FOURTH FIVE-YEAR REVIEW REPORT

Avtex Fibers Superfund Site

Front Royal, Warren County, Virginia

Prepared by:

U.S. Environmental Protection Agency

Region III

Philadelphia, Pennsylvania

Approved by:

Kathryn A. Hodgkiss, Acting Director
Hazardous Site Cleanup Division
U.S. EPA, Region 3

Date:

3/26/2013

Table of Contents

Attachments

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
DAF	Dilution Attenuation Factor
EDA	Economic Development Authority
EL	Emergency Lagoon
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences (ESD)
FA	Fly Ash
FMC	FMC Corporation
GLTP	Groundwater Leachate Treatment Plant
GPRA	Government Performance and Results Act
HI	Hazard Index
HQ	Hazard Quotient
LEL	Lower Explosive Limit
MBBR	Mixed Bed Biofilm Reactor
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal

NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTCRA	Non-Time-Critical Removal Action
O&M	Operation and Maintenance
OSC	On-Scene Coordinator
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbons
PB	Polishing Basin
PCB	Polychlorinated Biphenyls
PPA	Prospective Purchaser Agreement
ppm	parts per million
RAP	Response Action Plan
RAU	Ready for Anticipated Use
RAOs	Remedial Action Objectives
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act

SB	Sulfate Basin
SPLP	Synthetic Precipitation Leaching Procedure
SWCB	State Water Control Board
TCRA	Time-Critical Removal Action
TSCA	Toxic Substances Control Act
UAO	Unilateral Administrative Order
USACE	United States Army Corps of Engineers
VB	Viscose Basin
VDEQ	Virginia Department of Environmental Quality
VSWMR	Virginia Solid Waste Management Regulations
WWTP	Wastewater Treatment Plant

Executive Summary

The Avtex Fibers Superfund Site is a former rayon manufacturing facility consisting of approximately 440 acres, located in Front Royal, Virginia. The Norfolk Southern Railway railroad runs through the middle of the Site separating the former production facilities on the eastern side of the railroad tracks from the disposal units located on the western side of the railroad tracks. Residential areas are located to the east, south, and north of the property boundaries. The South Fork Shenandoah River is located along the western portion of the property.

The Site was placed on the NPL in 1986, and the first ROD, selecting a "pump and treat" remedy for groundwater, was issued in September 1988. A little over a year later, the Virginia Water Control Board revoked the NPDES permit, and Avtex ceased operations. Subsequently, EPA initiated emergency removal actions to prevent releases from reactive and dangerous materials left in tanks, piping, and buildings. To facilitate management of the cleanup, the remediation activities were divided into ten operable units and three removal actions.

The remedies selected for OU-1, OU-2, OU-3, OU-4, OU-5, OU-6, OU-8, and OU-9 are either complete or addressed under another action. The remedial action for OU-7, Groundwater, Surface Water, and Viscose Basins 9, 10, and 11, is under construction and the remedial action for OU-10, Plant Area Soils, Viscose Basins 1 through 8, and the Wastewater Treatment Plant (WWTP) is substantially complete.

EPA selected a remedy for OU-8, Areas B and C, requiring institutional controls which permanently restrict the land use of Areas B and C to commercial/industrial use on September 29, 2000. At present an institutional control is in place for the entire Avtex Site. A Conservation and Environmental Protection Easement and Declaration of Restrictive Covenants (Conservation Easement) was filed on December 7, 1999, which restricts land use of the areas associated with OU-8 to commercial/industrial and meets the remedial objective specified in the ROD. On January 3, 2012 EPA issued a second Explanation of Significant Differences (ESD), which among other things, selected a modification to the existing Conservation Easement. The signatories to the Conservation Easement are in the process of making these modifications.

EPA selected a remedial action in the March 10, 2004 OU-10 ROD for Viscose Basins 1 through 8, the New Landfill, the Plant Area Soils and the WWTP. The remedy included installation of geosynthentic caps as well as leachate collection and management for Viscose Basins 1 through 8 and the New Landfill. These construction activities were conducted between 2008 and 2012. The selected remedial action also required cleanup of Plant Area Soils to levels that protect human health and the environment. On January 10, 2006, EPA issued an ESD to extend the area to be remediated as part of Plant Area Soils. The plant area soils were remediated between 2002 and 2009. After the demolition of the Site's buildings, infrastructure, and sewers, and removal and disposal of the debris, the remaining soils on site were sampled in grid sizes of

100 ft. X 100 ft., 200 ft. X 200 ft., and 50 ft. X 50 ft., based on work plan criteria. The soils which exceeded risk-based remedial action levels were excavated and either disposed off-site, or beneficially used on-site if the soils met acceptable risk levels. Grid areas where soils were excavated were re-sampled to confirm that the specific areas met the acceptable risk-based levels. The only remaining OU-10 construction activity is the demolition of the existing Wastewater Treatment Plant which is scheduled to be completed in 2013.

Most recently, EPA issued the ROD for OU-7 (the fifth and final ROD for the Site), consisting of Viscose Basins 9 through 11, groundwater and surface water on January 13, 2010. The selected remedy, among other things, includes:

- Installation of a low permeability cap over Viscose Basins 9, 10, and 11;
- Installation of leachate extraction wells;
- Construction and operation of a plant to treat extracted leachate and contaminated groundwater;
- Provision of water to impacted property owners on the west side of the South Fork Shenandoah River; and
- Annual sampling of the surface water, sediments, and biota in the South Fork Shenandoah River.

The Remedial Designs for OU-7, consisting of capping and leachate extraction for Viscose Basins 9 through 11, a groundwater pump and treat system, and surface water monitoring, were approved in 2012. Construction of the OU-7 remedial action is scheduled to be completed in January 2015.

The assessment of this five-year review found that the remedies for OU-2 and OU-8 were implemented in accordance with their respective RODs and are considered protective of human health and the environment. The OU-7 and the OU-10 constructions are in progress and the remedies are expected to be protective upon completion. The Time-Critical Removal Action – Buildings was completed in September 2011 and is considered protective of human health and the environment. The other response actions, including the Non-Time-Critical Removal Action - Basins, the Non-Time-Critical Removal Action - Buildings and Sewers are in progress and are expected to be protective upon completion.

Because the Site is not construction complete, a Site-wide protectiveness determination has not been made.

This is the fourth five-year review for the Site. The first review was triggered by the date that onsite construction began for OU-2 and OU-3. The trigger for this five-year review was the completion date of the third review, March 26, 2008.

GPRA Measure Review

As part of this five-year review, the GPRA Measures have also been reviewed. The GPRA Measures and their status are as follows:

Environmental Indicators

Human Health: Current Human Exposure Under Control (HEUC)
Groundwater Migration: Groundwater Migration Not Under Control (GMNC)

Site-Wide RAU

The Site is expected to achieve Site-wide Ready for Anticipated Use on January 2015.

Five-Year Review Summary Form

Site Identification		
Avtex Fibers Superfund Site		
EPA ID: VAD0070358684		
Region: 3	State: VA	City/County: Front Royal/Warren County
Site Status		
NPL status : * Final Deleted Other (specify)		
Remediation status: * Under Construction * Operating Complete **OU-1, OU-2, OU-3, OU-4, OU-5, OU-6, OU-8, and OU-9** are either complete or deferred to another action Time-Critical Removal Action (Buildings): Complete Non-Time-Critical Removal Action (Buildings): Physical work is substantially complete with a few sewers to be removed. Non-Time-Critical Removal Action (Basins): under construction **OU-10**: Plant Area soils – physical work complete and final report is being prepared, Viscose Basins 1-8 - physical work is complete and final report is being prepared. Decontamination and demolition of on-site WWTP is under construction. New Landfill: Physical work complete and final report is being prepared. **OU-7:** Under construction		
Multiple OUs? *Yes No	Construction Completion date: N/A	
Has Site been put into reuse? *Yes Partially No		
Review Status		
Lead Agency: * EPA State Tribe Other Federal Agency		
Author name: Kate Lose		
Author title: Remedial Project Manager	Author affiliation: US EPA, Region 3	
Review period: 09/18/2012 to 03/12/2013		

Date of Site inspection: October 15, 2012
Type of review: * Post-SARA Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion
Review number : 1 (first) 2(second) 3 (third) Other (specify) 4th *
Triggering action: Actual RA Onsite Construction Actual RA Start at OU#__ Construction Completion Previous Five-Year Review Report* Other (specify)
Triggering action date: 03/26/2008
Due date (five years after triggering action date): 03/26/2013

Issues:

A few of the vents in the Viscose Basin Area (VB 4-6) are producing high concentrations of hydrogen sulfide at high flow rates. Screening of the hydrogen sulfide emissions, without controls, shows that the resultant ambient air concentrations may exceed the odor threshold offsite in the residential areas during periods of worst case meteorology. Furthermore, onsite sulfide ambient air concentrations may exceed the Hazard Index of 1.

During the site inspection, a few wells, which were not properly labeled or secured, were identified. The necessary repairs were made immediately following the inspection.

An evaluation of the analytical results for the soil data concluded that the plant area soil remedy is protective for an industrial/commercial worker. EPA did not evaluate the ecological impacts because the future site use is designated for industrial/commercial use. At the current time, there are no plans for development under consideration. To ensure that the plant area soils remedy is protective to the current ecological receptors, an ecological assessment is warranted.

Recommendations:

Collect gas vent data (concentrations, flow rates, temperature, etc.) of all the gas vents in Viscose Basins 3, 4, 5, 6, 7, 8, 9, 10 and 11 and incorporate the data into a refined air dispersion model such as AERMOD. The results of the model will be used to predict whether offsite and onsite ambient air concentrations of hydrogen sulfide are causing unacceptable risks to nearby residents and onsite workers. The results will also be used to determine the potential for nuisance odors offsite to be sporadic or routine. If the results of the air modeling show that the hydrogen sulfide

emissions cause unacceptable risks or causes routine nuisance odors offsite, air pollution controls will be installed to capture or destroy most of the hydrogen sulfide emissions from the vents. In lieu of the air modeling analysis, air pollution controls can be installed proactively.

A groundwater monitoring well evaluation plan should be developed and implemented.

An ecological assessment to evaluate the protectiveness of the remedy for ecological receptors should be conducted.

Protectiveness Statement:

The remedies for OU-2 and OU-8 are considered protective of human health and the environment as intended by their RODs. Time-Critical Removal Action for Buildings is protective for an industrial worker.

In regard to OU-10, for Plant Area Soils is protective for an industrial worker and the caps for Viscose Basins 1 through 8 and the New Landfill are also protective. The remedy for OU-7 is in progress. Future five-year reviews will evaluate the protectiveness of the OU-7 response actions, as appropriate.

The Time-Critical Removal Action – Buildings was completed in September 2011 and is considered protective of human health and the environment.

The other response actions, including the Non-Time-Critical Removal Action - Basins, the Non-Time-Critical Removal Action - Buildings and Sewers, and OU-10 wastewater treatment decontamination and demolition, are in progress and are expected to be protective upon completion.

Because the Site is not construction complete, a Site-wide protectiveness determination has not been made.

U.S. Environmental Protection Agency
Region III
Hazardous Site Cleanup Division
Fourth Five-Year Review
Avtex Fibers Superfund Site
(EPA # ID VAD0070358684)
Front Royal, Warren County, Virginia

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings and conclusions of the review are documented in a Five-Year Review report. In addition, a Five-Year Review report identifies issues, if any, found during the review and identifies recommendations to address them. This document will become a part of the Site file and the Administrative Record file for the Site.

The Agency is preparing this Five-Year Review report pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The United States Environmental Protection Agency (EPA), Region 3, conducted this five-year review of the remedy implemented at the Avtex Fibers Superfund Site in Front Royal, Virginia. This review was conducted for the entire Site by the Remedial Project Manager (RPM) from September 2012 through March 2013. This report documents the results of the review. EPA's oversight contractor completed a Site Inspection in support of this five-year review.

This is the fourth five-year review for the Avtex Fibers Superfund Site. The triggering action for this review is the third five-year review report signed March 26, 2008. The initial five-year review was required in conjunction with Operable Unit 2 (OU-2) of the September 1990 Record of Decision (ROD 2) due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

A comprehensive list of Site events highlighting removal, remedial and enforcement activities are provided in Table 1 below.

Table 1: Chronology of Site Events

Date	Event
October 15, 1984	Proposed to NPL List
June 10, 1986	Final NPL Listing
August 11,1986	EPA entered into a Consent Order with Avtex Fibers to perform a Remedial Investigation and Feasibility Study (RI/FS) to investigate the impacts of the viscose basins on the groundwater.
January 6, 1988	EPA amends the Consent Order to include FMC Corporation (FMC) as a potentially responsible party.
September 30, 1988	ROD 1 selecting the Operable Unit 1 (OU-1) remedy to pump and treat contaminated groundwater using existing pumping wells is signed.
May 12, 1989	Virginia Department of Health issued advisory against fish consumption in certain portions of the Shenandoah River. The South Fork of the Shenandoah River adjacent to the Avtex Site was part of that advisory.
June 30, 1989	EPA issues a Unilateral Administrative Order (UAO) to Avtex and FMC to implement the remedial action chosen in the ROD 1 for OU-1.
September 20, 1989	EPA Region III receives request from Virginia Department of Waste Management to conduct a removal assessment.
September 26, 1989	EPA On-Scene Coordinator (OSC) initiates a removal assessment at Avtex.

Date	Event
October 31, 1989	EPA issued a UAO to Avtex ordering it to conduct a removal action at the Site. Actions required include a plan to sample and segregate and dispose of hazardous substances, including drummed wastes and a plan to evaluate certain polychlorinated biphenyls (PCBs) - contaminated areas and a plan to provide Site security among other things.
November 10, 1989	Avtex Fibers National Pollutant Discharge Elimination System (NPDES) permit revoked by the Virginia Water Control Board. Avtex ceased operations.
November 11, 1989 - September 30, 1993	EPA initiated an emergency removal action at the Site. Removal operations included an imminent hazard evaluation; establishing Site security; design and operation of the wastewater treatment system; return of raw chemicals to suppliers; disposal of lab pack and flammable chemicals, draining and treatment of 22 carbon disulfide impoundments; and draining, flushing, and onsite treatment of various process line, tank and vessel fluids.
November 29, 1989	EPA issued a UAO to Avtex which restricts access to the Site and prohibits interference with EPA's removal actions being conducted at the Site.
February 2, 1990	EPA issued a UAO (WWTP UAO) ordering FMC to operate the wastewater treatment plant (WWTP) at the Site in order to maintain freeboard levels in sulfate basins 1-4E and the emergency lagoon.
February 6, 1990	Avtex Fibers, Inc. and Avtex Fibers - Front Royal file for Chapter XI Bankruptcy.
September 28, 1990	ROD 2 selecting the OU-2 remedy is signed. Subsequent to the OU-2 ROD, operable units for the Site were redefined to facilitate project management, Site characterization and remedial action. Remedial actions defined in ROD 2 were designated as: OU-2 PCB contaminated soils; OU-3 demolition of the acid reclaim facility; OU-4 Site security; and OU-5 drum removal.
March 4, 1991	Remedial Action for OU-3 delivery order was issued to commence expedited remedial actions for the acid reclaim facility.
March 4, 1991	Remedial Action for OU-2 delivery order was issued to commence PCB soil cleanup.

July 22, 1991	Remedial Action for OU-4 to provide Site security and maintenance initiated.
October 22, 1991	EPA issued a UAO requiring FMC to provide alternate water to residents in Rivermont Acres, a residential subdivision on the west side of the Shenandoah River.
January 22, 1992	OU-2 PCB soil cleanup completed.
March 30, 1993	EPA and FMC signed a Consent Order which required FMC to complete a portion of the RI/FS for the viscose basins, sulfate basins, WWTP lagoons, fly ash piles and basins, groundwater and onsite soils. The balance of the RI/FS, which included the investigation of the buildings, sewers, the River, an ecological investigation and risk assessment, would be conducted by EPA.
August 2, 1993	EPA issued Modification 1 to the WWTP UAO allowing FMC to decrease freeboard in the sulfate basins for the purpose of conducting sampling of the sulfate basins during the RI field work.
September 23, 1993	OU-3 Remedial Action Report for the Acid Reclaim dismantling and demolition completed.
October 1, 1993 - September 29, 1995	EPA continued time-critical removal activities including decommissioning of 22 carbon disulfide impoundments onsite; draining, treating and/or disposal of liquid wastes from 7 large storage tanks, removing and disposing of zinc sludge; directing and overseeing cleanup of PCB-oil spill conducted by Bankruptcy Trustee- hired contractor; overseeing removal and decontamination of assets sold by Bankruptcy Trustee.
September 20, 1996 - September 1998	Based upon the results of an EPA's remedial investigation, a time-critical removal action focusing on the demolition of the rayon manufacturing process buildings and staging of demolition debris was conducted. A total of 5,720,000 gallons of water generated during the removal activities were treated and/or discharged to the onsite WWTP.
November 18, 1996	First five-year review completed.
October 8, 1998	EPA issued a second modification to the WWTP UAO ordering FMC to perform stabilization activities at the Site. The removal activities conducted included, among other things, erosion and sedimentation control, and management of waste piles and debris.

February 19, 1999	Pursuant to the CERCLA of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), the Prospective Purchaser Agreement (PPA) between EPA and Century Enterprises, LLC became effective. The PPA pertains to a 5.2 acre uncontaminated parcel of land.
February 1999	EPA completes Final Ecological Risk Assessment for the Site and the adjacent reach of the South Fork of the Shenandoah River.
February 1999/March 1999	EPA, FMC, and the Virginia Department of Environmental Quality (VDEQ), working with the local Economic Development Authority (EDA), formed a stakeholder group to provide public input on the cleanup and reuse of the Avtex Site. The group is composed of individuals and organizations who reflect the diverse interests of Front Royal and Warren County.
May 29, 1999	EPA issues a proposed non-time-critical removal action plan for closing the sulfate basins, the wastewater treatment plant basins, the fly ash basins and fly ash stockpile. The public comment period took place from May 29, 1999 through July 2, 1999 with a public meeting conducted on June 17, 1999.
July 9, 1999	The Consent Decree between FMC Corporation and EPA was lodged in the U.S. District Court for the Western District of Virginia pursuant to the Clean Water Act and the Oil Pollution Act of 1990. The Consent Decree identified and defined additional activities to be conducted at the Site. Additional time-critical response activities for buildings were defined. The Consent Decree provided that EPA would select a non-time-critical response action (NTCRA) for sulfate sludge and fly ash wastes and a non-time critical response action for buildings and sewers. The Consent Decree also requires FMC to implement the OU-7 remedy (Viscose Basins 9-11, groundwater and surface water), and the OU-10 remedy (Viscose Basins 1-8, the New Landfill, WWTP and soils) after EPA issues RODs for these two operable units.
October 21, 1999	The Consent Decree between FMC and EPA became effective. FMC provides Site security, control, maintenance, and health and safety measures to ensure protection of human health and the environment in accordance with the Consent Decree.
November 1999	Avtex Bankruptcy Plan of Reorganization effective. Industrial Development Authority of the Town of Front Royal and the County of Warren County, d/b/a the Economic Development Authority (EDA)

Date	Event
	take title to property.
December 7, 1999	The Conservation and Environmental Protection Easement (Conservation Easement), which permanently places enforceable limitations on the future land uses of the Avtex Fibers Superfund Site Property, filed. The Conservation Easement are held and enforced by the Lord Fairfax Soil and Water Conservation District and the Valley Conservation Council.
January 31, 2000	EPA signed a Removal Action Memorandum selecting a non-time-critical response action for the sulfate basins, the wastewater treatment plant basins, the fly ash basins and the fly ash stockpile, a.k.a., non-time-critical-removal action - Basins (NTCRA - Basins).
March 20, 2000	The PPA between EPA and the EDA, the Town of Front Royal and the County of Warren became effective.
September 29, 2000	ROD 3 for OU-8 selecting institutional controls which permanently restrict the land use of Areas B and C to commercial/industrial usage is signed.
April 2001	EPA approves FMCs Response Action Plan to close the basins.
May 2001	FMC begins onsite work to close basins.
December 20, 2001	EPA signed a Removal Action Memorandum selecting a non-time-critical response action for the remaining buildings and sewers, a.k.a., non-time-critical-removal action - Buildings (NTCRA - Buildings).
January 2002	FMC began decontaminating the buildings under an approved Response Action Plan.
March 28, 2003	Second five-year review completed.
March 10, 2004	EPA signs ROD 4 for OU-10 selecting remedies for Viscose Basins 1 through 8, the WWTP, the New Landfill and Plant Area Soils. The selected remedy for Viscose Basins 1 through 8 includes improving the existing soil covers, collecting and treating leachate and groundwater monitoring. The WWTP is to be decontaminated and demolished. The selected remedy for the New Landfill includes constructing a soil cap, collecting and treating leachate and groundwater monitoring. The final area included in the OU-10 ROD is the Plant Area Soils. The selected remedial action requires cleanup of Plant Area Soils to levels that protect human health and the

Date	Event
	environment.
December 23, 2004	EPA approved the OU-10 Remedial Design Work Plan for Viscose Basins 1 through 8, the WWTP and the New Landfill.
April 8, 2005	EPA approved the OU-10 Remedial Design Work Plan for Plant Area Soils.
June 13, 2005	As part of the NTCRA - Buildings project, FMC began excavating sewers under an approved Response Action Plan. The project was conducted in three phases as buildings and other obstacles to sewer excavation have been removed. Phase I sewer removal activities were completed in Fall 2005.
September 19, 2005	The U.S. Army Corps of Engineers, Norfolk District (USACE), imploded the boiler house, part of a massive three-building complex that included the power house and compressor room. After the boiler house implosion, USACE contractors demolished the remaining two buildings using conventional track hoe methods. This milestone was marked with a well-attended public ceremony including speakers: Congressman Frank Wolf, Front Royal Mayor James M. Eastham; Norfolk District Commander and Engineer, Col. Yvonne J. Prettyman-Beck; U.S. EPA Region III, Regional Administrator, Donald S. Welsh; and FMC Corporation Senior Vice President W. Kim Foster.
January 10, 2006	EPA signed an ESD for OU-10 ROD to expand the area being addressed as Plant Area Soils to include additional areas of concern that had been identified. (Soils in Vicinity of SoccerPlex Area, Burnt Debris/Ash Area, and the Coal Seam Area).
August 17, 2006	EPA approved the final Viscose Basin Leachate Pumping Test and Field Treatability Study Work Plan. FMC conducted the work during July and August 2006 to provide additional information for the preparation of the OU-7 Feasibility Study Report.
September 9, 2006	The Skyline SoccerPlex, the first completed redevelopment of the Site, officially opened. FMC, EPA, the U.S. Soccer Foundation, and the local EDA worked together to cleanup the 30-acre parcel of land and constructed four soccer fields.
September 29, 2006	EPA provided conditional approval of FMC's Time-Critical Removal Action Buildings Report dated September 28, 2006. This Report documents the work activities conducted and completed in accordance

Date	Event
	with Paragraph 21 of the October 21, 1999 Consent Decree describes the work to be conducted and completed by FMC for the Removal Action - Buildings (Time-Critical). Conditional approval was provided because a number of the required activities described by these documents are currently being implemented along with the Non-Time-Critical Removal Action - Buildings as part of the remaining buildings and the remaining sewers remedies, and the ROD for OU-10 as part of the Plant Area Soils remedy.
September 29, 2006	EPA approves the OU-10 Final Remedial Design for Plant Area Soils.
February 26, 2007	As part of the NTCRA - Buildings project, FMC initiated Phase II of the removal of sewers.
May 31, 2007	Reconciliation and Termination Agreement to the State Superfund Contract for Remedial Actions between the Virginia Department of Environmental Quality and EPA is executed.
November 2007	USACE completed non-CERCLA asbestos abatement and building demolition activities and demobilized from the Site.
November 5, 2007	EPA approves FMC's Plant Area Soils Remedial Design Amendment #1 to the approved Final Remedial Design for Plant Area Soils (OU-10). This amendment updated the remedial design to include soils that had been characterized since the September 29, 2006 final remedial design.
December 10, 2007	EPA approves FMC Plant Area Soils Remedial Design Amendment #2 to the approved Final Remedial Design for Plant Area Soils (OU-10). This amendment updated the remedial design to include soils that had been characterized since the first amendment to the remedial design (November 5, 2007).
January 22, 2008	EPA approves FMC's Final Remedial Design for Viscose Basins 1-8 and New Landfill (OU-10).
March 26, 2008	Third Five-Year Review Completed.
June 30, 2008	EPA approves FMC Plant Area Soils Remedial Design Amendment #3 to the approved Final Remedial Design for Plant Area Soils (OU-10). This amendment updated the remedial design to include soils that had been characterized since the second amendment to the remedial design (December 10, 2007).

Date	Event
July 11, 2008	EPA approves FMC Plant Area Soils Remedial Design Amendment #4 to the approved Final Remedial Design for Plant Area Soils (OU-10). This amendment updated the remedial design to include soils that had been characterized since the third amendment to the remedial design (June 30, 2008).
October 4, 2008	OU-10: VB 4-6 construction completed
May 2009	FMC completed Phase II of sewer removal
January 5, 2009	As part of the NTCRA – Buildings project, FMC initiated Phase III of the removal of the sewers
August 21, 2009	EPA approves OU-7 Feasibility Study for OU-7
October 2, 2009	OU-10: VB-1, 2, 3, 7 and 8 construction completed
October 14, 2009	EPA approves NTCRA – Buildings RAP Supplement 5 (Amendment 1) for characterization of groundwater at former Polymer Plant and select sewers. Soil sampling and removal activities June 2010 through February 2011. EPA approved Amendment 2 July 5, 2011. Wells installed in 2011 and sampled 2011/2012. EPA approves final report July 2, 2012.
October 29, 2009	EPA approves NTCRA – Buildings Characterization of Soils associated with Sewers within the Norfolk Southern Right of Way.
January 13, 2010	EPA signs ROD 5 selecting the OU-7 remedy to pump and treat contaminated groundwater; a cap and leachate extraction system for Viscose Basins 9-11; and an annual monitoring of surface water and sediments is signed.
March 10,2010	EPA approves NTCRA – Basins SB-2 Basin Supplemental Design Plan; Construction Documents; and Closure of SB-2 Drawing.
May 3, 2010	EPA approves NTCRA- Buildings RAP Supplement 6 for the characterization of brine impacted wastes.
July 30, 2010	EPA approves NTCRA – Buildings work plan for excavation and management of asbestos-impacted soils from the former manufacturing building area.
September 20, 2010	NTCRA – Basins – Sulfate Basin -2 and Polishing Basin 3 construction completed.
November 2, 2010	EPA approves FMC Plant Area Soils Remedial Design Amendment #5 to the approved Final Remedial Design for Plant Area Soils

Date	Event
	(OU-10). This amendment updated the remedial design to include soils that had been characterized since the fourth amendment to the remedial design (July 11, 2008).
November 3, 2010	EPA approves OU-7 Sampling and Analysis Plan Supplement
January 4, 2011	Initiated NTCRA – Buildings RAP 4 Supplement 10 for the Carbon Disulfide Moats and the Carbon Disulfide Overflow Line remediation. Work completed June 2011.
January 11, 2011	EPA approves NTCRA – Buildings approach for characterization of Subgrade Structure 28 Fan House No. 8.
January 12, 2011	EPA accepts NTCRA – Buildings implementation plan for RAP Supplement 6 management of brine impacted wastes.
January 28, 2011	EPA approves NTCRA – Basins SB-1 Cells 2-4 Closure Design Report
June 17, 2011	EPA approves NTCRA – Buildings RAP Supplement 10 Carbon Disulfide Moat and Carbon Disulfide Overflow Line Soil Characterization
July 5, 2011	As part of the NTCRA- Buildings Project, FMC completed Phase II of the removal of sewers
September 28, 2011	EPA determines the Time-Critical Removal Action Buildings has been satisfactorily completed.
November 19, 2011	NTCRA – Basins Sulfate Basin 1, Cells 2-4 remedy completed
January 6, 2012	OU-10 Plant Area Soils remediation completed
January 11, 2012	EPA approves Remedial Design for OU-7 Groundwater and Leachate Treatment Plant
January 19, 2012	EPA approves OU-7 Remedial Design for Viscose Basins 9-11 Cap System and Groundwater and Leachate Extraction System
January 25, 2012	EPA issues second ESD for OU-7, OU-8, and OU-10 RODs to modify the Conservation Easement by replacing the existing Easement with multiple easements to address multiple owners and property uses. This ESD also modified Ecological Backfill Values with site specific cleanup values.
March 26, 2012	EPA approves OU-10 Design Addendum to the Final Remedial Design for Viscose Basins 1-8 and New Landfill consisting of the final design for the New Landfill.
March 26, 2012	EPA approves OU-7 Sampling and Analysis Plan Supplement.

Date	Event
June 7, 2012	EPA approves OU-10 Investigative Report for Soils Adjacent to the SoccerPlex.
June 15, 2012	New Landfill (OU-10) construction completed
July 23,2012	OU-7 Groundwater and Leachate Treatment Plant (GLTP) construction started
August 7, 2012	EPA approves OU-7 Surface Water and Sediment Monitoring Plan
August 20, 2012	EPA approves NTCRA – Basins design for Sulfate Basin SB-1, SB-3, and SB-4 Final Cover Remediation Project
September 4, 2012	South Fork Shenandoah River Biota, Surface water and Sediment Samples Collected (OU-7)
October 2, 2012	EPA approves OU-10 Final Remedial Design and Remedial Action Work Plan for WWTP Demolition
October 18, 2012	OU-7 VB 9-11 – Cap installation completed.
January 2, 2013	EPA approves NTCRA- Basins Closure Design Plan for Polishing Basins (PB-1 and PB-2) and Emergency Lagoon
February 1, 2013	EPA approves NTCRA- Basins Remediation of SB-1 Final Cover System.

III. Background

Site Description

The Avtex Fibers, Inc. Site (Site) is a former synthetic fibers manufacturing facility that is located at 1169 Kendrick Lane, Front Royal, Virginia. Over the course of approximately 50 years, the plant manufactured rayon, polyester and polypropylene. Situated along the east bank of the South Fork Shenandoah River (River), the facility occupies approximately 440 acres. A map of the Site is provided on Figure 1.

The Site property is bisected by the Norfolk Southern Railway railroad (Norfolk Southern) which separates the plant production area from the former waste disposal areas. The plant area occupies approximately 200 acres east of the railroad tracks whose features included approximately 60 acres of manufacturing and administrative buildings, tank storage areas, open fields and parking lots. The area west of the railroad tracks, encompasses approximately 240 acres, includes 23 impoundments and fill areas, and a WWTP. A groundwater plume from the impoundment area extends under the River and beneath some property on the west bank of the South Fork Shenandoah River (Rivermont Acres) shown on Figure 2.

To manage the evaluation and cleanup more efficiently, ten operable units have been designated for the Site. For information purposes, a summary of the operable units and removal actions is provided below in Table 2 and a more detailed description is provided following this table.

	Table 2	
OU/Removal Action	Description	Status
1	Groundwater – ROD #1 issued on 9/30/88	Suspended and deferred to OU-7
2	PCB Contaminated Soil – ROD #2 issued on 9/28/90	Completed January 1992
3	Acid Reclaim Building – ROD #2 issued on 9/28/90	Completed September 1993
4	Site Security – ROD #2 issued on 9/28/90	Completed September 2002
5	Drum material – ROD #2 issued on 9/28/90	Completed September 1994
6	Investigation of Buildings	Suspended and deferred to Time Critical Removal Action (TCRA)
7	Groundwater, Surface Water and Viscose Basins 9, 10, and 11- ROD #5 issued on January 13, 2010	Under construction
8	Areas B (open lot) and C (former parking lot) – ROD #3 issued on 9/29/00	Being addressed through a Conservation Easement
9	Ecological Investigation and Risk Assessment. Risks are being addressed under ongoing Non-Time-Critical Removal Action (NTCRA) #1; the ongoing activities under ROD #4 (OU-10 ROD) for Plant Area Soils, Viscose Basins 1 through 8, New Landfill, and Waste Water Treatment Plant (WWTP); and ROD #5 (OU-7 ROD) Groundwater, Surface Water and Viscose Basins 9, 10, and 11	Being addressed under several actions
10	Plant Area Soils, Viscose Basins 1 through 8, New Landfill, and WWTP – ROD #4 (OU-10 ROD) issued on March 10, 2004	Construction complete except for the demolition of the WWTP.
TCRA	Building investigation, demolition of some buildings, and management of building demolition debris, accumulated wastes, wastewater and stormwater – work is either completed or being addressed under ROD #4	Complete

	Table 2	
OU/Removal Action	Description	Status
	(OU-10 ROD) or NTCRA #2	
NTCRA #1	Basins – includes Sulfate Basins (SB) 1 through 5, Fly Ash Basins, Fly Ash Stock Pile, and WWTP Basins, Polishing Basins (PB) and Emergency Lagoon (EL). Issued January 31, 2000.	On-going – most of the work is complete. The remaining work includes closure of PB 1 & 2, EL and repairing covers for SB 1, 3 and 4.
NTCRA #2	Remaining Buildings and Sewers. Decontaminate buildings, tanks, piping, duct work, and equipment; evaluate underlying soils and remediate: excavate and remove all sewers and manholes; and evaluate soils associated with sewers and remediate. Issued December 20, 2001	On-going – all the buildings have been demolished, and underlying soils addressed. The only remaining sewers and related soils are associated with the EL & WWTP.

- Operable Unit 1 (OU-1) addressed groundwater contamination caused by leachate leaking from Viscose Basins 9, 10 and 11. EPA issued a ROD (ROD 1) to pump and treat contaminate groundwater but implementation of this remedial action was later suspended by EPA and addressed as part of OU-7.

- Operable Unit 2 (OU-2) is a remedial action (ROD 2) to address PCB-contaminated soils above 10 parts per million (ppm) by excavation and off-site disposal. This remedial action was completed by EPA in January 1992.

- Operable Unit 3 (OU-3) is a remedial action (ROD 2) to address the unstable acid reclaim buildings. The dismantling and demolition of the acid reclaim buildings was completed by EPA in September 1993.

- Operable Unit 4 (OU-4) is a remedial action (ROD 2) that addressed the need for Site security to protect workers and trespassers from the physical, chemical and structural threats present at the Site. This remedial action was completed by EPA in September 2002.

- Operable Unit 5 (OU-5) addressed the sampling, identification and disposal of drums of hazardous substances. This remedial action (ROD 2) was completed by EPA in September 1994.

- Operable Unit 6 (OU-6) encompassed the investigation of onsite buildings. This remedial investigation led to EPA's time-critical removal action to demolish high hazard process buildings in September 1997. In September 1998, FMC assumed the responsibility to manage all the demolition debris and waste materials. The response action is complete.

- Operable Unit 7 (OU-7) includes groundwater, surface water and Viscose Basins 9, 10 and 11. EPA signed a ROD (ROD 5) on January 13, 2010 selecting a pump and treat system for contaminated groundwater; a cap and leachate extraction system for Viscose Basins 9- 11; and an annual monitoring program for surface water and sediments. EPA approved the Remedial Designs and the monitoring plan in 2012. The construction of the pump and treat system is underway; Viscose Basin 9-11 were capped in 2012; and surface water and sediment samples were collected in September 2012.

- Operable Unit 8 (OU-8) consists of Areas B and C. EPA signed a ROD (ROD 3) on September 29, 2000 selecting institutional controls which permanently restrict the land use of Areas B and C to commercial/industrial. The requirements of this ROD are being implemented through the Conservation Easement. As noted on Table 1, EPA issued an ESD in January 2012 for OU-8 to modify the Conservation Easement by replacing the existing Easement with multiple easements to address multiple owners and property uses.

- Operable Unit 9 (OU-9) consists of the ecological investigation and risk assessment. Based on the results of this investigation and assessment, a non-time-critical-removal action is being performed to close the sulfate basins, fly ash basins and stockpile and the wastewater treatment plant basins. No further work under this operable unit is planned.

- Operable Unit 10 (OU-10) consists of plant area soils, Viscose Basins 1 through 8, the WWTP and the New Landfill. EPA signed a ROD (ROD 4) for OU-10 on March 10, 2004. The selected remedy for Viscose Basins 1 through 8 included improving the existing soil covers, collecting and treating leachate and groundwater monitoring which was completed in 2010. The existing on-site WWTP was used to treat surface water and leachate until 2012. A modular unit is currently being used to treat the leachate until the new GLTP for OU-7 is constructed. The existing on-site WWTP is scheduled to be decontaminated and demolished in 2013. The selected remedy for the New Landfill included constructing a soil cap, collecting and treating leachate and groundwater monitoring which was completed in 2012. The selected remedial action requires cleanup of Plant Area Soils to levels that protect human health and the environment. Soils were remediated between 2002 and 2009. A risk analysis of the plant area soils remaining on-site after the completion of the remedial action was conducted in 2012 and concluded that the soils remedy is protective for a current or future industrial worker. With the exception of the demolition of the existing

WWTP, the physical work for OU10 is complete and the final report is being prepared.

Land Use

Land use surrounding the Site consists of a private school located along the eastern property boundary, residential areas located to the east, south and north property boundaries. In addition, the former General Chemical facility plant is located along the north/northwest boundary of the property. A portion of the former General Chemical plant is designated as conservancy/open space in the Conservation Easement. The other land uses surrounding the Site are expected to remain unchanged.

Both RODs 2 and 3 addressed areas associated with the plant portion of the property. Future land use associated with those areas was identified as commercial/industrial. Since ROD 2 was issued in September 1990, future land use of the plant portion of the property has been further refined and land use for the disposal area defined.

Several plans for the Site's redevelopment have been prepared. In 1998, the Town and County officials, along with FMC, engaged Northern American Realty Advisory Services (NARAS) to prepare a comprehensive plan for the Site's redevelopment and reuse. An approved master plan emerged from that process that provided for the development of the Site into a mixed-use commercial, light industrial, office, and open space project. Since then, areas of reuse have been further refined to either commercial/light industrial (160 acres), active recreation (33 acres), conservancy and open space (240 acres), and public park on the west side of the South Fork Shenandoah River (70 acres). Enforceable limitations on the future land uses have been placed on the Avtex property. A Conservation Easement was filed on December 7, 1999 and is held and enforced by the Lord Fairfax Soil and Water Conservation District and the Valley Conservation Council.

On January 13, 2012 EPA issued an ESD selecting Conservation Easements as an institutional control to replace the 1999 Conservation Easement with multiple easements to ensure the use of the property would not undermine existing protectiveness by establishing land use restrictions while at the same time specifying property development and stewardship requirements. Figure 3 shows the future land use being proposed in the revised Conservation Easements. The signatories to the 1999 Conservation Easement are currently working to modify the 1999 Conservation Easement and expect to replace it with four Conservation Easements.
The EDA holds title to most of the property described in the Conservation Easements and has the lead in its redevelopment. The EDA conveyed the SoccerPlex area to Warren County on February 6, 2006. The working name of the commercial/industrial redevelopment effort is Royal Phoenix.

Resource Use

Lateral groundwater flow through the overburden materials and bedrock is generally westward toward the River, where it discharges. At depth, the groundwater passes beneath the river.

Data obtained during bedrock coring and geophysical borehole logging indicate that groundwater flow in the bedrock aquifer occurs along fractures, joints, and cleavage. The bedrock aquifer is used in the area west of the River for domestic water supply. Potable water in the area on the east side of the River is provided by the Town of Front Royal.

In 1982, carbon disulfide was first detected in domestic wells in Rivermont Acres, across the River from the Avtex Site. The carbon disulfide plume, which originated from the Avtex Fibers Site, passed beneath the river because of density differences between the plume of contamination and groundwater. Avtex purchased all the homes with domestic wells within the potentially degraded area of Rivermont Acres and adjacent Fiddlers Green. In addition, FMC supplies water to three seasonal residences located in Rivermont Acres and one permanent resident in Fiddlers Green. Currently, the EDA holds title to the properties purchased by Avtex.

The primary surface water feature at the Avtex Site is the South Fork Shenandoah River. Surface water from the Avtex Site generally drains west toward the river, which has historically received runoff and treated discharge from the WWTP at the Site. The South Fork Shenandoah River flows northeast to its confluence with the North Fork. The stretch of River, adjacent to the Avtex Site, is generally used for recreational fishing and boating activities.

History of Contamination

For nearly 50 years, the Avtex plant manufactured rayon, polyester and polypropylene fibers for commercial, defense and space industries. It employed over 2,500 people in the area. From 1940 through 1962, American Viscose owned the facility. FMC Corporation (FMC) owned the plant from 1963 until 1976. In 1976, Avtex Fibers, Inc. (Avtex) purchased the Site from FMC and continued manufacturing operations until November 1989 when the plant closed and declared bankruptcy.

The plant manufacturing operations generated three major waste types. The first type was generated when the waste acid from the production process was treated with lime in the WWTP; the metal bearing sludge generated by that treatment was placed in six sulfate basins. The second waste type was the fly ash generated from the combustion of coal in the onsite power plant. Fly ash was disposed in four impoundments and one stockpile. The third waste type was waste viscose that was disposed in eleven onsite viscose basins. The waste viscose was primarily an off-specification product from the production process. In addition, solid wastes were placed in an onsite solid waste landfill that was permitted by Virginia.

Initial Response

The Site was proposed and subsequently finalized on the NPL in 1986 after groundwater contamination was found in residential wells in Rivermont Acres across the River from the plant. Prior to its listing on the NPL, Avtex purchased all the homes with domestic wells within the potentially degraded area of Rivermont Acres and Fiddlers Green. In addition, water was supplied to three seasonal residences located in Rivermont Acres and one permanent residence located in Fiddlers Green.

Under the 1986 Consent Order with EPA, Avtex performed a remedial investigation which included installing monitoring wells and sampling groundwater and waste materials. In September 1988, EPA issued ROD 1 for OU-1 specifying pumping and onsite treatment of groundwater and dewatering viscose basins 9, 10 and 11.

Shortly after EPA issued an Administrative Order requiring Avtex and FMC to implement the ROD 1 for OU-1, Virginia discovered significant PCB contamination. On July 14, 1989, Virginia filed a $19.7 million environmental damage suit against Avtex for violating its state pollution discharge permits.

At the request of the Virginia Department of Waste Management (now known as the Virginia Department of Environmental Quality), an EPA On-Scene Coordinator (OSC) performed a preliminary assessment of the Site in accordance with the NCP on September 26, 1989. The assessment confirmed the existence of a threat to public health, welfare, and the environment due to the release of PCBs, the threat of fire and explosion, and concerns associated with the integrity and management practices of the bulk storage tanks and process lines used to contain or transfer hazardous substances at the Site. One month later, on October 31, 1989, EPA issued a UAO to Avtex requiring the company to undertake PCB removal action at the Site.

On November 10, 1989, the State Water Control Board (SWCB) revoked the plant's National Pollutant Discharge Elimination System (NPDES) Permit. Subsequently, Avtex discontinued operating and abandoned the facility. EPA Region III responded under CERCLA declaring an emergency situation due to the uncontrolled nature of the Site resulting from the plant shutdown on November 11, 1989. Highlights of EPA's emergency and removal response activities include: transferring approximately 2,000 tons of various chemicals for recycle/reuse; onsite and off-site treatment of an estimated 241,000 gallons of flammable and corrosive chemicals; designing and operating a low-flow wastewater treatment system to protect the Shenandoah River from untreated discharges; closing 22 carbon disulfide impoundments which included treating approximately 992,000 gallons of carbon disulfide wastewater; treating and removing approximately 1,300 cubic yards of carbon disulfide sludge; and disposing of 320 cubic yards of contaminated soils. In addition, the contents of 33 large capacity storage tanks were drained. As part of this action, EPA managed over 770,000 gallons of hazardous and non-hazardous liquids and 320 cubic yards of soil.

Basis for Taking Action

Hazardous substances that have been detected at the Site include:

Soil	Groundwater	Sediment
PCBs	Acetone	Carbon Disulfide
Polynuclear Aromatic Hydrocarbons (PAHs)	Carbon Disulfide	Chlorobenzene
Antimony	2-Methylphenol	PCBs
Arsenic	4-Methylphenol	
	Bis(2-ethylhexyl)phthalate	

Soil	Groundwater	Sediment
Carbon Disulfide	Naphthalene	
Lead	Pentachlorophenol	
Manganese	Phenol	
Mercury	Aluminum	
Phenol	Antimony	
Zinc	Arsenic	
	Cadmium	
	Chromium	
	Cobalt	
	Cyanide	
	Iron	
	Lead	
	Manganese	
	Mercury	
	Nickel	
	Vanadium	
	Zinc	

In 1989, there was the threat of fire and explosion when Avtex abandoned the facility. In addition to the initial emergency removal action to stabilize the site, several RODs were issued to address not only buildings on the verge of collapse, but also large quantities of PCB contaminated soil and drums full of hazardous material. A summary of the Operable Units and Removal Actions is provided previously in Table 2.

A subsequent time-critical removal action was initiated in 1995 to remove observable waste materials in the remaining buildings and demolish those buildings that were subject to collapse and potentially releasing acids, viscose, mercury and other contaminants into the environment.

In 2000, EPA initiated a non-time critical removal action to remove a potential risk to ecological receptors coming in contact with metal bearing sludges in numerous basins.

In 2001 EPA initiated a second non-time critical removal action to decontaminate and demolish buildings contaminated with particulate residues in the form of dust and fine debris containing antimony, arsenic, lead, PCBs, benzo(a)pyrene as well as caustic and acid salts and asbestos containing material. Excavation of sewers, and soils impacted by sewer leaks, was also included in this removal action.

The OU-10 ROD concluded that lead concentrations in Plant Area soils presented a risk to future workers.

The ecological assessment concluded that metals and PCBs posed a risk to all ecological receptors.

The OU-7 ROD for groundwater identified carbon disulfide arsenic, and mercury as contributing 90% of the calculated risk for non-cancer health effects via the ingestion and dermal pathways. For carcinogenic effects via the ingestion and dermal pathways, arsenic contributes virtually all of the carcinogenic risk (99%) for potential exposure to groundwater.

IV. Remedial Actions

A. Remedy Selection/Remedy Implementation

The remedies selected for OU-1, OU-2, OU-3, OU-4, OU-5, OU-6, OU-8, and OU-9 are either complete or addressed under another action. The remedial action for OU-10 is complete with the exception of the demolition of the existing WWTP which is scheduled to be completed in 2013. The Remedial Designs for OU-7, consisting of capping and leachate extraction and treatment for Viscose Basins 9 through 11, a groundwater pump and treat system, and surface water monitoring, were approved in 2012. Viscose Basins 9 through 11 were capped in October 2012. The construction of the OU-7 remedial action is scheduled to be completed in January 2015.

To date, EPA has signed five RODs as part of a strategy to cleanup the Site.

RODs 1, 2 and 3

ROD 1, dated September 30, 1988, is the first operable unit ROD. EPA selected a pump and treat remedy; however, that ROD was suspended and deferred to the OU-7 ROD (ROD 5) which is discussed below in more detail.

ROD 2, dated September 28, 1990, which covers OU-2, OU-3, OU-4 and OU-5, selected response actions needed to stabilize the Site. The excavation of PCB contaminated soils for OU-2 was completed in January 1992. The acid reclaim building was dismantled and demolished and was completed in 1993. OU-4 addressed Site Security which was completed in September 2002. OU-5 addressed the disposal of drums which was completed in September 1994.

ROD 3, dated September 29, 2004, for OU-8 selected institutional controls that permanently restrict the future land use for two parcels, Areas B and C, to commercial/industrial use. The requirements of this ROD are being implemented through the existing Conservation Easement which was filed in 1999. EPA issued an ESD in January 2012 to modify the Conservation Easement by replacing the existing Easement with multiple easements to address multiple owners and property uses. The existing Easement is in effect while EPA works with the signatories to modify it.

RODs 4 and 5

The remedial actions for ROD 4 (OU-10), dated March 10, 2004, is for Plant Area Soils, Viscose Basins 1 through 8, the WWTP, and the New Landfill. The remedial actions for ROD 5 (OU-7),

dated January 13, 2010, is for Viscose Basins 9 through 11, Groundwater and Surface Water. The remedial actions specified under these RODs for OU-10 and OU-7 are in progress and the following discussion updates the progress since the last five-year review. The status of the other OUs is provided above and summarized in Table 2.

ROD 4 -OU-10

In March 2004, EPA selected a remedial action cleanup plan for Viscose Basins 1 through 8, the on-site landfill (New Landfill), the Plant Area Soils, and the WWTP. The OU-10 ROD calls for capping the viscose basins and the on-site landfill, treating leachate and monitoring groundwater. In addition, the remedy selected the decontamination and demolition of the existing on-site WWTP, which was used to treat leachate and storm water runoff. The OU-10 ROD was subsequently modified with an ESD in 2006 to include remediation of additional soils referred to as the expanded area. The OU-10 ROD and subsequent ESD developed cleanup criteria for Plant Area Soils. Sampling results for soils remaining on site were compared to EPA's April 2012 Regional Screening Levels (RSLs) to determine if the plant area soils remedy is protective.

1. Viscose Basins 1-8 and New Landfill

Viscose Basins 4, 5, and 6 were capped with a geosynthetic liner and a soil cover in 2008 and the permanent seeding was completed in 2009. Viscose Basins 1, 2, 3, 7 and 8 were capped with a geosynthetic liner with a soil cover in 2009 and the permanent seeding was completed in 2010. There are 25 passive gas vents installed on Viscose Basins 1-8.

The New Landfill is approximately 2.75 acres and is approximately 40 feet high from base to peak. It is the highest point of elevation in the area west of the railroad tracks. The closure design complies with the substantive portions of the Virginia Solid Waste Management Regulations (VSWMR) for closure of a non-hazardous industrial waste landfill (9 VAC 20-80-270E). The landfill cap includes a geosynthetic liner with a two foot soil cover and four gas vents. Construction was completed in July 2012.

Currently, leachate from Viscose Basins1-8 and the New Landfill is collected and treated in the modular unit. Treatment consists of aerobic biological treatment via a mixed bed biofilm reactor (MBBR). Effluent from the MBBR is filtered through activated carbon, multi-media filtration and bag filtration. Effluent is discharged to the South Fork Shenandoah River via the Site outfall. The discharge limits for the effluent are provided on Table 3. Ultimately, leachate will be treated in the Groundwater Leachate Treatment Plant (GLTP) which is under construction.

Nineteen monitoring wells are included in the annual monitoring well network for both the Viscose Basins and the New Landfill. Groundwater monitoring is conducted in accordance with the EPA approved January 11, 2008 Groundwater Monitoring Plan, Appendix M of the Final (100%) Remedial Design for Viscose Basin 1-8 and the New Landfill.

The OU-10 ROD developed the following Remedial Action Objectives for VB1through 8 and the New Landfill:

- Prevent direct contact with the VB 1 through 8 and New Landfill soils and waste by humans and ecological receptors and prevent the migration of contaminants;
- Mitigate current and future potential risks to human health and ecological receptors associated with VB 1 through 8 leachate and uncovered leachate-impacted soil; and
- Control production and uncontrolled release of VB 1 through 8 and New Landfill gases.

The Remedial Action Objectives for VB 1 through 8, shown on Figure 4, are being met as follows:

- The capping of these units prevents direct contact with soils and waste;
- Leachate impacted soil was capped. Leachate is collected and treated; and
- Passive gas vents were installed on these units to control the production and release of landfill gas. The passive gas vents were sampled with field equipment for hydrogen sulfide, percent Lower Explosive Limit (LEL), percent methane, carbon monoxide, carbon dioxide and oxygen in 2011-2012. The sampling showed that the vents most actively producing landfill gas and hydrogen sulfide are in VB-4, VB-5 and VB-6 at the northern end of the Site. Vent sampling performed during a pilot study to treat the vent emissions in 2012 showed that three of the vents, GV-4, GV-5, and GBV-6, produced the most emissions with the highest concentrations of hydrogen sulfide. However, the gas emissions and flow rates from the vents may be widely variable.

2. Plant Area Soils

Plant Area soils characterization was initiated in September 2004 and remediation was completed in January 2012. The Site was carved into 100 foot grids and soils were excavated until the sample results were below the cleanup levels in the OU-10 ROD and ESD.

Soils from 0 to 10 feet in depth were remediated to meet the direct contact human health standards and the groundwater protection standards. Soils greater than 10 feet in depth had to meet the groundwater protection standards only.

Soils that were characteristically hazardous due to metals (lead) were stabilized. Approximately 1600 cubic yards of lead impacted soils were excavated from the Lead Shop area and stabilized. These stabilized soils were disposed under the cover of the New Landfill. Soils with total PCB concentrations greater than 25 mg/kg but less than 50 mg/kg of PCBs were used in basin and landfill closures below the infiltration layer. Soils exceeding the direct contact human health standard but not the groundwater protection standard were used in basin or landfill closures below the infiltration layer. Soils exceeding the groundwater protection standard were disposed off-site.

An evaluation of the protectiveness of the OU-10 Plant Area Soils/NTCRA –Buildings remedies for human health based on the post-excavation soil samples collected during the remediation was

conducted. Over 500 soils sample results (for soils remaining on-site) were rescreened against the April 2012 RSLs. This evaluation demonstrated that the surface soils (0 to 10 feet below ground surface) on site are protective of human health for an industrial/commercial scenario and both the surface soils and deeper soils are protective to groundwater.

The OU-10 ROD developed the following Remedial Action Objectives to address risks for the Plant Area Soils:

- Mitigate direct contact risks to humans and ecological receptors posed by contaminants in Plant Area Soils;
- Mitigate future human health and ecological risks associated with the potential migration of contaminants; and
- Mitigate current and future risks associated with the migration of contaminants to groundwater.

The Remedial Action Objectives for Plant Area Soils are being met as follows:

- Depending on the type of contaminant and level of contamination, excavated soils were disposed off-site, stabilized and disposed on-site under the New Landfill cover system, or disposed on-site in a sulfate basin or viscose basin being capped with a low permeability cover system;
- Soils presenting a risk to human health were remediated;
- During remediation, surface water runoff from areas that had to be remediated to the OU-10 soil cleanup standards was treated in the onsite WWTP to prevent the migration of contaminants to the South Fork Shenandoah River. Soils containing contaminants that exceeded a groundwater protection standard were excavated and disposed off-site; and
- A Conservation Easement is in place to restrict future activities at the Site and ensure that the remedies at the site are protective of human health and the environment.

Waste Water Treatment Plant (WWTP)

The WWTP is scheduled to be demolished in 2013 in accordance with the EPA-approved Work Plan dated September 26, 2012. A temporary modular wastewater treatment plant unit is in place to treat leachate until the OU-7 GLTP is constructed and operational. Surface water runoff from areas in which soil remediation has not been completed is also treated by this modular WWTP unit/system.

ROD 5 –OU-7

In January 2010 EPA selected a remedial action cleanup plan for Viscose Basins 9 through 11, groundwater and surface water. The OU-7 ROD requires the extraction and treatment of leachate

from the viscose basins and a low permeability cap to prevent infiltration of precipitation. In addition, the ROD selected a pump and treat system to control the migration of contaminated groundwater and remediate the ground water. Annual monitoring of the South Fork Shenandoah River is also required. Figure 2 shows the extent of the contaminated groundwater plume. The OU-7 ROD was subsequently modified with an ESD on January 25, 2012 with site specific cleanup values modifying the Ecologically Backfill Values as well as selecting and modifying institutional controls.

1. Viscose Basins 9-11

Pre-design activities in 2010 included placing a bridging layer on the basins with leachate extraction and bench-scale treatability testing. Attic fill to support the cap was placed on top of the bridging layer in 2011. The low permeability cap was constructed in 2012. Full scale leachate extraction and treatment will be initiated when the GLTP is operational which is scheduled for 2015.

2. Groundwater

Groundwater extraction pre-design activities (Pumping tests, bench scale treatability testing) were conducted from June 2010 through July 2012. Construction of the GLTP started in 2012 and is expected to be completed in 2015.

3. Surface Water

Surface water sampling was conducted in September 2012 in accordance with the EPA-approved sampling plan dated August 3, 2012. FMC is in the process of preparing a data package for EPA review.

The OU-7 ROD developed the following seven (7) Remedial Action Objectives to address risks for Viscose Basins 9, 10, and 11, groundwater and surface water:

- Prevent Human exposure (human ingestion, inhalation or dermal contact) to groundwater that contains Site related contaminants of concern (COCs) that would result in unacceptable levels of risk;
- Prevent human and ecological receptor exposure through direct contact with waste in Viscose Basins 9, 10, and 11;
- Mitigate the risks from the principle threat wastes in Viscose Basins 9, 10, and 11 by the treatment of the leachate;
- Restore groundwater to its beneficial uses by: (1) reducing contaminant concentrations such that the cumulative excess lifetime cancer risk is less than one in ten thousand (1×10^{-4}); (2) reducing non-cancer risks to a hazard index (HI) of 1 (or less) for each specific organ; and (3) ensuring that Maximum Contaminant Levels (MCLs) for carcinogens and non-zero Maximum Contaminant Level Goals (MCLGs) for non-carcinogens are not exceeded;
- Mitigate further releases to groundwater of hazardous substances from residual contamination in Viscose Basins 9, 10, and 11; and

- Control and mitigate contaminated groundwater plume discharge to the river.
- Control the production and release of hazardous and/or noxious gases from Viscose Basins 9, 10, and11 that represent an unacceptable risk or public nuisance.

The remedy for OU-7 is under construction. The Remedial Designs for the Viscose Basins and Groundwater Leachate Treatment Plant were prepared to meet the Remedial Action Objectives at a future date. EPA will determine if the Remedial Action Objectives are being met after the construction of the remedy is complete.

B. Other Response Actions

In addition to the remedial actions called for the in the RODs issued for the Site, a number of removal response actions have been or are being performed. These are described below:

1. Time-Critical Removal Actions (TCRA) - Buildings

EPA's remedial program performed a building investigation and evaluation in 1994 and 1996. It found that areas of the facility had high chemical hazard (large amount of remaining chemical, leaking pipes, vessels) and poor structural integrity. Based on these findings EPA undertook a time-critical removal action to demolish manufacturing buildings. This action eliminated approximately 17 acres of building structures, generated over 100,000 cubic yards of debris and waste materials and 5,720,000 gallons of wastewater. In September 1998, as part of a global settlement with EPA, FMC assumed the responsibility to manage the demolition debris and waste materials, as well as manage wastewater and storm water at the Site. FMC began managing the waste in accordance with an EPA-approved plan in October 1999. This work was completed in 2006.

2. Non-Time-Critical Removal Action (NTCRA) – Basins

The basin area of the Avtex Site occupies approximately 240 acres lying on the west side of the Norfolk-Southern Railroad tracks identified as Area 3 in Figure 3. EPA signed an Action Memorandum on January 31, 2000 for the closure of the basins. The goal of this removal action is to mitigate current and potential future risk to ecological receptors from direct contact with uncovered waste in the basins and to mitigate the release of contaminants which may be potentially affecting the ecological receptors in the South Fork Shenandoah River. The cleanup plan calls for the consolidation of wastes on site and provides for closure of the basins containing wastes using engineered protective caps. FMC began implementing the closure of the Basins project in May 2001, following approval of the Response Action Plan in April 2001. A general schedule summary of the closure activities is presented below. The locations of the basins are shown on Figure 4.

- Fly Ash Basins 1, 2, 3 and 6 – cap construction performed in 2001 and 2002
- Sulfate Basin 5 – remediation performed in 2001 and 2002

- Sulfate Basin 3 – cap construction performed in 2002 and 2003
- Sulfate Basin 4 – cap construction performed in 2002 and 2004
- Sulfate Basin 1, Cell 1 – cap construction performed in 2002 and 2003
- Sulfate Basin 2 – remediation performed in 2010
- Polishing Basin 3 – cap construction performed in 2010
- Sulfate Basin 1, Cells 2 – 4 – cap construction performed in 2010 and 2011
- Polishing Basins 1, 2 and Emergency Lagoon – Remediation scheduled for 2013
  Repairs to Sulfate Basins 1, 3, and 4 covers – scheduled to be completed in 2013.

Overall the response actions were performed as described in the Basins Action Memo, dated January 31, 2000. A few problems were encountered and addressed as follows:

1. The Basins Action Memo did not contemplate a geomembrane liner in the SB cap system; however, based upon design analysis and to ensure conformance with the VSWMR, the cap system design was modified to include a geomembrane.
2. During cap construction of SB 4, unexpected off-gases from the waste were identified and a system of passive gas vents was designed and installed. The passive gas vent design was incorporated into the cover design for each SB cap.
3. The SB 1 basin closure design was modified to incorporate a relocation and clean closure of a portion of the basin (i.e., western half of Cell 4). This modification was performed to reduce the volume of imported soil fill necessary for closure.
4. The SB 1 closure design was modified to incorporate a high strength geotextile to further mitigate differential settlement.

It is also noted that portions of the covers installed on SB 1, SB 3 and SB 4 have experienced differential settlement to a degree that will require significant repairs. These cover repairs are expected to be performed in 2013.

The remaining remediation construction work for the NTCRA – Basins includes:

1. Closure of Polishing Basin 1 and 2, which is scheduled for 2013.
2. Closure of the Emergency Lagoon, which is scheduled for 2013.
3. Repair of the covers on SB1, 3, and 4, which is scheduled for 2013.

The cleanup activities are facilitating the implementation of the Conservancy Park Master Plan that was developed for the future use of this portion of the Site. The conservancy park concept has been integrated into the cleanup activities, i.e., by revegetating the cleanup areas with appropriate vegetation, construction of a pond and wetland area, and providing the frame work for future park trails.

After completion of construction, the basins will be monitored and post-closure maintenance will be performed to ensure the cap remains protective. Groundwater monitoring will be conducted to identify potential future impacts of the basins on groundwater quality. A Conservation Easement is in place to prevent disturbance of the soil covers.

3. Non-Time-Critical Removal Action - Buildings and Sewers

EPA selected a non-time-critical response action to decontaminate the remaining buildings and excavate the remaining sewers on December 20, 2001. This action consists of the removal of hazardous substances located in the remaining onsite buildings (i.e., those buildings not addressed under the Time-Critical Removal Action or the non-CERCLA work completed by the USACE) including decontamination of the buildings and associated foundations, basements, tunnels and sumps, evaluating and remediating underlying soils as well as the excavation of all sewers. The NTCRA-Buildings is being conducted in accordance with the 1999 Consent Decree, the NTCRA-Buildings Action Memorandum, the NTCRA-Buildings Response Action Plan (RAP) (RAP, January 9, 2002) and ten RAP supplements.

A. Buildings and Sewers

The Buildings and Sewers remediation activities were performed from January 2002 through December 2012. The only remaining work is the sewers associated with the WWTP which will be addressed in 2013. A general schedule of the major remediation-related tasks is provided below:

- Decontamination of buildings, foundations, above grade structures, and subgrade structures – January 2002 through June 2011
- Removal of sewers and manholes (performed in three phases):
  - Phase I: northern quarter of the former Plant Area (June 2005 to November 2005),;
  - Phase II: southern three quarters of the former Plant Area (February 2007 to July 2011);
  - Phase III: area west of the Norfolk Southern railroad line to the South Fork Shenandoah River (January 2009 to March 2013);
  - Sewers located within the WWTP demolition area will be addressed as part of the OU-10 WWTP Remedial Action in 2013; and
- Waste Management and disposal (January 2002 to March 2013).

The sewer removal work was a major undertaking resulting in the removal of 56,470 linear feet of sewers. The diameters of the sewers ranged from four inches to 72 inches. The sewers were located anywhere from four feet to 30 feet below the surface. In addition to the sewers, 222 manholes associated with the sewers were removed.

B. Former Plant Area Soils

Soils in the former plant area were remediated under both OU-10 and the NTCRA Buildings, and remediation was completed in January 2012. To ensure that the soils in this area was protective for

future use, the EPA required FMC to prepare and submit a Soils Data Report where the results of the post-excavation soil samples were compared to the EPA April 2012 risk-based RSLs. The above evaluation and findings concluded that the remedy is considered protective of human health for direct contact risk for an industrial/commercial worker to both surface and subsurface soils as well as for groundwater protection.

EPA did not evaluate the ecological impacts because the future site use is designated for industrial/commercial use. At the current time, there are no plans for development under consideration. To ensure that the plant area soils remedy is protective to the current ecological receptors, an ecological assessment is warranted.

4. Non-CERCLA Response Actions

In 2007, the USACE completed removing asbestos, demolishing the remaining onsite buildings, and excavating the building foundations and structures to at least 6 feet below surface (except Section III), which FMC had decontaminated. This work was performed to prepare the Site for reuse.

Other Non-CERCLA response actions at the Avtex Superfund Site are associated with site investigations and remediation of releases of petroleum products to the environment. The EPA has determined that their response authority under Section 101 of CERCLA is limited to the release of "hazardous substances" under Section 101, and that release of petroleum products, including crude oil or any fraction thereof, is not considered a "hazardous substance," subject to CERCLA, unless the substance is listed or designated as a hazardous waste under the RCRA Regulations.

As a result, the EPA has determined that the releases of petroleum and oil products at the Avtex Superfund Site are "exempted" from CERCLA jurisdiction. Therefore, the investigation into the nature and extent of petroleum contamination of soils and groundwater, and the subsequent remediation of the releases of petroleum products in soils and groundwater has been deferred to the Virginia Department of Environmental Quality's (VADEQ's) Tank Program in 2007. The investigation and remediation of petroleum releases at the Avtex Site is ongoing at this time.

5. Operation and Maintenance

There is no equipment or systems associated with the remedial action work completed to date. Therefore, none of the remedial actions are in the operation and maintenance presently. However, there are activities associated with other response actions being performed that are essentially as if they were in operation and maintenance, e.g., groundwater monitoring.

Operation of an interim waste water modular treatment system will continue until the GLTP system is operational. The interim system treats leachate and water that collects in the sumps of several disposal basins. The effluent is discharged to the South Fork Shenandoah River. The discharge limits for the effluent are provided on Table 3.

V. Progress Since the Last Five-Year Review

As previously mentioned, this is the fourth five-year review for the Site. The third five -year review did not identify any issues.

Since the last Five-year Review, EPA issued the fifth and final ROD (OU-7) for the Site on January 13, 2010, which selected a remedy for the Viscose Basins 9- 11, the groundwater and surface water. The OU-7 ROD was subsequently modified with an ESD on January 25, 2012 with site specific cleanup values modifying the Ecologically Protective Backfill Values as well as selecting and modifying institutional controls.

EPA approved the remedial designs for the Viscose Basins and GLTP in 2012. Viscose Basins 9 - 11 were capped in 2012 and the groundwater remedy is under construction.

EPA signed the ROD for OU-10, which selected a remedy for Plant Area Soils, on March 10, 2004. The selected remedy for Plant Area Soils has been implemented and a risk evaluation conducted to ensure the area is protective for an industrial/commercial worker. Viscose Basins 1 – 8 and the New Landfill were capped between 2008 and 2012. EPA approved the remedial design and remedial action work plan for the demolition of the existing WWTP on October 2, 2012. The demolition of the existing WWTP is scheduled to begin in March 2013.

VI. Five Year Review Process and Findings

Administrative Components

EPA notified FMC, the Settling Defendant, and the Virginia Department of Environmental Quality of the initiation of the Five-Year Review in August 2012. The five-year review team was led by Kate Lose, EPA's RPM for the Site, and included members from the Regional Technical Advisory Staff with expertise in hydrogeology, biology, and risk assessment.

EPA began the five year review for the Site in September 2012. The components of the five year review include:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-year Review Report development and review

Community Involvement

A public notice appeared on September 7, 2012 in the Northern Virginia Daily notifying the community that EPA was undertaking a five-year review of the Avtex Superfund Site. The advertisement explained the five-year review process, provided point of contact information, and

identified the location of the information repositories for the Site. No comments were received from the community as a result of the advertisement.

EPA has met with the signatories of the Conservation Easement to discuss modifications or replacement of the Conservation Easement with multiple easements to allow greater flexibility in future reuse of the site as well as allow for easier enforcement of the easements. EPA met twice with the signatories in 2012 and future meetings are planned for 2013.

EPA, VDEQ and FMC continue to provide updates and information to the community. Consistent with the terms of the Consent Decree, FMC participates significantly in and cooperates with EPA in providing information regarding the remediation and cleanup activities to the public. Each year a variety of methods are used to update the community on progress at the Site which includes:

- Meeting with key local organizations, including the EDA, the Front Royal Town Council and the Warren County Board of Supervisors;
- Participating in local Festivals and Open Houses (approximately 3 per year);
- Providing updates on Site progress on the local radio station (WFTR);
- Providing site tours to schools and civic organizations upon request;
- Advising media of achievements and milestones, as appropriate; and
- Responding to citizen questions and inquiries as they arise.

In addition, FMC developed and maintains a website, www.avtexfibers.com for those interested in current information regarding the Avtex Site. FMC updates the website with the latest information monthly.

Interviews

Given the level of community involvement activities on-going at this Site, separate interviews for this five-year review were not conducted.

Document Review

This review included a review of relevant documents. A complete list can be found in Attachment 2.

Data Review

The EPA has developed an extensive knowledge base for the Site as a result of multiple actions which have been completed or are underway. A risk evaluation of the COCs in the remaining soils of the former plant area was prepared to ensure that the actions taken in the area are protective for future use.

Soils in the former plant area were remediated to the cleanup standards in the OU-10 ROD. A risk based screening analysis was conducted for the soils in the former plant area to re-evaluate the protectiveness of the remedial/removal actions to 2012 Risk Screening Levels.

The results of soil samples collected during the implementation of the OU-10 Plant Area Soils and NTCRA-Buildings soils, sewers and subgrade remedies were re-screened against both the OU-10 Soil Cleanup Standards for Direct Contact presented in Table 1 of the 2004 OU-10 ROD and soil risk-based levels developed using toxicity values provided in the April 2012 EPA RSLs. For purposes of this evaluation, the soil data was segregated into two data sets:

1. Soil samples collected from the surface grids (0 to 1 foot), or deeper if remediation was conducted (i.e., reflect the uppermost soils that remain) as part of the OU-10 Plant Area Soils and NTCRA-Buildings soils remedies, and

2. Soil samples collected from the subsurface, either during the NTCRA-Buildings sewer removal activities (soil samples from stockpiles of excavated soils that had been located adjacent to sewers or post-excavation samples from beneath the sewer pipe), or soil samples collected from beneath the subgrade structures as part of the NTCRA-Buildings response action.

Direct Contact Risk – Surface Soils

The results of the screening of the analytical soil data (519 samples) for surface soils that remain at the Site against the soil risk-based levels based on the April 2012 RSLs were reviewed to ensure that there were not detections of ten or more carcinogens, or detections of non-carcinogens with the same target organ. Based on this initial review, it was determined that it was appropriate to rescreen the analytical data against the soil risk-based levels set at 10^{-5} risk level and a hazard quotient (HQ) of 1. The results (excluding lead) indicate that there are no exceedances of the soil risk-based levels set at 10^{-5} risk level and an HQ of 1.

The results of the screening indicate that there are three exceedances (less than 1.0 percent of the 368 samples analyzed for lead) related to the reduction of the lead standard from 1,000 to 800 mg/kg. These three exceedances of the April 2012 RSLs for lead do not represent a material change in the direct contact risk. Therefore, the remedy for OU-10 Plant Area Soils/NTCRA – Buildings for surface soils (0 to 1 foot) is considered protective and consistent with the risk threshold specified in the OU-10 ROD.

Direct Contact Risk – Subsurface Soils

The results of the screening of the analytical soil data for subsurface soils associated with sewers and subgrade structures that remain at the Site against the soil risk-based levels based on the April 2012 RSLs were reviewed to ensure that there were not detections of ten or more carcinogens, or detections of non-carcinogens with the same target organ. Based on this initial review, it was determined that is was appropriate to re-screen the analytical data against the soil risk based levels set at 10^{-5} risk level and a HQ of 1.

The results of the re-screening of the analytical soil data for the subsurface samples (761 samples) that remain at the Site against the soil risk-based levels based on the April 2012 RLSs indicate that there is one exceedance of the soil risk-based levels set at 10^{-5} risk level and a HQ of 1. 1,2,4-Trichlorobenzene was detected in one sewer sample at a concentration of 311 mg/kg, which exceeds the April 2012 risk based soil screening level of 278 mg/kg. The OU-10 standard for this compound is 20,000 mg/kg. The one exceedance for 1,2,4-Trichlorbenzene was out of 172 samples analyzed, or 0.6 percent. There are also two exceedances related to the reduction of the lead standard from 1000 mg/kg to 800 mg/kg. The two exceedances for lead were out of 680 samples analyzed, or 0.3 percent. These three exceedances of the April 2012 RSLs do not represent a material change in the direct contact risk.

Groundwater Protection

The OU-10 Soil Cleanup Standards for Groundwater Protection used to assess the OU-10 and NTCRA-Buildings soils are based on the following:

- The standard for a specific constituent is the Safe Drinking Water Act Maximum Contaminant Level Goal (MCLG) provided the MCLG is not zero;
- In the absence of a non-zero MCLG, the Safe Drinking Water Act Maximum Contaminant Level (MCL) is the standard for the compound; and
- If neither a non-zero MCLG or an MCL have been established for the compound, the standard for the compound will be the EPA RSL risk-based tap water standard.

The re-screening was conducted by comparing the Synthetic Precipitation Leaching Procedure (SPLP) analytical data for soils against the groundwater protection levels based upon the April 2012 RSLs using the following step-wise approach:

- The site database was used to query the SPLP data for each individual parameter for each soil sample; and
- The results of the query were divided by the Dilution Attenuation Factor (DAF) of 10 specified in the OU-10 ROD and then compared to the updated groundwater cleanup level to identify any exceedances.

The number of samples varied by the constituent. Most metals were analyzed in over 1,400 samples, most volatile organic compounds in over 300 samples, semi-volatile organic compounds typically in 350 to over 1,400 samples, and PCBs generally in more than 1,300 samples.

The results revealed one exceedance of the OU-10 groundwater protection standard for lead. This lead exceedance was associated with a soil sample from soil located beneath the active Norfolk-Southern railroad line that could not be removed. EPA approved leaving the soil in place. In addition, there were 47 exceedances of the updated groundwater protection levels based upon the April 2012 RSLs for nine constituents. Specifically, there were exceedances for 2-methylnapthalene, benzo(a)anthracene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene,

naphthalene, nitrobenzene, cobalt, manganese and zinc due to the reduction of the RSL for these compounds as compared to the value used to develop the Soil Cleanup Standard for Groundwater protection contained in the 2004 OU-10 ROD. The majority of the SPLP exceedances were associated with benzo(a)anthracene (8), naphthalene (21), and cobalt (11). These SPLP exceedances represent less than 0.6, 1.5, and 0.8 percent, respectively, of the total number of samples analyzed for these constituents.

The OU-10 groundwater protection standards were developed to ensure impacted soil that could potentially generate groundwater quality impacts was remediated. Based on the few exceedances of the groundwater protection levels based on the April 2012 RSLs across the approximately 135-acre Plant Area, there is negligible risk of future groundwater quality impacts associated with leaving these soils in place.

Conclusions for soil data review

The results of the soil re-screening against soil risk-based levels and groundwater protection levels developed using the April 2012 RSLs indicate the following:

- The remedy for OU-10 Plant Area Soils/NTCRA-Buildings for surface soil is considered protective of human health and consistent with the risk threshold specified in the OU-10 ROD;
- To ensure that the plant area soils remedy is protective to the current ecological receptors, an ecological assessment is warranted.
- The remedy for NTCRA-Buildings for subsurface soils is considered protective of human health and consistent with the risk threshold specified in the OU-10 ROD; and
- The remedy for OU-10 Plant Area Soils/NTCRA-Buildings for surface soils and subsurface soils is considered protective for groundwater.

Air Data

The passive gas vents in SB-1 (Cells 1-4) were sampled for hydrogen sulfide, percent Lower Explosive Limit (LEL), percent methane, percent carbon monoxide, percent carbon dioxide, and percent oxygen during 2011 -2012. Most of the vents in the northern part of the SB-1 area had no detections of hydrogen sulfide. The greatest concentrations of hydrogen sulfide were detected in the southern portion of the SB-1 area with the maximum concentration of 0.004 ppm measured in a few vents. The vents are barely producing any landfill gas or methane and high concentrations of oxygen were detected.

The passive gas vents in OU-10, Viscose Basins 1 through 8, and the New Landfill, and OU-7, Viscose Basins 9, 10 and 11 have been monitored for hydrogen sulfide, percent LEL, percent

methane, percent carbon monoxide, percent carbon dioxide, and percent oxygen since 2011. The highest levels of hydrogen sulfide and methane have been detected from Viscose Basins 1 through 8. Gas vent GV-4 contained the highest concentration of hydrogen sulfide detected in the area (3,580 ppm), and the highest yearly average (250 ppm). Gas vent-5 also had a maximum hydrogen sulfide detection of >500 ppm and a yearly average of 202 ppm.

During a 2011 bio-filter pilot study for treating the vent emissions from gas vents on Viscose Basins 4, 5 and 6, the gas vents GV 2, 3, 4, 6 and 9 were sampled for a list of contaminants with method TO-15. The flow rates of gas vents GV 1 – 10 were also measured. From the data, it was determined that gas vents GV 4, 5, and 6 had the greatest potential to produce high ambient air concentrations of hydrogen sulfide. A screening air model performed in January 2013 showed that the annual average hydrogen sulfide ambient air concentrations will most likely not exceed the concentration of 2.2 ug/m3 (HI=1) in the residential area near the viscose basins approximately 1,500 feet away. However, during periods of worst case meteorology, there will be concentrations of hydrogen sulfide exceeding the odor threshold of hydrogen sulfide (0.7 ug/m3) in the town. Onsite hydrogen sulfide ambient air concentrations may exceed the Industrial RSL HI =1 (8.8 ug/m3) mainly due to the emissions of GV-5. However, industrial receptors are unlikely to be present in the viscose basin area continuously during working hours. During periods of worst case meteorology, all of the vents that were evaluated produced hydrogen sulfide concentrations onsite that would exceed the odor threshold.

It is recommended that field data (concentrations, flow rates, temperature, etc.) be collected of all the gas vents. Based on the findings of the field data, vents will be identified for a more detailed evaluation and laboratory analysis. The laboratory analysis data will be incorporated into a refined air dispersion model such as AERMOD. The results of the model will be used to determine if offsite and onsite ambient air concentrations of hydrogen sulfide are likely to pose an unacceptable risk to nearby residents and onsite workers. The results will also be used to determine if the potential for nuisance odors offsite to be sporadic or routine. If the results of the air modeling show that the hydrogen sulfide emissions cause unacceptable risks or cause routine nuisance odors offsite, air pollution controls will be installed to capture or destroy most of the hydrogen sulfide emissions from the vents. In lieu of an air modeling analysis, air pollution controls can be installed proactively.

A second pilot study for gas vent odor control was initiated in 2012 to evaluate additional options for controlling emissions from GV 4, 5 and 6. The options for treatment that were considered were passive gas vent filters or an active combustion gas treatment system. The pilot is currently ongoing to evaluate the performance of passive gas filters to control hydrogen sulfide emissions and odors. Recommendations will be made regarding the evaluation and findings in a forthcoming Gas Vent Odor Control Pilot Study Report. If either gas treatment option is effective and employed, the potential for unacceptable concentrations of hydrogen sulfide in the ambient air will be reduced.

Site Inspection

The purpose of the site inspection is to gather information about the current status of the site and to visually confirm and document the conditions of the remedies, the site and the surrounding area.

Due to on-going work at the Avtex Site, the EPA Project Manager conducts six to eight site visits per year. In addition, EPA has an oversight contractor present at the Site two times a month and/or during significant construction activities. On October 16, 2012 the EPA RPM and other EPA and VDEQ representatives, as well as EPAs' oversight contractor, conducted a visual site inspection to observe significant aspects of the remedial and removal actions. On October 23 and 24, 2012, EPA's oversight contractor completed a more in depth inspection for this Five-Year Review. A copy of the summary report for the Five Year Review Site Inspection is provided in Attachment 3. Overall, there has been significant progress and improvement at the site since the last five-year review. Construction activities in the plant area are complete and the area has been graded. Most of the basins are capped and vegetation is established in most areas. For each unit that was inspected, the inspection report contains actions for consideration. The majority of the suggested actions address minor erosion repairs or monitoring well maintenance. These suggestions are listed in Section IX, Recommendations and Follow-Up Actions, of this Five Year Review Report.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

ROD 2 - Operable Unit Two – PCB Contaminated Soil

The remedy associated with OU-2 was implemented and completed as intended by the decision document. Soils contaminated with PCBs have been removed to meet the PCBs regulatory action levels and remaining soils are considered protective of human health and the environment. There was no system in operation and thus no O&M activities are associated with that remedy.

ROD 3 - Operable Unit Eight – Institutional Controls for Areas B and C

The institutional control for Areas B and C is being implemented through the 1999 Conservation Easement. The Conservation Easement can be enforced by EPA, the Lord Fairfax Soil and Water Conservation District and the Valley Conservation Council.

ROD 4- Operable Unit Ten – Plant Area Soils, Viscose Basins 1-8, New Landfill, WWTP

The major components of the remedy are substantially complete. There is no O&M associated with the Plant Area soils. Groundwater monitoring is conducted for Viscose Basins 1 through 8 and the New Landfill in accordance with the approved monitoring plan. Inspection and repairs (as needed) of the cover system on Viscose Basins 1-8 and the New Landfill will be performed as per the O&M Plan. The WWTP is scheduled for demolition in 2013

ROD 5 – Operable Unit Seven – Viscose Basin 9-11, Groundwater, Surface Water

The remedy is under construction.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

ROD 2 - Operable Unit Two – PCB Contaminated Soil

There have been no changes in the Site conditions that would affect the remedial action objectives or the overall protectiveness of the remedy for ROD 2. Consistent with the previous five-year review, there have been no changes in the Applicable or Relevant and Appropriate Requirements (ARARs) or To Be Considered (TBC) that affect the protectiveness of the OU-2 remedy that was implemented. A cleanup level of 10 ppm was selected for PCBs based on EPA's "August 1990 Guidance on Remedial Actions for Superfund Site with PCB Contamination" which recommends cleanup levels between 10 ppm and 25 ppm for industrial sites. This cleanup range remains in use today.

As stated in the previous five-year review, the Toxic Substances Control Act (TSCA) Regulations at 40 C.F.R.§ 761.61 were cited with regard to the PCB cleanup standard. On June 24, 1999, technical and procedural amendments to TSCA Regulations at 40 C.F.R. §761.61 for polychlorinated biphenyls (PCBs) were issued. The revisions include cleanup levels that are based on the kind of material and the potential exposure to PCBs left after cleanup is completed. Under these amendments soil is considered a bulk PCB remediation waste and a cleanup level of $\leq$ 25 ppm would be appropriate. This newer standard is less stringent than the cleanup level selected at the time the OU-2 ROD was issued. Since ARARs are frozen at the signing of the ROD, the cleanup standard for the PCB area will remain at 10 ppm, unless EPA issues a decision document which modifies the cleanup standard for that area.

ROD 3 - Operable Unit Eight – Institutional Controls for Areas B and C

The remedial action objective to implement an institutional control for Areas B and C to restrict the future use to commercial or industrial use is still valid. The institutional control is being implemented through the existing Conservation Easement. As stated previously, EPA is working with the signatories to modify the existing easement, but this modification would include restricting future use to industrial/commercial use. The existing Conservation Easement can be enforced by EPA, the Lord Fairfax Soil and Water Conservation District and the Valley Conservation Council

ROD 4- Operable Unit Ten – Plant Area Soils, VB 1-8, New Landfill, WWTP

ROD 4 was issued while there were removal actions taking place which included the demolition of buildings that presented serious safety concerns. Since EPA was unable to simultaneously collect the necessary data to identify site specific Contaminants of Concern (COCs), ROD 4 and the subsequent ESD for OU-10 developed cleanup numbers for the entire list of chemicals that are analyzed using the EPA Contract Laboratory Procedures. Since the ROD was written, the RSLs for some of these chemicals have changed. In turn, a risk evaluation using the April 2012 RSLs was conducted which concluded that the soils remediation for OU-10 is protective.

ROD 5 – Operable Unit Seven – VB 9-11, Groundwater, Surface Water

The exposure assumptions, toxicity data, cleanup levels and remedial action objectives selected in the 2010 ROD are still valid. The remedy is under construction.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

On February 17, 2012, EPA released the final non-cancer dioxin reassessment, publishing a non-cancer toxicity value, or reference dose, for 2,3,7,8- tetrachlorodibenzo-p-dioxin in EPA's Integrated Risk Information System. The new reference dose is now the recommended value "to be considered" for use in developing site-specific dioxin preliminary remediation goals and cleanup levels under CERCLA and the NCP. EPA's Office of Solid Waste and Emergency Response has proposed to revise the interim preliminary remediation goals for dioxin and dioxin-like compounds, based on technical assessment of scientific and environmental data. The new preliminary remediation goals calculated using the new reference dose of 0.7 picograms per kilogram-day and EPA non-adjusted exposure factors are 0.051 µg/kg for residential soil and 0.6654 µg/kg (ppb) for commercial/industrial soil (both are based on toxicity equivalence quotients, which add up the toxicity of all dioxin-like contaminants). EPA has evaluated the impact of this dioxin reassessment on the Site, and found that the Site remains protective.

There has been no other information that calls into question the protectiveness of the remedies selected for Operable Units 2, 8 and 10.

Technical Assessment Summary

According to the information reviewed, the Site Inspection, and the community involvement activities conducted, the remedies for OU-2 and OU-8 are functioning as intended by ROD-2 for OU-2 and ROD-3 for OU-8. The OU-7 and the OU-10 remedial actions are being implemented in accordance with the remedial designs. The other response actions, including the Non-Time-Critical Removal Action – Basins and the Non-Time-Critical Removal Action - Buildings and Sewers are proceeding in accordance with the Consent Decree and applicable Action Memoranda, response action plans, and response design documents. There have been no changes in the physical conditions at the Site that would affect the protectiveness of the selected remedies and other response actions. There is no other information that calls into question the protectiveness of the selected remedies and other response actions.

VIII. Issues

The following issues have been identified as a result of this technical assessment and five-year review process.

Issue	Recommendation	Party Responsible	Oversight Agency	Milestone Date	Affects Current Protectiveness Y/N	Affects Future Protectiveness Y/N
Some groundwater monitoring wells are routinely sampled and inspected, while others may be neglected.	Develop and implement a comprehensive ground water monitoring well evaluation plan. Implement the recommendations of the plan.	FMC	EPA	2014	N	N
There is insufficient information to confirm that air emissions do not present an unacceptable risk.	Collect gas vent data and incorporate into an air model to determine risk and potential for nuisance odors onsite and offsite. If risks are unacceptable, apply emission controls to the vents to capture or destroy contaminants. In lieu of air modeling analysis, install air pollution controls proactively.	FMC	EPA	2014	N	N
The former plant area is currently vacant and an ecological assessment is necessary to determine if the remedy is protective to ecological receptors.	Conduct an ecological assessment.	FMC	EPA	2014	N	N

Recommendations and Follow-Up Actions

EPA recommends that five-year reviews continue to be conducted at the Site, since response actions do not allow for unlimited use or unrestricted exposure. EPA also recommends that the recommendations listed above in Section VIII be conducted.

X. Statement on Protectiveness

ROD 2 - Operable Unit Two – PCB Contaminated Soil

The remedial action for OU-2 has been completed and the remedy is protective because the cleanup level of 10 ppm was achieved in the area of concern.

ROD 3 - Operable Unit Eight – Institutional Controls for Areas B and C

The institutional control for Areas B and C called for in the ROD is being implemented through the Conservation Easement. The Conservation Easement can be enforced by EPA, the Lord Fairfax Soil and Water Conservation District and the Valley Conservation Council. The ROD 3 for Areas B and C is considered protective.

ROD 4- Operable Unit Ten – Plant Area Soils, VB 1-8, New Landfill, WWTP

The major components of the remedy are substantially complete. The Plant Area soils were remediated to the cleanup levels established in the ROD. In addition, a risk evaluation was conducted comparing the concentration of contaminants in the existing soils to the April 2012 RSLs. This evaluation demonstrated that the plant area soils are protective for an industrial/commercial scenario. To ensure that the plant area soils remedy is protective to the current ecological receptors, an ecological assessment is warranted. Viscose Basin 1-8 and the New Landfill have been graded, capped, and seeded preventing exposure. The WWTP is scheduled for demolition in 2013.

ROD 5 – Operable Unit Seven – VB 9-11, Groundwater, Surface Water

The remedy is under construction.

XI. Next Five-Year Review

Since the remedial actions selected for OU-2, OU-7, OU-8 and OU-10 do not allow for unlimited use or unrestricted exposure, the next five-year review for the Avtex Fibers Superfund Site is required by March 2018, five years from the date of this review.

ATTACHMENT 1

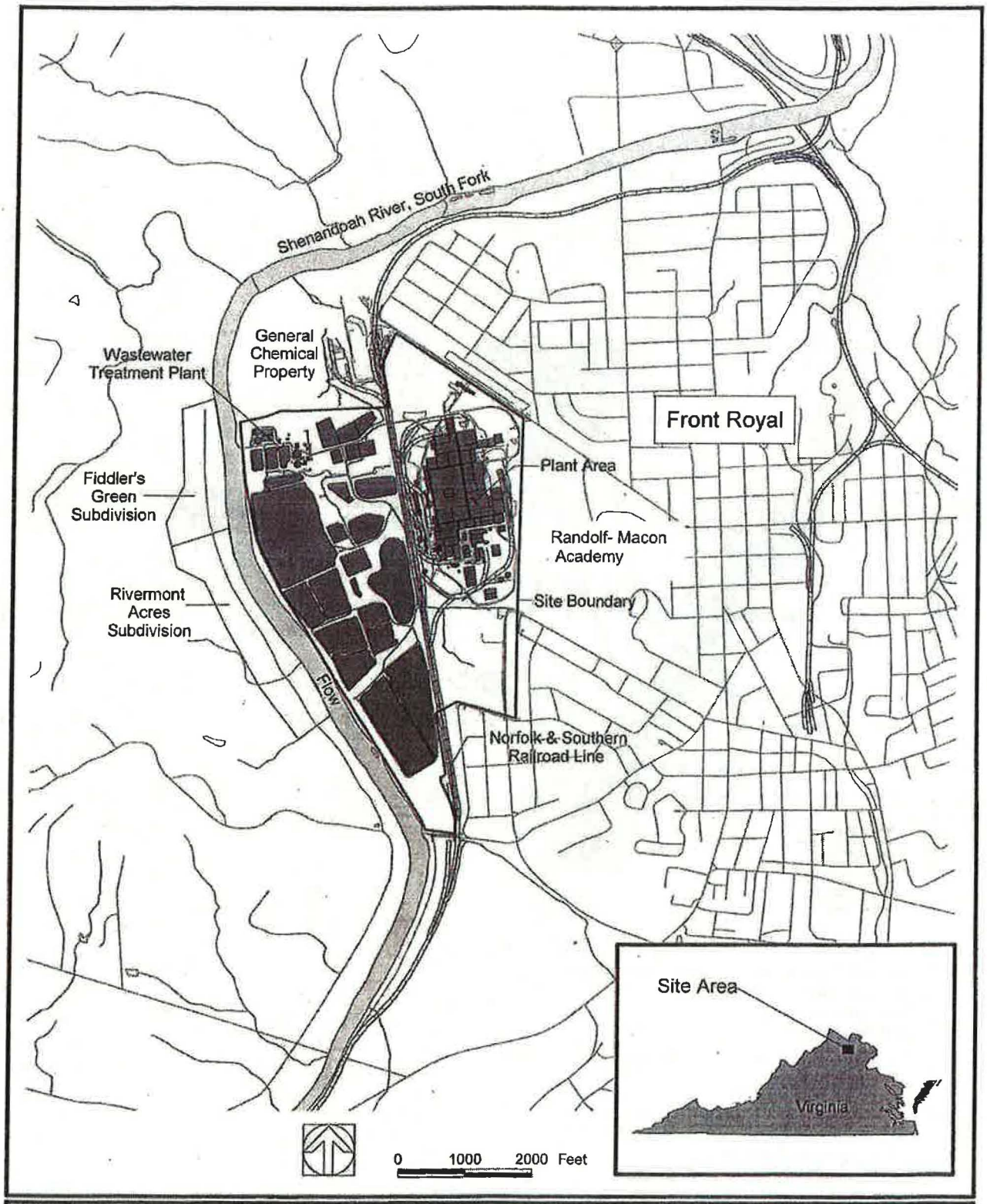

Figure 1 Avtex Location Map

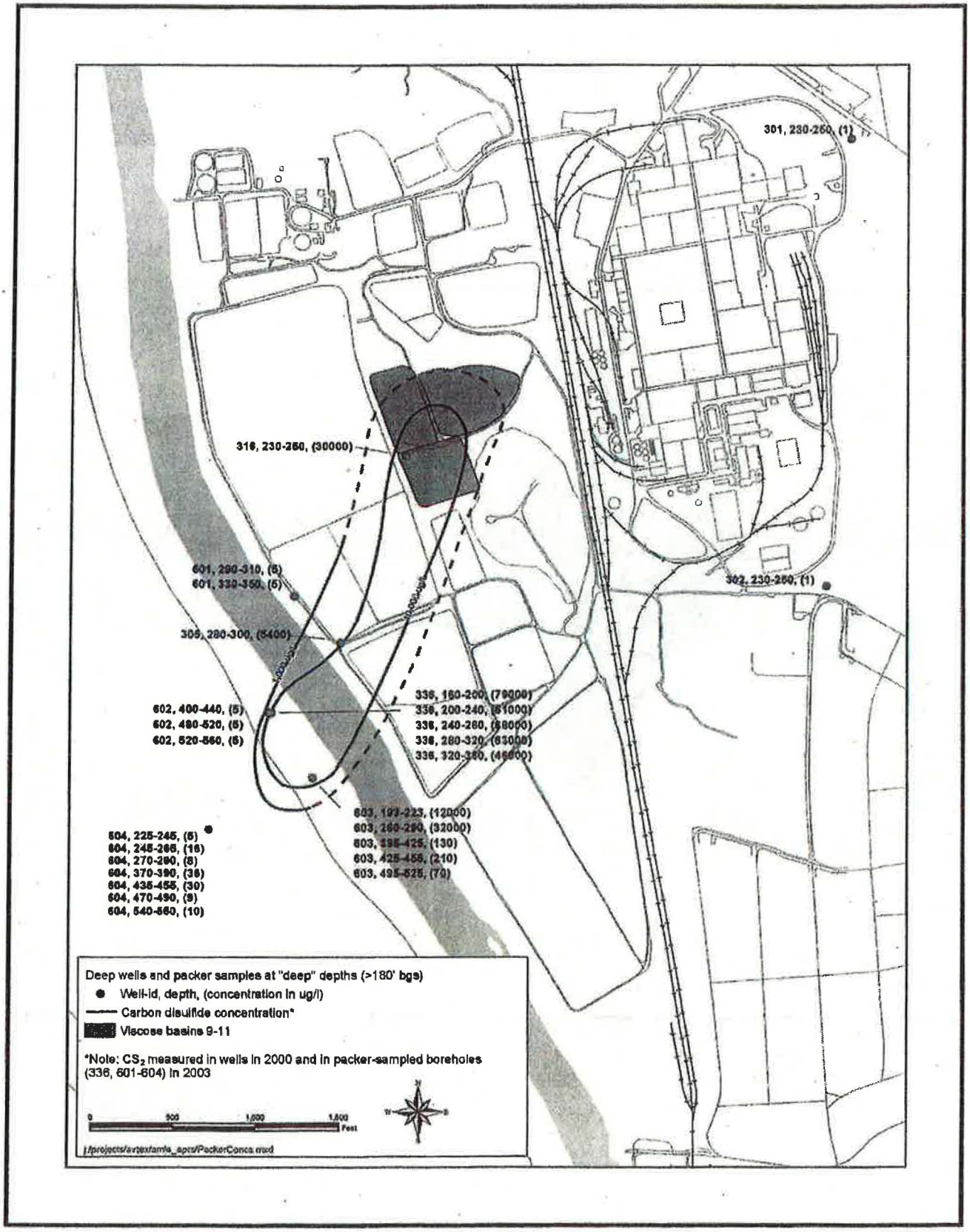

Figure 2 **Groundwater Plume**

Figure 3

MAP OF FUTURE LAND USE
AVTEX FIBERS SUPERFUND SITE
FRONT ROYAL, VIRGINIA

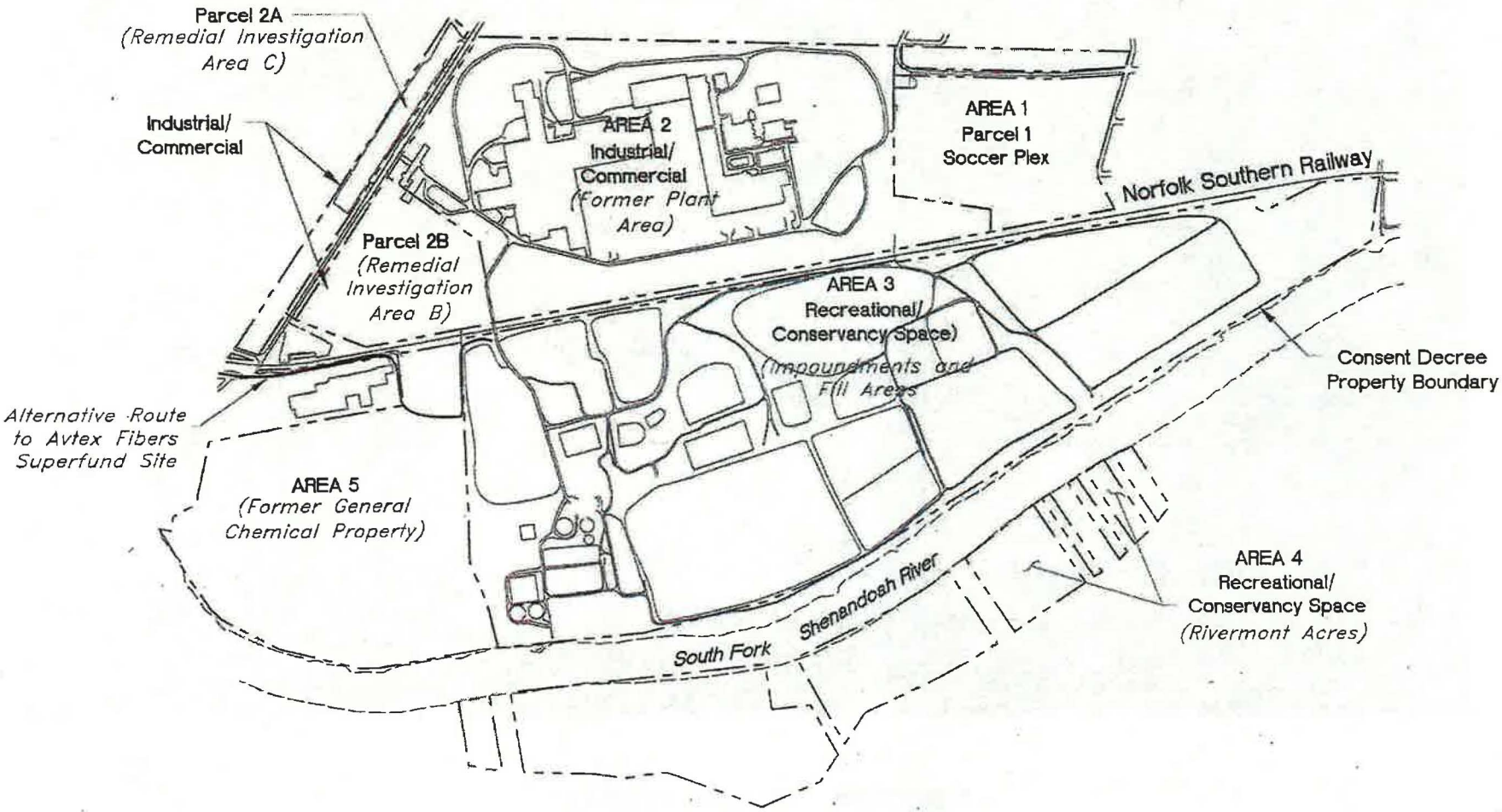

Figure 4

AVTEX FIBERS SUPERFUND SITE
FRONT ROYAL, VIRGINIA

TABLE 3- WWTP Effluent Limits

	Flow	BOD5	TSS	PCBs	Zinc	Copper	Lead	Cadmium	Cyanide	Phenol
	MGD	mg/l	mg/l	ug/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Monthly avg.	NL	30	30	ND	NL	1.450	NL	NL	0.420	0.015
Daily max. (1)	NL	45	45	ND	3410	2.496	0.060	0.231	0.706	0.026

BOD5 – Biological Oxygen Demand five day test
MGD – Million gallons per day
TSS- Total Suspended Solids
MGD – Million Gallons per day
mg/l - milligram per liter
ug/l - microgram per liter
NL – No limit
ND – Not detected

Parameter	Method	Detection Level
PCB	8082	0.50 ug/L
Zinc	200.7	10 ug/l
Phenol	420.4	0.01 mg/l
Copper	200.7	5 ug/l
Lead	200.7	5 ug/l
Cadmium	200.7	1 ug/l
Cyanide	4500CNE	0.005 mg/l

Metal limits vary with flow rage

(1) Maximum zinc limit is based on the monthly average

ATTACHMENT 2

ATTACHMENT 2

Lists of Documents Reviewed

Avtex Fibers Superfund Site Operable Unit One Record of Decision, September 30, 1988, US EPA Region 3.

Avtex Fibers Superfund Site Operable Unit Two Record of Decision, September 28, 1990, US EPA Region 3.

Avtex Fibers Superfund Site Operable Unit Eight Record of Decision, September 29, 2000, US EPA Region 3.

Avtex Fibers Superfund Site Operable Unit Ten Record of Decision, March 10, 2004, US EPA Region 3.

Explanation of Significant Differences, Operable Unit 10 Record of Decision, Avtex Fibers Superfund Site, January 10, 2006, US EPA Region 3.

Avtex Fibers Superfund Site Operable Unit 7 Record of Decision, Avtex Fibers Superfund Site, January 13, 2010, US EPA Region 3.

Second Explanation of Significant Differences, Operable Units 7, 8 and 10, Avtex Fibers Superfund Site, January 23, 2012, US EPA Region 3.

Request for Ceiling Increase and Change in Scope of Removal Response Activities at the Avtex Fibers NPL Site (Action Memorandum - Basins), January 31, 2000, US EPA Region 3.

Request for Ceiling Increase and Change in Scope of Removal Response Activities at the Avtex Fibers NPL Site (Action Memorandum - Buildings), December 20, 2001, US EPA Region 3.

Five-Year Review Report, Avtex Fibers Superfund Site, March 26, 2008, US EPA Region 3.

Conservation and Environmental Protection Easement and Declaration of Restrictive Covenants, November 22, 1999, Recorded in Warren County Virginia Land Records, December 7, 1999.

Burnt Debris Area Sample Results Report, September 30, 2005, FMC.

Site Fencing Pla(s) dated December 19, 2011 and December 14, 2012, FMC.

2009 Annual Post Closure Monitoring for the NTCRA – Basins for the Avtex Fibers Superfund Site, FMC.

Updates and Modifications to Final Design, Viscose Basins 1-8 and the New Landfill, OU 10, March 20, 2009, FMC.

Risk-Based Screening Analysis for OU 10 Plant Area Soils and NTCRA – Buildings Soils Data, October 8, 2012, FMC

Viscose Basins 4, 5, & 6 Gas Vent Odor Control Options Evaluation, OU 10, November 19, 2012, FMC.

Response to EPA Comments to the Risk-Based Screening Analysis for OU 10 Plant Area Soils and NTCRA – Buildings Soils Data, December 19, 2012, FMC.

ATTACHMENT 3

AVTEX FIBERS SUPERFUND SITE
FRONT ROYAL, WARREN COUNTY, VIRGINIA
5-YEAR REVIEW ON-SITE INSPECTION
SUMMARY REPORT

Prepared By: Gannett Fleming, Inc.

NOVEMBER 2012

Gannett Fleming

TABLE OF CONTENTS

1.0 INTRODUCTION

This 5-Year Review On-Site Inspection Summary Report has been prepared by Gannett Fleming, Inc. (Gannett Fleming) to present the results of on-site inspection activities conducted in October 2012 at the Avtex Fibers Superfund Site in Front Royal, Virginia. The inspection was conducted on several days:

- **October 16, 2012**: The EPA Remedial Project Manager (RPM) (Kate Lose) and two representatives from Gannett Fleming, Inc. (EPA Oversight Contractor) (Sidney J. Curran and Steven Deasy) initiated the inspection. During the afternoon, representatives of EPA [Kate Lose, Bruce Pluta (BTAG), Ryan Bower (Hydrogeologist)], the Virginia Department of Environmental Quality (Kevin Greene, Richard Criqui, and Tom Modena), the FMC Site Manager (John Torrence of Environmental Resources Management), and Gannett Fleming (Sidney J. Curran and Steven Deasy) toured the site to observe key significant aspects of the remedial and removal actions.
- **October 23 and 24, 2012**: On October 23, 2012, Sidney Curran and Steven Deasy continued the inspection, and on October 24, 2012, Steven Deasy completed the inspection

This Report provides a summary of observations and findings from the inspection. The detailed inspection notes were previously sent to EPA.

2.0 INSPECTION METHODOLOGY

2.1 GENERAL

Prior to field inspections of the Avtex Superfund Site by Gannett Fleming, EPA completed an initial site walkthrough. EPA met with Gannett Fleming on site and provided guidance on the inspection approach, including identification of the areas, basins, and site features, and systems that required inspection.

A Five-Year Review Inspection Checklist was developed by EPA for documenting observations made during the inspection. A GPS equipped camera was used to take photographs tagged with latitude and longitude coordinates within 15 feet accuracy. Photographs were primarily taken to characterize areas where issues were evident (e.g. erosion, unstable soils, sparse vegetation, surface water ponding), not to document the condition of the entire site.

2.2 AREAS AND ACTIONS INSPECTED

Some areas and activities were considered "under construction", "pending construction activity", or deemed "non-applicable" and were not inspected, including:

- **Operable Unit 7 (OU-7):** The OU-7 remedy is under construction for Viscous Basins 9, 10, and 11; surface water; and groundwater. These activities were only inspected to the extent that it could be determined that there were no imminent unacceptable hazards that needed to be addressed. The eastern shore of the South Fork Shenandoah River was walked by an inspector and no evidence of leaks in berms or releases to the river were identified. No additional information for OU-7 is presented in this report.
- **West Bank (Rivermont Acres and Fiddler's Green Subdivisions):** This area is located to the west of the South Fork Shenandoah River. The groundwater plume that extends under part of the area is being addressed by the OU-7 remedial action which is

in the construction phase. No additional information for the West Bank is presented in this report.

- **"SoccerPlex":** This area is comprised of the former Stump Park and the southern portion of the OU-10 Plant Area Soils. The area has been developed into soccer fields and a skateboard park by Warren County. The OU-10 portion is addressed under the OU-10 Plant Area Soils section.
- **Non-Time-Critical Removal Action (NTCRA) Basins: Sulfate Basins 3 and 4 (SB-3 and SB-4)**: Construction documents for repairing these basins have been approved and will be implemented in 2013. The engineering studies that were conducted indicated there were no hazards that necessitated making repairs sooner. SB-4 was not inspected except to confirm there were no imminent hazards – no additional information is provided in this report. SB-3 was inspected and included in the report, except for the issues pertaining to settlement that are scheduled for repair.
- **Historical Waste Water Treatment Plant (WWTP) - Operable Unit 10 (OU-10):** The construction on the remedy for the historical on-site WWTP is scheduled for 2013. This area was observed to be in a similar condition as in the past and poses no unacceptable hazards that have not been previously identified that would necessitate remedy construction sooner. No additional information is provided in this inspection report.

A listing of the areas or basins inspected on October 23 and October 24, 2012, are included in **Table 1**. In some cases, several areas or basins were inspected together and combined under a single checklist.

Table 1
Avtex Superfund Site, Front Royal Virginia
List of Inspected Areas and Conditions Observed – October 2012

Area or Basin	Inspected Features					
	Surface Conditions & Erosion (1)	Vegetative Cover (2)	Surface Water Controls (3)	Sumps & Lift Stations (4)	Gas Vents (5)	Ground Water Monitoring Wells (6)
Areas B and C						
Areas B and C	X	X	X	NA	NA	NA
Non-Time-Critical Removal Action: Buildings						
Plant Area, including Area A and East and West Storm Water Basins	X	X	X	NA	NA	NA
Operable Unit 10 (OU-10)						
Viscous Basin 1	X	X	X	NA	X	X
Viscous Basins 2 and 3	X	X	X	NA	X	X
Viscous Basins 4, 5, and 6	X	X	X	X	X	X
Viscous Basins 7 and 8	X	X	X	NA	X	X
New Landfill and Sediment Basin #2	X	X	X	X	X	X
Plant Area Soils	X	X	X	NA	NA	NA

Area or Basin	Inspected Features					
	Surface Conditions & Erosion (1)	Vegetative Cover (2)	Surface Water Controls (3)	Sumps & Lift Stations (4)	Gas Vents (5)	Ground Water Monitoring Wells (6)
Non-Time-Critical Removal Action: Basins						
Fly Ash Basins 1 and 2	X	X	X	X	NA	X
Fly Ash Basin 3	X	X	X	X	NA	X
Fly Ash Basin 6	X	X	X	X	NA	X
Former Fly Ash Stockpile	X	X	X	NA	NA	X
Fly Ash Removal Area	X	X	X	NA	NA	NA
Sulfate Basin 1, Cell 1	X	X	X	X	X	X
Sulfate Basin 1: Cells 2, 3, &4	X	X	X	X	X	X
Sulfate Basin 2	X	X	X	NA	NA	X
Sulfate Basin 3	X	X	X	X	X	X
Sulfate Basin 5	X	X	X	NA	NA	X

Notes:

"NA" Inspection feature was not located within the respective area or basin.
(1) Conditions such as settlement, cracks, holes, bulges, wet areas, and slope instability, and erosion.
(2) Conditions such as stressed vegetation, areas of sparse or no vegetation, and type of vegetation.
(3) Conditions such as vegetative obstructions, settlement, excessive sedimentation, and erosion (affecting ditches, off-site discharge, and detention ponds).
(4) External visual observation of sumps and lift stations. Units were not opened.
(5) Condition, seals, vertical versus tilting.
(6) Wells used for annual groundwater monitoring programs to meet the Virginia Solid Waste Regulations monitoring requirements for NTCRA Basins and OU-10 were inspected for locks, well caps, and general condition.

3.0 INSPECTION SUMMARIES

The following Inspection Summaries provide an overview of field observations, observed issues and proposed actions for consideration regarding the basins, areas, site features and monitoring systems inspected in the field by Gannett Fleming as part of the 5-year review.

3.1 AREAS B AND C

INSPECTION SUMMARY

Area B is located in the area of the Former Administrative Building's and is 24.5 acres in area. This area was previously utilized for excavating soil for use in the closure of on-site basins. Storm water drains in a westward direction to a culvert beneath the railroad tracks. The area is well drained and well vegetated.

Area C is a former parking Lot located on the north side of Kendrick Road that occupies 10.17 acres. The area is partially paved and stoned. The parking lot has areas of moderate vegetation.

Actions for Consideration: Areas B and C

- No action required.

3.2 NTCRA – BUILDINGS: PLANT AREA AND SEWERS (AND EAST & WEST STORM WATER BASINS)

INSPECTION SUMMARY

The **NTCRA – Buildings** is composed of the former **Plant Area** (area within the footprint of the former buildings) located to the east of the Norfolk Southern railroad tracks. The action also included removal of all site sewers, located both east and west of the railroad tracks.

The **Plant Area** is well vegetated in areas and less so in locations with foundations and other building structural elements still at ground level. At the time of the inspection, some drums and rolloffs related to brine impacted materials remained onsite, however, they were scheduled for off-site disposal within a few weeks. The status of a fuel oil line that ran along the eastern site boundary was to be checked. Minor areas of ponded water (**Photo 1**) were observed, such as north of Borrow Area A and adjacent to a pile of old railroad ties (note: some ponded areas may have been the result of OU-10 Plant Area Soils activities).

The **Storm Water Basin West** receives drainage from the Storm Water Basin East and drains an area north of the New Landfill and adjacent to the west side of the railroad tracks. The basin is well vegetated with wetland plants. Erosion along the southern side of the concrete inlet, and rill erosion covering an area of approximately 40 feet by 15 feet along the northern slope of the basin, were observed (**Photo 2**). The erosion is being addressed under the Operations and Maintenance Plan (O&M Plan).

The **Storm Water Basin East** drains approximately 50 acres in the adjacent area east of the railroad tracks. Moderate bank erosion was occurring along the basin inlet, and erosion gullies approximately 1 to 2 feet in depth were present northeast of basin (**Photos 3 & 4**). The erosion is being addressed under the O&M Plan.

Actions for Consideration: NTCRA – Buildings and East & West Storm Water Basins

- No action required.

Photo 1: Plant Area (09-05-12)
Latitude: not available
Longitude: not available
Description: Ponded Water (background left)

Photo 2: Storm Water Basin West (10-24-12)
Latitude: 38.9221
Longitude: -78.21004
Description: Erosion Gullies North Side of Basin

Photo 3: Storm Water Basin East (10-23-12)
Latitude: 38.9221
Longitude: -78.21543
Description: Bank Erosion along Basin Inlet

Photo 4: Storm Water Basin East (10-23-12)
Latitude: 38.9221
Longitude: -78.21543
Description: Erosion Gullies North of Basin

3.3 OU-10: PLANT AREA SOILS

INSPECTION SUMMARY

The **OU-10 Plant Area Soils** was composed of the soils outside the footprint of the buildings located east of the railroad tracks.
The field inspection did not identify any issues other than localized ponding of water that is described under NTCRA – Buildings: Plant Area and Sewers.

Actions for Consideration: Plant Area Soils

- No action required.

3.4 OU-10: VISCOUS BASIN 1

INSPECTION SUMMARY

Viscous Basin 1 (VB-1) is located to the west of Viscous Basins 2 & 3, just east of the historical wastewater treatment plant. VB-1 is predominantly well vegetated, but warm season grasses are less dense than VB 2 and 3. The north slope has small areas of unstable soils that are sparsely vegetated. A 40 foot by 40 foot area adjacent to monitoring wells MW-11 and 135 is void of vegetation with an adjacent area of stressed vegetation; white residue (assumed to be salts) are evident (**Photos 5 & 6).** The soils and vegetation are being addressed under the O&M Plan. All gas vents were inspected visually and appeared to be in good condition. Some were slightly out of vertical.

Actions for Consideration: Viscous Basin 1

- No action required.

Photo 5: VB-1 (10-23-12)
Latitude: 38.92883
Longitude: -78.21479
Description: Bare ground / Stressed Vegetation

Photo 6: VB-1 (10-23-12)
Latitude: 38.92968
Longitude: -78.21398
Description: North slope with sparse to no vegetation

3.5 OU-10: VISCOUS BASINS 2 AND 3

INSPECTION SUMMARY

Viscous Basins 2 and 3 (VB-2 & VB-3) are located to the east of Viscous Basins 1. VB-2 and VB-3 are predominantly well vegetated, however, the north facing slopes and north west corner show evidence of unstable soils with sparse to no vegetation along the rip rap channel (**Photos 7 and 8**). The unstable soils and vegetation are being addressed under the O&M Plan. All gas vents were inspected visually and appeared to be in good condition. Some wells were slightly out of vertical and some were not labeled.

Actions for Consideration: Viscous Basin 2 and 3

- No action required.

Photo 7: Viscous Basin 2 & 3 (10-23-12)
Latitude: 38.92993
Longitude: -78.213
Description: Unstable soils with sparse to bare vegetation

Photo 8: Viscous Basin 2 & 3 (10-23-12)
Latitude: 38.9297
Longitude: -78.21408
Description: Unstable soils with sparse to bare vegetation

3.6 OU-10: VISCOUS BASINS 4, 5, AND 6

INSPECTION SUMMARY

Viscous Basins 4, 5, and 6 (VB-4, VB-5, and VB-6) are located to the north of VB-1, VB-2, and VB-3. The basins are predominantly well vegetated, however, there are narrow strips (over 6 inches wide) of unstable soils with sparse vegetation along Flumes #2, #3, and #4 (**Photo 10**). Slight erosion was evident on the upper side of Flume #2 (**Photo 9**). The storm water pond at the northwest corner has an area of stressed vegetation with white residue (assumed to be salts) toward the eastern end of the pond near the inlet. Unstable soils and sparse vegetation along the flumes and the storm water pond are being addressed under the O&M Plan. All gas vents were inspected visually and appeared to be in good condition. Some were slightly out of vertical.

Actions for Consideration: Viscous Basins 4, 5 & 6 (VB-4, 5, &6)

- No action required.

Photo 9: Viscous Basin 4, 5 & 6 (10-23-12)
Latitude: 38.92944
Longitude: -78.21538
Description: NW corner Storm water pond. Assumed to be salt

Photo 10: Viscous Basin 4, 5, and 6 (10-23-12)
Latitude: 38.92959
Longitude: -78.21513
Description: Flume #3. Unstable soil

3.7 OU-10: VISCOUS BASINS 7 and 8

INSPECTION SUMMARY

Viscous Basins 7 & 8 (VB-7 & VB-8) are located to the west of the New Landfill. VB-7 and 8 are well vegetated and appear to be in overall good condition, however, unstable soil with slight erosion exists along Ditch #5. The Ditch #5 erosion is being addressed under the O&M Plan. All gas vents were inspected visually and appeared to be in good condition. Some were slightly out of vertical.

Note: No photos included.

Actions for Consideration: Viscous Basins 7 and 8

- No action required.

3.8 OU-10: NEW LANDFILL & SEDIMENT BASIN #2

INSPECTION SUMMARY

The New Landfill and Sediment Basin #2 are located to the east of Viscous Basins 7 & 8 and north of Ditch #10. The New Landfill was recently capped in May 2012 and seeded in June 2012. Vegetation is being established (**Photo 11**), although there are some areas of unstable soils contributing to minor rill erosion (**Photo 12**). Routine erosion monitoring and closure care maintenance including soil amendment/stabilization, erosion repair and reseeding as necessary is being performed under the O&M Plan. All gas vents were inspected visually and appeared to be in good condition. Some were slightly out of vertical. Sediment Basin #2 is well vegetated with wetland plants and in good condition.

Actions for Consideration: New Landfill and Sediment Basin #2

- No action required.

Photo 11: New Landfill (8-21-12)
Latitude: not available
Longitude: not available
Description: Vegetation being established on New Landfill

Photo 12: New Landfill (10-17-12)
Latitude: not available
Longitude: not available
Description: Minor unstable soil & rill erosion on slopes

3.9 NTCRA – BASINS: FLY ASH BASINS 1 AND 2

INSPECTION SUMMARY

Fly Ash Basins 1 and 2 (FAB-1 and FAB-2) are located north of FAB-6 and south of the former Fly Ash Stockpile. FAB-1 and FAB-2 are predominantly well vegetated and in good condition, however, an area of sparse vegetation is present along the northerly border **(Photo 13)**. The sparse vegetation will be addressed under the O&M Plan, if necessary.

Actions for Consideration: Fly Ash Basins 1 and 2 (FAB-1 and FAB-2)

- No action required.

Photo 13: FAB-1 and FAB-2 (10-23-12)
Latitude: 38.92272
Longitude: -78.21169
Description: Area of sparse vegetation along road.

3.10 NTCRA – BASINS: FLY ASH BASIN 3

INSPECTION SUMMARY

Fly Ash Basin 3 (FAB-3) is located to the west of the former Fly Ash Stockpile and south of Viscose Basin 9. The basin has generally sparse vegetation **(Photos 14 and 15)**, and a small ponded depression area **(Photos 16 and 17)** was observed; these will be addressed under the O&M Plan. Sump SB-3-1 was located but not opened; no visual evidence of problems.

Actions for Consideration: Fly Ash Basin

- No action required.

Photo 14: FAB-3 (10-23-12)
Latitude: 38.92363
Longitude: -78.21277
Description: Sparse Vegetation

Photo 15: FAB-3 (10-23-12)
Latitude: 38.92307
Longitude: -78.21281
Description: Sparse Vegetation

Photo 16: FAB-3 (10-23-12)
Latitude: 38.92325
Longitude: -78.21267
Description: Small ponded area

Photo 17: FAB-3 (10-23-12)
Latitude: 38.92321
Longitude: -78.21262
Description: Close-up of ponded depression area

3.11 NTCRA – BASINS: FLY ASH BASIN 6

INSPECTION SUMMARY

Fly Ash Basin-6 (FAB-6) is located at the southeastern end of the Avtex site parallel to and on the west side of the railroad tracks. FAB-6 is predominantly well vegetated and in good condition. Sparse vegetation occurs near sump FAB-6B and monitoring well B48-A along the perimeter ditch; where turf reinforcement matting (TRM) is exposed along a portion of the ditch in this area. These areas will be managed under the O&M Plan. Historic vehicle access shows evidence of stressed and sparse vegetation **(Photos 18 and 19)**. Sumps FAB-6-N (FAB-6-A) and FAB-6-S (FAB-6-B) were located but not opened; no visual evidence of problems.

Actions for Consideration: Fly Ash Basin 6

- No action required.

Photo 18: FAB-6 (10-23-12)
Latitude: 38.91957
Longitude: -78.21115
Description: Sparse vegetation & exposed TRM matting along ditch

Photo 19: FAB-6 (09-05-12)
Latitude: not available
Longitude: not available
Description: Sparse to bare vegetation along access road

3.12 NTCRA – BASINS: FLY ASH REMOVAL AREA

INSPECTION SUMMARY

The **Fly Ash Removal Area** is located at the northern end of FAB-6, just west of the railroad tracks. The Fly Ash Removal area is well vegetated and in good condition. There were no observed issues with vegetation, erosion, or with any other area features.

Actions for Consideration: Fly Ash Removal Area

- No action required.

3.13 NTCRA – BASINS: FLY ASH STOCKPILE AREA

INSPECTION SUMMARY

The **Fly Ash Stockpile (FAS) Area** is located just west of the railroad tracks and at the southwestern side of Viscose Basin 10. The Fly Ash Stockpile is generally well vegetated and in good condition. The area of salt impacted soil is still evident (**Photo 20**), however, vegetation appears generally good. Portions of the salt impacted area appear to be a monoculture (**Photo 21**). Areas of the ditch along a road at the southwestern border have sparse vegetation (**Photo 22**). These areas will be managed under the O&M Plan.

Actions for Consideration: Fly Ash Stockpile (FAS) Area

- No action required.

Photo 20: FAS (09-05-12)
Latitude: not available
Longitude: not available
Description: Salt in salt impacted area

Photo 21: FAS (09-05-12)
Latitude: not available
Longitude: not available
Description: Vegetation in salt impacted area.

Photo 22: FAB-3 (10-23-12) (DSC00159)
Latitude: 38.92268
Longitude: -78.21148
Description: Sparse vegetation along ditch.

3.14 NTCRA – BASINS: SULFATE BASIN 1, CELL 1

INSPECTION SUMMARY

Sulfate Basin 1, Cell 1 (SB-1, Cell 1) is located south of the Emergency Lagoon and east of and adjacent to the South Fork Shenandoah River. SB-1, Cell 1 is well vegetated and in good condition. A few areas of sparse vegetation exist along the contact line of Cell 1 and Cell 2. Gas vent GV4 leans appreciably south west; periodic observation of that area may be warranted. The articulated block-lined channel to the river is in good condition. Sump SB1-1 was located but not opened; no visual evidence of problems. All gas vents were inspected visually and appeared to be in good condition. Some were somewhat out of vertical.

Actions for Consideration: Sulfate Basin 1, Cell 1

- No action required.

3.15 NTCRA – BASINS: SULFATE BASIN 1, CELLS 2, 3, and 4

INSPECTION SUMMARY

Sulfate Basin 1, Cells 2, 3, and-4 (SB-1, Cell 2, 3, and 4) are located south of the Emergency Lagoon and east of and adjacent to the South Fork Shenandoah River. Vegetation on SB-1, Cells 2, 3, and 4 is becoming well established and is in overall in good condition. However, surface water ponding occurs in two areas at the west end of Cell 3, each approximately 25 feet by 25 feet in area (**Photo 23**). The design for addressing these areas of ponding has been approved and construction is scheduled for 2013. All gas vents were inspected visually and appeared to be in good condition. Some were not labeled and some were not vertical. Gas vents GV24 and GV25 along the southern side of Cell 4 show appreciable tilt (**Photo 24**); these vents are not located near the surface water ponding in Cell 3. The articulated block-lined channels to the river are in good condition. Sumps SB1-2, SB1-3, and SB1-4 were located but not opened; no visual evidence of problems.

Actions for Consideration: Sulfate Basin 1, Cell 2-4 (SB-1, Cell 2-4)

- No further action required.

Photo 23: SB-1, Cell 3
Latitude: 38.92618
Longitude: -78.21802
Description: Surface water ponding. Settlement

Photo 24: SB-1, Cell 4
Latitude: 38.92699
Longitude: -78.21604
Description: Gas Vent (GV25) tilting south

3.16 NTCRA – BASINS: SULFATE BASIN 2

INSPECTION SUMMARY

Sulfate Basin 2 (SB-2) is located south of the Emergency Lagoon and east of and adjacent to the South Fork Shenandoah River. SB-2 is well vegetated and in good condition. The articulated block-lined channel to the river is in good condition. There were no reportable issues with vegetation, erosion, or with any other area features or systems.

Actions for Consideration: Sulfate Basin 2

- No action required.

3.17 NTCRA – BASINS: SULFATE BASIN 3

INSPECTION SUMMARY

Sulfate Basin 3 (SB-3) is located south of the Emergency Lagoon and east of and adjacent to the South Fork Shenandoah River. SB-3 is well vegetated and in good condition. The articulated block-lined channel to the river is in good condition. There were no reportable issues with vegetation, erosion, or with any other area features or systems. Sump SB-3-1 was located but not opened; no visual evidence of problems. All gas vents were inspected visually and appeared to be in good condition. Some were slightly out of vertical.

Actions for Consideration: Sulfate Basin 3 (SB-3)

- No action required.

3.18 NTCRA – BASINS: SULFATE BASIN 5

INSPECTION SUMMARY

Sulfate Basin 5 (SB-5) is located near the southern end of the site. SB-5 is well vegetated and the pond is in good condition. There were no issues identified with vegetation, erosion, or with any other area features.

Actions for Consideration: Sulfate Basin 5

- No action required.

3.19 NTCRA – BASINS: WWTP Basins (Polishing Basins 1, 2, and 3 and the Emergency Lagoon)

INSPECTION SUMMARY

Polishing Basins 1 and 2 and the Emergency Lagoon are currently used for storage of stormwater and pre-treated leachate from viscose basins. The design for addressing these basins is in the review phase. The design is scheduled to be implemented in 2013. Polishing Basin 3 construction has been completed. No issues were identified for Polishing Basin 3.

Actions for Consideration: Sulfate Basin 5

- No action required.

3.20 NTCRA BASINS AND OU-10 MONITORING WELL INSPECTIONS

INSPECTION SUMMARY

The monitoring wells that are sampled during the annual NTCRA Basins and the annual OU-10 groundwater sampling programs were inspected visually for surface integrity and security. Observations are provided in Table 2. FMC undertook a well inspection and repair program soon after this inspection was conducted. Groundwater data were not reviewed as part of the inspection by Gannett Fleming.

Actions for Consideration: Monitoring Wells

- No action required.

3.21 REVEGETATION OF BASINS - GENERAL

INSPECTION SUMMARY

Based on observations and photos taken during a site visit by Biological Technical Assistance Group (BTAG) on October 25, 2012, there are infestations of Chinese lespedeza (*Lespedeza cuneata*) on some of the caps. This is an invasive species that is aggressive and out-competes many native plant species. In addition, Chinese lespedeza does not provide good erosion control compared to native warm season grasses. The presence of Chinese lespedeza may increase erosion of the cap soils. As part of the long-term maintenance of these caps, Chinese lespedeza should be controlled and these areas should be restored to native warm season grasses.

Actions for Consideration: Revegetation of Basins - General

- No action required.

Table 2
Monitoring Well Inspection (October 2012)
Avtex Fibers Superfund Site, Front Royal, Virginia

Inspection Condition	Well #	Type	Monitor / Comment
Basins – NTCRA – GW Monitor			
OK	008	OMW	Upgradient FAB-6 – east of RR
OK	012	OMW	Downgradient FAB-1, upgradient SB-4E
OK	013	OMW	Downgradient FAB-2, upgradient SB-4
OK	022	OMW	Downgradient SB-4, adjacent to river
OK	023	OMW	Downgradient SB-2, adjacent to river
Needs lock	025	OMW	Downgradient SB-1, Cell 3, adjacent to river
OK	029	OMW	Upgradient FAS, adjacent to RR
No cap	014R	OMW	Downgradient FAB-3, upgradient SB-3
Screw on plastic cap cannot be locked	B-48A	OMW	Downgradient FAB-6, upgradient SB-5
OK	MW-12	OMW	Downgradient VB-7, upgradient SB-1, Cell 4
Casing cover cracked but OK	108	SBMW	Upgradient FAB-6, east of RR
OK	110	SBMW	Downgradient SB-5, adjacent to river
OK	112	SBMW	Downgradient FAB-1, upgradient SB-4E
OK	113	SBMW	Downgradient FAB-2, upgradient SB-4
Well cover (metal) loose from casing	114	SBMW	Downgradient FAB-3, upgradient SB-3
OK	129	SBMW	Upgradient FAS, adjacent to RR
Not labeled	132	SBMW	Downgradient VB 7/8, upgradient SB-1
Clasp broken, cannot insert lock	PZ-03	SBMW	Downgradient SB-1, Cell 3, adjacent to river
OK	PZ-06	SBMW	Downgradient SB-2, adjacent to river
No lock	PZ-07	SBMW	Downgradient SB-4, adjacent to river
OU10 – VB 1-8 & NL			
Unlocked, steel casing lid open, no well cap	GPW-02	OMW	Upgradient east of RR tracks
OK	GPW-03R	OMW	Upgradient east of RR tracks
Locked, no cap	GPW-14	OMW	Upgradient side and VB 4-6
Needs to be labeled on outside	GPW-15R	OMW	Downgradient VB 4-6
Needs relabeling	GPW-16R	OMW	Water level measurements only
No cap, lock does not lock	GPW-17	OMW	Water level measurements only
OK	GPW-19	OMW	Upside gr. NL & downgradient VB 2/3
OK	GPW-20	OMW	Downgradient NL & upgradient VB 9/10/11
OK	MW-11	OMW	Downgradient VB-1, upgradient VB-7
OK	MW-12	OMW	Downgradient VB-7, upgradient SB-1, Cell 4
OK	MW-5	SBMW	Upgradient VB-6 & old WWTP
OK	MW-7	SBMW	Downgradient NL & upgradient VB-7
OK	MW-8	SBMW	Downgradient NL & upgradient VB-9
Lock does not lock	118	SBMW	Upgradient VB 4-6 (adjacent to RR tracks)
OK	119	SBMW	Upgradient VB 4-6
OK	120R	SBMW	Upgradient VB 4-6
OK (found unlocked, but no cap lock there)	128	SBMW	Upgradient VB 9-11
OK	130R	SBMW	Upgradient NL
Not labeled	132	SBMW	Downgradient VB 7/8, upgradient SB-1
OK	133	SBMW	Downgradient NL
Could not unlock	134	SBMW	Upgradient VB-2, down VB 4-6
OK	135	SBMW	Downgradient VB-1
OK	GPW-18	OMW	Water level measurements only
No cap	GPW-21	OMW	Water level measurements only

Figure was adapted from EPA working inspection document
OK = Locked, labeled, and capped.
OMW = Overburden monitoring well
SBMW = Shallow bedrock monitoring well