil sample where concentration exceeds industrial screening criteria
- - - Soil Management Area

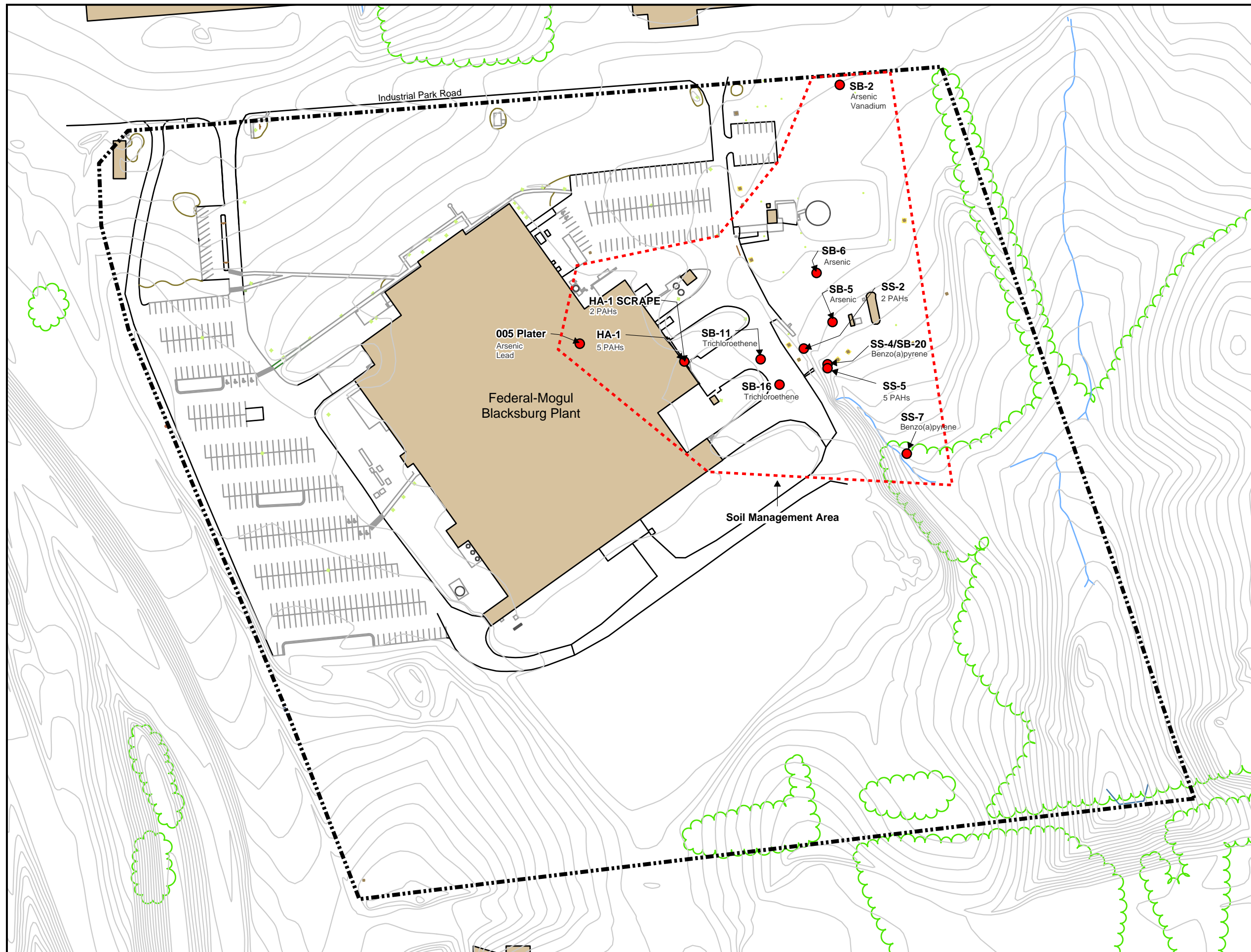


Figure 9
 Proposed Soil Management Area
 for the Proposed Final
 Remedy for Soil